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The Effects of Information and Technology on the Relational Orientation of Marketing Channels: Impact on Structure and Performance

by

Jack D. Kulchitsky 

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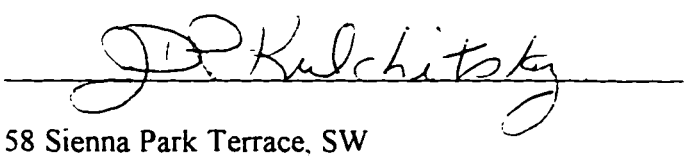

58 Sienna Park Terrace, SW
Calgary, Alberta
Canada, T3H 3L4

September 29, 1997
Date

University of Alberta

Faculty of Graduate Studies and Research

The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research for acceptance, a thesis entitled The Effects of Information and Technology on the Relational Orientation of Marketing Channels: Impact on Structure and Performance submitted by Jack D. Kulchitsky in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Marketing.

Dr. P. Larson

Dr. P. Messinger

Dr. D. West

Dr. K. Devine

Dr. J. Bookbinder

September 29, 1997

Date

DEDICATION

To My Daughter

SARAH

Fulfill your dreams,

As you have allowed me to fulfill mine;

My heart will always be with you,

For an eternity of time.

ABSTRACT

In the mid-1960s, business strategy focused on growth through vertical acquisition. Forward and backward integration resulted in vertical marketing systems where exchange activity was coordinated through authoritative control. By the mid-1980s, many businesses were discovering that greater financial returns could be achieved by outsourcing less-familiar channel activities and focusing corporate resources on core competencies. This emphasis shifted business strategies away from vertical integration toward contractual relationships in conventional channels that involved normative mechanisms to manage the coordination of exchange activity.

Though the marketing channels literature acknowledges that communication plays a vital role in facilitating exchange, limited attention has been directed toward understanding the moderating effect of interorganizational technology and information enabled by the technology. This dissertation addresses this gap by developing a model of the effect of information and technology on the relational orientation of marketing channels. The hypotheses are tested using data collected by surveying 410 logistics professionals from the Canadian Association of Logistics Managers, and 514 purchasing managers who are members of The Purchasing Management Association of Canada. The empirical results suggest that channel managers rely on synchronous communication, enabled by direct forms of technology (face-to-face and telephone), for the establishment and maintenance of exchange relationship, whereas mechanical technologies (mail and fax) have the greatest influence on the cooperation and

coordination of channel activity. Electronic technologies (EDI and inter-firm data links) are under-utilized at present, but have potential to affect both strategic and tactical interorganizational communication.

This dissertation makes at least three distinct and important contributions to the understanding of the effects of information and technology in relationship marketing in channels of distribution: (1) Development of a conceptual model to empirically test the effect of information technology on the structure of relational exchange in marketing channels; (2) Separation of interorganizational systems into two distinct dimensions of communication (value of shared information and adoption of technology); and, (3) Separation of the construct of interorganizational communication into strategic and tactical communication.

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Statement of Purpose

In the mid-1960s, business strategy focused on growth through vertical acquisition. Forward and backward integration resulted in vertical marketing systems where exchange activity was coordinated through authoritative control. During this period, research on the structure of exchange relationships in marketing channels focused on the institutional form and physical attributes of the channel (Bucklin, 1966). Channel length, distribution intensity, and functional responsibility were examined to describe vertically administered channels (McCammon, 1970).

By the mid-1980s, many businesses were discovering that greater financial returns could be achieved by outsourcing less-familiar channel activities and focusing corporate resources on core competencies (Peters and Waterman, 1983). This emphasis on core competencies shifted business strategies away from vertical

integration toward closer relationships in conventional channels that involved normative mechanisms to manage the coordination of exchange activity.

In the marketing literature, the concepts of "relationship marketing" and "relational orientation" are used to describe the strategy of interorganizational cooperative behavior. Berry (1983) first defined relationship marketing in the services literature as attracting, maintaining, and enhancing customer relationships. More recently, Parvatiyar and Sheth (1994) have defined relationship marketing as an orientation that seeks to develop close interactions with selected customers, suppliers, and competitors for value creation through cooperative and collaborative effort. Morgan and Hunt (1994) broaden the definition of relationship marketing to refer to all marketing activities directed toward establishing, developing, and maintaining successful relational exchanges. Included within the scope of this definition are: supplier relationships (Frazier, Spekman, and O'Neal, 1988); strategic alliances (Day, 1990); co-marketing alliances (Bucklin and Sengupta, 1993); distribution partnerships (Anderson and Narus, 1990); end-user relationships (Berry, 1983); internal marketing (Arndt, 1983; Berry and Parasuraman, 1991); and, intra-firm relationships (Porter, 1987).

The movement toward contractual relationships in conventional channels has shifted the focus of research from channel length and intensity, to more complex treatments of the structure of dyadic relationships. For example, Mohr and Nevin's (1990) contingency theory of channel communication integrates Macneil's (1980)

concept of relationship structure to position the role of communication as an antecedent to the establishment and maintenance of exchange relationships. Boyle, Dwyer, Robicheaux, and Simpson (1992) contribute to this research stream two large-scale empirical tests of the effects of channel communication processes on the structure of contractual exchange.

Drawing from models in communication theory (e.g., Krone, Jablin, and Putnam, 1987), organization theory (e.g., Porter and Roberts, 1976), and relational exchange theory (e.g., Macneil, 1980), research on interorganizational communication in marketing channels has examined the flows of information between firms, and the quality of the information exchanged. Researchers who have modeled the nature of communication flows in marketing channels have examined aspects of communication such as the frequency of interaction, the extent to which flows are bi-directional, or the level of formality in the flow (e.g., Mohr and Nevin, 1990). Researchers who have focused on the value of the information in communication, have examined the adequacy (Bialaszewski and Giallourakis, 1985) or efficacy (Anderson and Narus, 1990) of information in problem solving.

Though the marketing channels literature acknowledges that communication plays a vital role in facilitating exchange (Grabner and Rosenberg, 1969; Stern and El-Ansary, 1988), limited attention has been directed toward understanding the moderating role of channel communication when linking relational behavior with channel performance (Mohr and Nevin, 1990). For example, the marketing literature

has not acknowledged the effect of channel communication in research that has linked increased relational behavior to better performance (Reve and Stern, 1986).

The lack of research on the behavioral and operational benefits of adopting information technology is a significant omission in the understanding of the moderating effects of communication in the development and maintenance of relationships in marketing channels (Achabal and McIntyre, 1987). In a special issue of *The Journal of the Academy of Marketing Science*, Weitz and Jap (1995) emphasize this research gap:

> "In light of the substantial potential cost reduction [resulting from the adoption of communication technology], it is surprising that marketing scholars and other academics have devoted as little attention to understanding the benefits of relationship marketing in this channel context. The primary investigators of the implications of improving coordination in this channel have been consulting companies. Reminiscent of the Total Quality Movement, marketing scholars have been watching the world evolve rather than leading or even participating in the evolution." - Weitz and Jap (1995)

The purpose of this dissertation is to address the research gap identified by Weitz and Jap (1995) by examining the moderating effects of communication, enabled by technology, on marketing channel cooperative behavior and performance.

Contribution to Marketing Knowledge

Although newer communication systems have been described as "the most important technological breakthrough in channels of distribution and significantly impacting the relationship between channel members" (O'Callaghan, Kaufmann, and Konsynski, 1992), marketing research on the effect of multiple forms of technology and the quality of information in interorganizational communication is limited. Noting the absence of research in this area, Achabal and McIntyre (1987) call for answers to some important questions such as: "What are the economic and behavioral effects of interorganizational technologies?" Bakos and Kemerer (1992) claim that the changes in business strategies that have resulted in the movement from vertically managed hierarchies to inter-firm alliances, have been so dramatic and occurred so rapidly that they have outpaced progress in economic and management theories.

In the development of a theoretical model, and the empirical testing of the research hypotheses, this dissertation will seek answers to the following questions:

1. How does communication technology impact interorganizational relational orientation?
2. What effect does the structure and form of the information and technology in interorganizational communication have on (a) relational outcomes, and (b) operational performance?

This dissertation will make at least three distinct and important contributions to the understanding of the effects of information and technology in relationship marketing in channels of distribution:

1. **Development of a conceptual model to empirically test the effect of information technology on the structure of relational exchange in marketing channels**. Despite the call for research on the economic impact of information technology in marketing channels, marketing research has been limited to identifying the characteristics of early adopters of technology, and the empirical analysis of the correlation between the rate of technical diffusion of technology and industry performance. A model of relational orientation incorporating technology as an independent construct has not been tested.

2. **Separation of information technology into two distinct dimensions of interorganizational communication**. Previous empirical studies are consistent with a common theme in information systems research – the value of the technology. As a consequence, there are several published examples showing a correlation between the dollar value invested in information systems and operational performance. This dissertation separates interorganizational systems into two distinct dimensions (information and technology) and examines the impact of technology adoption and the value of the information exchanged by the technology.

3. **Separation of the construct of interorganizational communication into strategic and tactical communication**. Previous models of communication have focused on communication as a single construct. This dissertation separates the construct of interorganizational communication to examine the effects of information and technology on strategic and tactical information exchange.

In addition to addressing the academic research gaps identified by Achabal and McIntyre (1987) and Weitz and Jap (1995), answers to the preceding questions will also benefit marketing and logistics practitioners. The retail trade press and consultant reports suggest that the adoption of technology, such as electronic data interchange and interorganizational data links, will result in significant performance improvements. The problem with most of the claims of improved industry performance reported in the trade literature is that they are anecdotes drawn from individual cases, they focus solely on the adoption of communication hardware and software, and they often ignore the cooperative relationship necessary for the flow of information enabled by the adoption of technology. This dissertation will provide marketing practitioners with a framework to position the adoption of communication technology in the development and maintenance of channel relationships.

Organization of the Dissertation

The organization of this dissertation is as follows. The current chapter has described a significant gap in the marketing literature, and the contribution this dissertation will make toward reducing this gap by developing and testing a model of communication in the context of relational orientation in marketing channels. The contribution of this dissertation is of benefit to both academics and practitioners.

Chapter II reviews the literature on exchange relationships in marketing channels. Drawing from the literature in marketing, logistics, economics, social psychology, and contract law, this chapter reviews and synthesizes the research that characterizes the structure of buyer/supplier exchange relationships, interorganizational communication, and interorganizational technology that enables communication.

The purpose of Chapter III is to address the research gap identified by Achabal and McIntyre (1987) and reemphasized by Weitz and Jap (1995) and develop a model of the effects of communication, enabled by interorganizational technology, on the relational orientation of marketing channels. This chapter establishes the relationship between communication (information and technology) and relational orientation, and develops a set of hypotheses about the direction of influence of each construct within the model.

Chapter IV defines the methodology that will be used to empirically test the research hypotheses. This chapter describes the phases of development for the survey instrument and describes the "total design" procedures used to ensure high response to the survey.

The statistical results from estimation of the model are presented in Chapter V. Analysis of the adoption and use of telecommunication technology is used to confirm assumptions made in the theoretical and methodological sections of this dissertation. In this chapter, three models are tested using structural equation modeling to establish the relationship between information, technology, and relational orientation in marketing channels. The contributions of this dissertation that result from the development and testing of the model are presented in Chapter VI. This dissertation concludes with a discussion on the limitations of the study, and suggestions for future research.

CHAPTER II

Review of Literature

Introduction

The purpose of this chapter is to review the literature on relational orientation in conventional marketing channels, interorganizational communication, and communication technology. The review draws from literature in marketing, logistics, economics, social psychology and contract law. As channels shift from a transactions to relational orientation, inter-organizational communication becomes increasingly important.

This chapter is organized as follows. In the first section, Relational Orientation in Conventional Marketing Channels, the changing focus of research in buyer/supplier relationships is described. Early research in marketing channels tended to focus on the physical attributes of a channel, while more recent research focuses on the development and maintenance of long-term relationships. The second section reviews the literature on interorganizational communication in marketing channels. Research

in channel communication has focused on the flows of information between channel members, and the ability of the information to enhance decision making. The final section examines current research on the forms of technology that enable flow of information between firms.

Relational Orientation in Conventional Marketing Channels

A common theme in much of marketing theory and practice is the concept of exchange. Commenting on the conceptual domain of marketing, Hunt (1983) concludes that the primary focus of marketing activity is the exchange relationship. Consistent with this view of marketing is Frazier's (1983) framework for interorganizational exchange, Bagozzi's (1975, 1979) formal theory of marketing exchange, and Weitz's (1981) contingency model of selling.

Early research on exchange focused on physical attributes of the channel. The structure of channels has been described in terms of distribution intensity (Clark, 1937), levels of title transfer, and functional task assignment (Stern and El-Ansary, 1992). Extending Alderson's (1954) work, Bucklin (1966, 1967, 1972) proposed the principle of postponement-speculation to explain the effects of end-user requirements and channel member resources on channel structure. Postponement implies moving inventory forward in the channel at the latest possible time. In this research, channel

structure was described along a single dimension – length. Zinn and Bowersox (1988) extend this work to study postponement of a wide variety of logistics functions.

In the mid 1960s, marketing research began describing channel structure in terms of organizational form. Considerable attention was directed toward the concept of vertical marketing systems which distinguished conventional channels from corporate, administrative, and contractual exchange structures. Much of the research on vertical marketing systems (e.g., Brown, 1981; Stern and El-Ansary, 1992) has built upon Warren's (1967) typology which examines the level and type of power necessary to secure trading partner compliance. This typology is similar to an exchange structure proposed by Williamson (1985) who stated that transaction forms are arrayed in terms of the degree to which exchange partners maintain decision making autonomy.

The first proposed definition described power as: "the ability of one member of a marketing channel for a given product to stipulate marketing policies to other channel members" (Stern 1965). Consistent with this definition, studies of power in marketing channels focused on isolating the one powerful channel member who could stipulate overall policy for the channel as a whole (e.g., Wilemon 1972; Bucklin 1973). Subsequent work by El-Ansary and Stern (1972) led to the development of a model of channel member power. Their model viewed power as a function of (1) the extent to which the two members in a channel are dependent on each other for satisfaction of

their goals and (2) the relative bases (or sources) of each channel member's power. Hunt and Nevin (1974) and Etgar (1976) subsequently provided empirical evidence that the power of a channel member, in fact, is a function of the magnitude of power sources and the countervailing power available to the other channel members. Porter (1980) attempted to extend power and control theory horizontally as well as vertically. He suggested that a manufacturer group is powerful when, (1) the industry is dominated by a few large firms, (2) manufacturers have built up switching costs for customers, and (3) the product is an important part of the customer's production process. Porter theorized that these conditions enabled the industry manufacturer to exert power over other participants in the distribution channel, including distributors and customers.

Much empirical research examined marketing channel power from a behavioral theory perspective, with channel member interaction conceptualized in terms of the exchange dyad (e.g., Bonoma 1976). Earlier research studied power from an economic theory and industrial organization perspective. Heflebower (1957) showed that sellers operating in oligopolistic markets can exercise power when dealing with buyers operating in more competitive markets. Palamountain (1965) pointed out that in imperfectly competitive markets, a manufacturer that has created consumer preference for its brand has created a bargaining advantage in its dealings with distributors.

Arndt (1979) argued however, that such economic and behavioral perspectives failed to adequately capture the more recent trends toward long-term, integrated relationships which include joint promotion and extensive information sharing. Bradach and Eccles (1989) also criticized the vertical systems approach to channel structure and argued that the various typologies of channel structure are inadequate to deal with the broad range of control mechanisms found in channel relationships. Similar conclusions were reported by Boyle, Dwyer, Robicheaux, and Simpson (1992) and Robicheaux and Coleman (1994).

More recent research on exchange in marketing channels focuses on the antecedents and consequences of developing and maintaining channel relationships. This research shifts the focus from simplistic treatment of channel structure, such as length and intensity, to more complex treatments of the relationship between agents in the marketing channel. Concepts in relationship marketing include: relational contracting (Macneil, 1980); buyer/seller relationships (Dwyer, Schurr, and Oh, 1987); working partnerships (Anderson and Narus, 1990); symbiotic marketing (Varadarajan and Rajaratnam, 1986); strategic alliances (Day, 1990); co-marketing alliances (Bucklin and Sengupta, 1993); and internal marketing to business units and employees (Arndt, 1983).

Related concepts in logistics are integrated logistics management (ILM) and supply chain management (SCM). ILM involves coordinated management of the logistics functions to improve performance (Larson, 1994). Bowersox and Closs

(1996) suggest that SCM extends the coordination to suppliers and customers. They state that: "the basic notion of supply chain management is grounded on the belief that efficiency can be improved by sharing information and by joint planning." Chu demonstrates that asymmetric information reduces supply chain efficiency if suppliers and buyers must resort to signaling and screening to measure potential demand. In the absence of shared information, sellers increase costs by advertising to signal high product demand. Buyers increase costs by screening for demand through high slotting allowances and handling fees.

Focusing on the buyer/seller dyad, Arndt (1979) describes "domesticated markets" as those that emphasize interdependencies, interactions, reciprocity, and long term commitment. Berry (1983) focuses on the consumer/seller dyad and describes the role of marketing as "attracting, maintaining, and enhancing customer relationships." Berry's definition is one of the first to stress the long-term nature of buyer/seller relationships. Gronroos (1990) extends Berry's description stating that the purpose of relationship marketing is to establish, maintain, enhance, and commercialize customer relationships by a mutual exchange and fulfillment of promises. In an industrial marketing setting, Jackson (1985) refers to relationship marketing as "marketing oriented toward strong, lasting relationships with individual accounts." Jackson's definition is adopted by Paul (1988) in his study of the health care industry and O'Neal (1989) in a discussion of just-in-time procurement. Doyle and Roth (1992) suggest that the goal of relationship marketing is to earn the position of preferred supplier in the eyes of key accounts over time.

Although many researchers have focused on the concept of long-term relationships within marketing channels, there is no universal definition of relationship marketing (Morgan and Hunt, 1994). Parvatiyar and Sheth (1994) define relationship marketing as an orientation "that seeks to develop close interactions with selected customers, suppliers, and competitors for value creation through cooperative and collaborative efforts." According to Juttner and Wehrli (1995), the two main objectives of relationship marketing are: "(1) the design of long term relationships with customers to enhance value shares for both parties, and (2) the extension of the long term relationship ideas to vertical and horizontal cooperation partners." Realizing that many of the relationships central to the success of any firm may not involve end-use customers. Morgan and Hunt (1994) broaden the definition of relationship marketing to refer to "all marketing activities directed toward establishing, developing, and maintaining successful relational exchange."

Relational exchange theory is most relevant to marketing channels. Macneil (1978) provided the earliest discussion of relational exchange by drawing on legal theorizing about contractual exchange. Building on Macauley's (1963) seminal study on non-contractual business relations, Macneil (1978, 1980) developed a formal typology of 'discrete' versus 'relational' exchange. Discrete exchange is consistent with the underlying assumptions of neoclassical economic theory, in which individual transactions are assumed to be independent of past and future relations between the contracting parties and constitute nothing more than the transfer of ownership to a product or service (Goldberg 1976). Under discrete exchange the individual parties to

a transaction remain autonomous, pursue their own interests, and rely to a large extent on economic and legal sanctions for the purpose of enforcing contractual obligations. As described by Macneil (1974):

> "Discreteness is the separating of a transaction from all else between the participants at the same time and before and after. Its ideal, never achieved in life, occurs when there is nothing else between the parties, never has been, and never will be."

In contrast to discrete exchange, relational exchange accounts explicitly for the historical and social context in which transactions take place and views enforcement of obligations as following from the mutuality of interest between parties (Dwyer, Schurr, and Oh, 1987; Kaufmann and Stern, 1988). In relational exchange, the relationship may have a past history, but more importantly it has an anticipated future.

Expanding on Williamson's and Macneil's work, a number of researchers have considered characteristics that "stimulate the operation of hierarchies." (Stinchcombe, 1985). In the marketing literature, McGuire and Staelin (1983) found that product substitutability influenced movement from markets to hierarchies. For low degrees of substitutability, each manufacturer tends to distribute its product through vertically integrated operations, however for highly competitive goods, sellers tend toward more decentralized distribution systems. Dwyer, Schurr, and Oh (1987) and Kaufmann and

Dant (1992) adapt Macneil's theory to develop indicants of nondiscrete transactions in marketing exchange. In all of these theoretical accounts, various characteristics of exchange are described whereby a relationship moves from the discrete end of a continuum. This discrete pole has been best described by Goldberg (1976) as being a transaction in which " no duties exist between the parties prior to the formation of the exchange, and in which the duties of the parties are determined completely up-front."

Despite these conceptual analyses, empirical work on relational governance structures is limited. Williamson only hints at the operational dimensions of governance whereas Macneil offers a large set of multiple overlapping dimensions. Palay (1984) and Kaufmann and Stern (1988) have built operational measures of the relational content of interfirm exchange. Palay measured a set of five dimensions to characterize the relational content of rail shipper-carrier interaction. Kaufmann and Stern build on Palay's work to measure a large number of dimensions in their study of interfirm litigation. Other researchers, who have attempted to use Macneil's relational exchange theory to distinguish between exchange types across industries, have typically used only a small subset of Macneil's dimensions of exchange. Kaufmann and Dant (1992) represent an initial attempt at operationalizing seven dimensions of exchange reflected in Macneil's theory using industry non-specific scales that can be applied to both buyers and sellers.

Interorganizational Communication

Communication in marketing channels has been described as "the process by which persuasive information is transmitted" (Frazier and Summers, 1984) and "the glue that holds the channel together" (Mohr and Nevin, 1990). Research in this area is important to the understanding of marketing channels for three reasons: (1) planning and negotiating for role and reward adjustments are essential facets for adaptive channel systems, (2) channel conditions may constrain the nature of communication between members, and (3) channel member attitudes, morale, and system performance are determined, in part, by type and amount of communication (Frazier 1983). Communication behavior between channel members has been linked to trust (Anderson and Weitz, 1989; Anderson and Narus, 1990), power and influence strategies (Boyle, Dwyer, Robicheaux, and Simpson, 1992; Frazier and Summers, 1984), channel structure (Brown, 1981; Etgar, 1976), coordination (Guiltinan, Rejab, and Rodgers, 1980), channel member commitment (Anderson and Weitz, 1992; Morgan and Hunt, 1994), cooperation (Anderson and Narus, 1990), and resource allocation decisions (Anderson, Lodish, and Weitz, 1987).

Research has taken one of two approaches in conceptualizing and defining channel communication. The first approach focuses on flows of information between channel members. This approach typically examines aspects such as frequency of interaction, extent to which communication flows are bi-directional, medium of communication, or level of formality in the information exchange. For example,

Brown (1981) examined the number of communication interactions between channel members over specific periods of time. Anderson, Lodish, and Weitz (1987) examined the extent to which channel members were involved in two-way communication and feedback. Anderson and Weitz (1989) measured the extent to which expectations were communicated in detail.

The second approach focuses on evaluative/summary judgments regarding the communication exchange. Rather than capturing the specific nature of communication flows, summary judgments capture a more holistic assessment of the quality of the communication interactions over time. Evaluative judgments of communication have examined attributes of information to measure the adequacy (Bialaszewski and Giallourakis, 1985) or efficacy (Anderson and Narus, 1990) of information in problem solving.

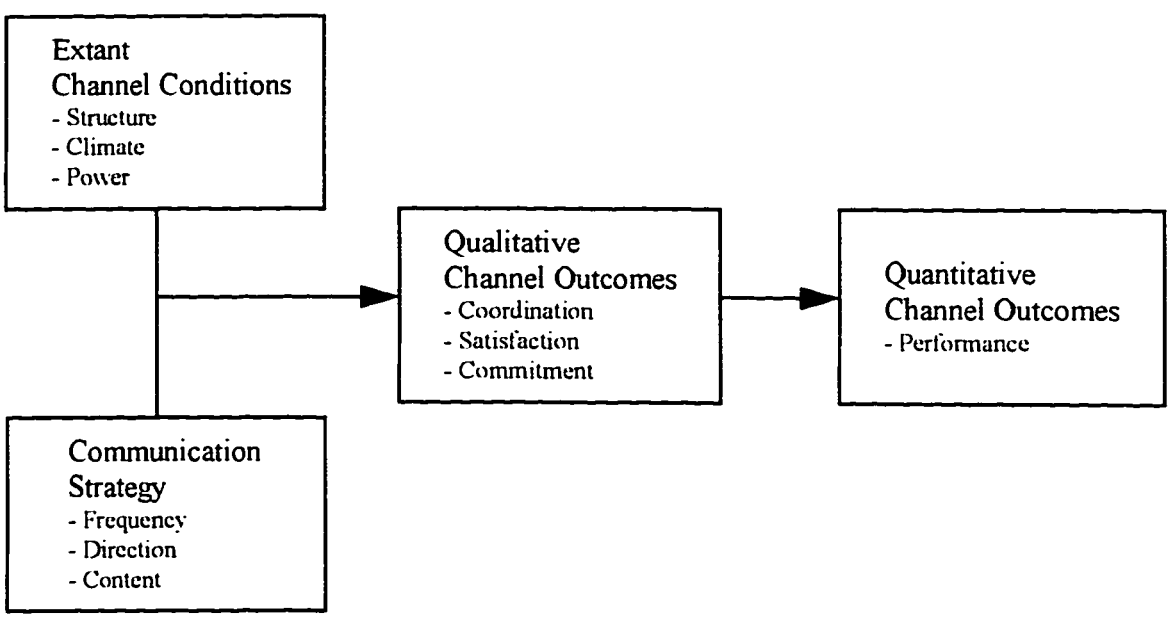
Of particular importance to the operation of a channel system is collaborative, bi-directional communication (Mohr, Fisher, and Nevin, 1996). Collaborative communication consists of combinations of intensive relationship building facets including: the medium of communication and content of the communication message (Mohr and Nevin, 1990). Increased levels of these dimensions of communication have been shown to be associated with commitment (Anderson and Weitz, 1992; Morgan and Hunt, 1994), satisfaction (Keith, Jackson, and Crosby, 1990), and coordination (Guiltinan, Rejab, and Rodgers, 1980).

The medium of communication, or its modality, refers to the method used to transmit information. Modality has been operationalized in the literature in a number of ways (Stohl and Redding, 1987). Lengel and Daft (1985) categorize modality according to the medium's ability to transmit 'rich' information, or a variety of clues including feedback, facial cues, language variety, and personalization. Huber and Daft (1987) posit a hierarchy of media richness, with face-to-face being the most rich, followed by video-phone, phone conference, telephone, electronic mail, personally addressed documents such as memos and letters, and, finally, formal unaddressed documents. Mohr and Nevin (1990) categorize modality using a formal/informal dichotomy. In this classification formal modes of communication refer to communication that flows through written modes and formal meetings (Ruekert and Walker, 1987). Informal modes are more personalized and spontaneous, and can occur outside the organizational flow of information.

In communication research, the content of communication refers to the message that is transmitted -- what is said. Communication research has categorized content on the basis of the type of information exchanged, or on the type of influence strategy embedded in the exchanged information. For example, Gross (1968) categorized different types of marketing information exchanged between parties including: physical inventory, promotional activity, product characteristics, pricing structure, and market conditions.

Frazier and Summers (1984) distinguished between direct and indirect communication strategies. Direct communication strategies such as requests recommendations, promises, and appeals to legal obligations, are designed to change behavior of the target by implying or requesting the specific action that the source wants the target to take. Indirect communication is designed to change the target's beliefs or actions without a direct request. An example of indirect communication content is information exchange, whereby the source uses discussions on general business issues to alter the target's attitude toward certain behaviors. Frazier and Summers (1984) found that the strategies of information exchange and requests were correlated positively and that use of the strategies was correlated negatively with promises, threats, and legalistic pleas.

Figure 1 - Contingency Model of Communication



Adapted from Mohr and Nevin (1990)

Mohr and Nevin's (1990) contingency theory of communication (Figure 1) builds on the political economies paradigm (Stern and Reve, 1980) to develop communication strategy components that interact with channel conditions to affect channel performance. Their model describes channel conditions on three critical planes: *climate*, the extent to which channel members feel trust and mutual supportiveness; *power*, specifically the extent to which dependence is balanced or skewed; and *structure*, a continuum with discrete trading "market structures" at one pole and long-term, independent partners in "relational structures" at the other.

Communication Technology

Because communication is integral to the flow of products in marketing channels, information technology, as an enabler of communication, is a vital component of the channel. According to Bowersox and Closs (1996), "information technology is the key resource to achieve integration." Interorganizational systems (IOS) are based on information technology that facilitates information management and exchange between firms. In the marketing channel, a typical IOS links buyers to suppliers or shippers to carriers, and enables communication necessary for the exchange of products and services. Traditionally, information systems have been limited to applications within the boundaries of a single organization. However, as channel members begin to shift away from vertically integrated structures and form business alliances in conventional channels, information technology is needed to facilitate interorganizational communication.

Interorganizational systems are not a new phenomenon. Advances in communication have long been recognized for their impact on the organization. The rudimentary file system, inter-office memo, and business meeting are primitive but effective forms of communication technology enabling coordination and control among organizational components (Yates, 1989; Yates, and Orlikowski, 1992). The mail system, telegraph, and telephone, can be considered long-standing examples of technology that have enabled communication within and between organizations. More recently IOS have coupled telecommunication technology with conventional data-processing activities to produce electronic communication media capable of creation, storage, transformation, and transmission of information across organizational boundaries (Hammer and Mangurian, 1987; Scherr, 1983). Systems such as electronic data interchange and interorganizational data links are being credited for enabling electronic workflow (Monge and Fulk, 1995), just-in-time production (Piore, 1994), and the virtual organization (Davidow and Malone, 1992).

While few deny the importance of technology as an enabler of communication, research on technology used for interorganizational communication is limited. Studies that have been published deal either with telecommunications in a very general sense (Hammer and Mangurian, 1987; Kriebel and Strong, 1984; Sullivan and Smart, 1987), or in terms of competitive implications (Barrett and Konsynski, 1982; Cash and Konsynski, 1985; Johnston and Vitale, 1988), or in terms of specific applications such as electronic mail (Crawford, 1982), electronic banking (Grant, 1986), intelligent telephones (Manross and Rice, 1986), and private networks (McCauley, 1983).

Huber and Daft (1987) suggest that "each form of telecommunication medium is not just an information source, but is also a complex information conveying channel." Categorizing telecommunication systems by their ability to transmit "rich" information including feedback, facial cues, language variety, and personalization, Huber and Daft (1987) posit a hierarchy of media richness with face-to-face being the most rich, followed by video phone and video conferencing. Telecommunication modes classified as least rich because of the inability to "see" the other party were telephone, electronic mail, and written documentation.

Grover and Gosler (1993) and Grover, Gosler and Segars (1995) develop a classification for telecommunication technologies based on adoption patterns and environmental factors. The first category includes technologies that have been formally evaluated by most firms, and have a high degree of diffusion in most businesses. This category includes relatively mature technologies such as voice/data telephone systems and fax. The second category includes technologies that have been formally evaluated by all sizes of business, have been adopted by most firms, but have diffused only moderately within the adopting firm. These include voice mail, LANs, WANs, e-mail, and interorganizational data links. The third category of telecommunication technologies in their studies include systems that have not been extensively adopted or diffused within the firm. These include expensive, novel, or substitutable technologies like integrated system digital network (ISDN), video conferencing, video text, value added networks (VANs), owned communication lines,

and intelligent/mobile phones. More complete descriptions of these telecommunications are provided in Table 1.

Table 1 - Telecommunication Technologies

Technology	Description
Voice/data PBX (internal telephone system)	The traditional telephone system used by industry to transfer data and voice across corporate sites and to support individual on-line communication
Voice oriented systems (voice mail)	Technology combining the features of telephone and postal mail; Facilitates asynchronous voice communication
Integrated services digital network (ISDN)	End-to-end digital connectivity enabling concurrent transmission of video, data, and voice media
Local area networks (LAN)	Hardware and software installed to link individual and business unit computer workstations within a confined geographical region; Enables information flows including migration of data files, spreadsheets, and mail
Wide area network (WAN)	Communication networks that link widely dispersed business units
Facsimile (Fax)	Electronic transmission of paper documents
Electronic mail (e-mail)	Electronic messaging normally conducted on an asynchronous-based person-to-person flow
Value added network (VAN)	Communication lines offered through common carriers that facilitate timely and accurate information flow; 'Value-added' includes processing services such as error checking, re-transmission, and alternate routing in the event of network node failure
Interorganizational data links (EDI)	Bridging and conversion technologies that enable transmission and receipt of such items as documents, transactional data, functional information, and planning perspectives across organizational boundaries

Adapted from Grover, Gosler, and Segars (1995)

Research on IOS in marketing channels has primarily focused on industry diffusion of point-of-sale (POS) scanners for data capture and electronic data interchange (EDI) for communication between firms. Bucklin (1980) attributed the severity of retail losses during the 1970's recession to the unwillingness of retailers to

adopt the new information technology. Bucklin suggested this unwillingness was due to high capital costs, concerns of labor unions, and a lack of consumer acceptance. Levin, Levin, and Meisel (1987) used proportional hazard models to investigate the differing effects of market structure variables on the conditional probability of a retail firm adopting IOS technology. During the early diffusion stage, the probability of adoption increased if the firm had larger than average stores, was not a member of a leading chain, and operated in a less concentrated market with higher incomes and wage rates. In a later study Levin, Levin, and Meisel (1992) employed a two-stage approach which related market environment characteristics to the estimated rate of inter-store IOS diffusion. The results indicated that firms with larger market shares adopt the technology early in the diffusion process but diffuse the innovation throughout their stores more slowly than firms with smaller market shares. In addition, the authors found that firms that lag competitors in the initial adoption of scanners tend to diffuse the technology more quickly.

Responding to a call for more research on the economic impact of IOS technology in marketing channels (Achabal and McIntyre, 1987), recent studies in marketing have focused on the impact of IOS technology on organizational structure (Krapfel and Guinn, 1990; Clemons, and Row, 1992), and performance (Monczka and Carter, 1989; Mohr, 1990). Larson and Lusch (1990) used "integrated logistics management" as a general framework for their analysis of IOS technology in retailing. They showed that the adoption of IOS retail technology, coupled with integrated effort among retailers and suppliers, produces increased sales and gross margins, with

lower inventory levels. In a case study of QR merchandising in the drug store industry, Larson and Kulchitsky (1992) attributed differences in inventory levels and stock turnover to the adoption of POS scanning systems. Larson and Sijbrands (1991) conclude that increased interest in interorganizational technology within the retail trade is responsible for declining retail inventory levels and increased stock turnover. Kulchitsky and West (1994) used macroeconomic indicators, retail performance indicators, and cumulative adoption of POS scanners within the grocery industry to explain increases that have occurred in retail stock turnover since the end of the 1970's recession.

Interorganizational systems are designed to deliver transactional efficiencies to both parties. IOS add value in a channel relationship through an increase in the efficiency of transaction processing and improvements in the coordination and communication systems. Malone (1985) and Malone and Smith (1984) suggest that the effects of IOS technology can be divided into two components: (1) influence on the efficiency and effectiveness of organizational processes; and, (2) effect on the coordination of the business relationship. Hence, organizational efficiency can be viewed as dependent on the influence of forces on production costs (Crawford, 1982) and coordination costs. Production costs include costs of delivering products and services. Because coordination costs come mainly from processing and communicating information, they provide a basis for establishing a theoretical link between information technology and coordination of channel flows.

An important aspect of IOS is that it is not just a form of technology for improving the efficiency of the channel operation, but rather it is a fundamental change in the way firms interact. The adoption of IOS technology between two firms signifies a commitment to a relationship that removes their transactions from the open market (Arndt, 1979; Dwyer, Schurr, and Oh, 1987; Macneil, 1980). Clemons, Reddi and Row (1993) argue that the adoption of IOS technology by a channel dyad affects the cost of coordination and has had an even more dramatic impact on the risks historically associated with interfirm coordination. These effects have changed the historical balance between hierarchies and markets, contributing to the observed changes in the strategies and structures of entire industries.

Although many factors contribute to the major structural changes occurring in marketing channels, the importance of IOS technology cannot be discounted. For example, in discussing the emergence of value-added partnerships (VAPs), a concept very much related to cooperative long-term relationships, Johnston and Lawrence (1988) highlight the importance of IOS by listing technological tools that enable the formation of VAPs. These tools include data standards/bar codes that lower the "transaction costs between organizations," information network capability that "permits instantaneous sharing of information between organizations," and computer-aided design that improves "coordination between organizations in design functions." Cover stories in the business press (e.g. Business Week, 1993) make the case that new coordination technologies will increasingly facilitate major structural changes in the organization of economic activity.

The transactions costs framework (Williamson, 1975) has been used extensively in information technology research to evaluate the impact of IOS on the firm's operations. Ciborra (1983) recognized that IOS technology reduces transaction costs, thereby enabling the emergence of more efficiently organized markets and hierarchies. Malone, Benjamin, and Yates (1987) argue that IOS reduces the unit cost of coordination and the transaction specificity of investment in interfirm interactions. They suggest that the increasing adoptions of interfirm technology will lead to a greater degree of outsourcing and hence less vertically integrated firms. Moreover, since search costs are decreased, firms will rely on search, leading to the emergence of electronic markets. Malone et al., (1987) also identify a phenomenon they term electronic hierarchies, where interfirm relationships are characterized by less use of search and more use of tightly coupled operations with a few long-term partners.

Gurbaxani and Whang (1991) integrated the basic transaction costs argument with an investigation of internal agency costs. Their work highlighted the interactions between the economics of internal organizational structure and the economics of interfirm relationships, and suggest that the cost efficiencies resulting from IOS are a determinant of optimal firm size.

Clemons and Row (1992) argue that the impact of IOS on economic organization cannot be understood without explicitly considering risk. They suggest that transaction costs are composed of the costs of coordination and transaction risk. Cooperation is viewed as an effort to increase resource utilization and value through

higher explicit coordination of economic activities, that is, integration of operations. However, increasing explicit coordination can increase transaction risk or exposure to opportunistic behavior by the other party. In the past, increased explicit coordination required investment in physical or human resources that could not readily be transferred to other relationships. Williamson (1975) suggests that firms would avoid this risk by vertically integrating with their suppliers or customers or by underinvesting in potentially value-creating transaction specific capital. Clemons and Row (1992) show that IOS can lower the cost of coordination without necessarily increasing the risk associated with a greater level of explicit coordination. They conclude that the investment in IOS technology would lead to a greater degree of outsourcing due to production economies of scale and specialization available outside the firm. The resulting structure enabled by technology would also result in increased levels of cooperation. The form of buyer/supplier relationships in marketing channels has also been addressed by Bakos and Brynjolfsson (1993a, 1993b) who argue that tightly coupled operations supported by IOS increased investments by suppliers in noncontractible resources, such as quality, innovation, and information sharing.

Conclusion

The purpose of this chapter was to review the literature on relational orientation in marketing channels, interorganizational communication and technology. Although this literature acknowledges communication as a necessary condition in relationship marketing, the attributes of communication and their effect on the

development and maintenance of the relationship have not been addressed. Communication models have not addressed the value of information in the development of new business paradigms and the use of technology to share multiple levels of information requires additional research.

Consistent with the observations of Weitz and Jap (1995), the dimensions of communication, the role of technology, the type and value of shared information must still be integrated into a model of relational orientation. The next chapter addresses these issues and develops a model to examine how the dimensions of communication (information and technology) impact the development of relational behavior, the effect of communication on cooperative efforts, and the effect of communication on the economic performance of the partnership.

CHAPTER III

Model of Construct Interrelationships

Introduction

The purpose of this chapter is to address the research gap identified by Achabal and McIntyre (1987) and reemphasized by Weitz and Jap (1995). This chapter establishes the relationship between communication (information and technology) and relational orientation, and develops a set of hypotheses about the direction of influence of each construct within the model.

This chapter is organized as follows. The first section, Constructs of Relational Orientation, establishes the relationship between relational behavior, relational outcomes, and operational performance. The second section, Constructs of Interorganizational Communication, positions the role of information and technology in interfirm relationships.

Constructs of Relational Orientation

In the mid-1960s, business strategy focused on growth through vertical acquisition. Forward and backward integration resulted in the development of vertical marketing systems where the coordination of exchange activity was achieved through authoritative control. By the mid-1980s, many businesses were discovering that greater financial returns could be achieved by outsourcing less-familiar channel activities and focusing corporate resources on core competencies (Peters and Waterman, 1983). This focus has shifted business strategies away from vertically integrated structures and toward establishment of relationships that involve normative mechanisms to coordinate exchange activity. Factors contributing to this shift include: (1) the growing disenchantment with vertical integration, (2) the consolidation and increasing power of intermediary channel firms such as retailers and wholesalers, and (3) the recognition of opportunities to gain strategic advantage through the management of channel activities (Weitz and Jap, 1995).

Webster (1992) considers this change a "fundamental reshaping of the field" whereas others consider it a genuine paradigm shift (Day and Wensley, 1983; Kotler, 1991). Kotler (1991) believes that the current business strategies are shifting marketing away from a focus on exchange, in the narrow sense of discrete transactions, and toward a focus on building value-laden relationships and market networks. This fundamental reshaping of the marketing field is manifested in relationship marketing, a concept that encompasses a relational orientation in

conventional marketing channels. In this model, relational orientation includes the constructs of relational behavior, relational outcomes, and operational performance.

Relational Behavior

The relational contracting model proposed by Macneil (1974, 1978, 1980, 1981, 1983) provides a rich conceptual framework capable of capturing the "dimensions and dynamics" that underlie the nature of exchange relationships as well as the belief structures and activities that make for successful exchange relationships. Although originally proposed as a paradigm for studying contractual law, the emphasis of this work is on contractual behavior. To Macneil (1980), contracts are about exchange behavior because contracts capture the relationships among parties which projects exchange into the future. This paradigm shifts the focus of control mechanisms used to coordinate exchange activity in conventional marketing channels from authoritative mechanisms based on an imbalance of power and conflicting objectives, to normative control grounded in the societal relations of custom, status, habit, hierarchical structure, and past exchange relationships.

Authoritative control involves one party in the relationship using its position or power to control the activities of the other party (Gaski, 1984). In a conventional channel setting, the opportunity to influence other channel members arises from unilateral relationships. Through the use of power, a focal organization can shape the conduct and functions of channel partners. Heavy-handed applications of power have

been noted to contribute to worsening channel relationships in a variety of channel contexts (Frazier and Antia 1995).

Within the context of a single organization, normative control involves a shared set of implicit principles or norms describing the firm's culture. The behavior of employees is coordinated through shared beliefs. Employees learn about the norms of behavior and are encouraged to conform to them through informal communication with their peers. Similarly, in interorganizational relationships such as conventional marketing channels, exchange relationship norms are learned through past interaction and marketplace reputation. Macneil's norms describe normative behavior -- principles of right action that are binding on the members of the group and serving to guide, control and regulate proper and acceptable behavior. For example, norms indicate how parties might make trade-offs between long-term and short-term profit opportunities (long-term orientation norm), the degree to which change due to unforeseen situations will be accommodated (flexibility norm), and the nature and quantity of proprietary information that will be exchanged (openness norm).

For the purpose of studying the effect of communication enabled by technology on the structure and performance of exchange relationships, three norms appear central to the establishment of a relational orientation: solidarity, flexibility, and information exchange. These three relational norms do not constitute an exhaustive set. Macneil's other norms (role integrity, mutuality, recurrent planning, effectuation of consent, creation and restraint of power, interpersonal linkages,

harmonization conflict, and propriety of means) also distinguish transactional from relational contracting. However, empirical attempts to measure relationalism have found a high degree of inter-norm correlation (Noordewier, John, and Nevin, 1990). As described by Boyle, Dwyer, Robicheaux, and Simpson (1992), relationships that are characterized by high solidarity, flexibility, and information exchange are likely to have similarly high levels of interpersonal trust, constructive conflict, mutuality, and role integrity.

The norm of flexibility defines a bilateral expectation of willingness to make adaptations as circumstances change. In exchange relationships, flexibility represents insurance that the relationship will be subject to good-faith modification if a particular practice proves detrimental in light of changed circumstances. If exchange is to occur, given the parameters of the contracts between parties, it must either be envisioned or permitted within the existing relationship. While discrete transactions presume fixed terms of trade, relational exchange must have open-ended components.

Solidarity is a norm defining a bilateral expectation that a high value is placed on the relationship. Solidarity describes behavior directly specified toward the creation and maintenance of the relationship. While authoritative exchange structures rely on arms length bargaining and legal enforcement to create and sustain transactions, normative structures accommodate more complex and indefinite relational forms, by means of solidarity of the relationship.

The third norm considered to be key to the establishment of relational behavior concerns the exchange of information. Information exchange can be broadly defined as the formal as well as informal sharing of meaningful and timely information between firms. This definition has at its focus the efficacy of information rather than the amount. Information exchange represents a safeguard to the normative relationship by providing unforeseen information that may affect the efficiency of operations. Heide and John (1992) note that an expectation of getting necessary information on an ongoing basis allows firms to cope with the risk of sharing the control of channel management.

Support for the inclusion of solidarity, flexibility, and information exchange as indicants of relational behavior can be found in the marketing literature on relational norms. Heide and John (1992) show that although these three dimensions have distinct elements, they originate from a single, higher order norm of relationalism. Dahlstrom, McNeilly, and Speh (1996) demonstrate that solidarity, flexibility, and information exchange are behavioral norms relevant to the procurement of logistical services. Logistic services, such as transportation, warehousing, repackaging, and inventory management require a high degree of information exchange, often facilitated by electronic data interchange. It is also logistics services that are most often subject to unexpected change in the channel and the environment, which reinforces the necessity of flexibility and solidarity (Lusch and Brown, 1996).

Relational Outcomes

Theory in social-psychology and empirical studies of exchange relationships in marketing channels suggests two closely related constructs as consequences of relational behavior: cooperation and coordination. Robicheaux and El-Ansary (1975) define channel cooperation as "a state or condition characterized by members' willingness to coordinate activities" and cite Pearson (1973) as having published the only empirical article on channel cooperation at that time. More recently, Anderson and Narus (1990) define cooperation as "similar or complementary coordinated actions taken by firms in interdependent relationships to achieve mutual outcomes or singular outcomes with expected reciprocity over time." Heide and John (1990) show that "moves toward closer exchange relationships involve the parties carrying out the focal activity in a cooperative or coordinated way."

Morgan and Hunt (1994) posit that coordination, which implies cooperation, is a consequence of shared value (norms of appropriate action) in relationships characterized by commitment and trust. As a precursor to commitment and trust, shared value defines the extent to which relationship partners have beliefs in common about what behaviors and policies are important, appropriate, and right. Pruitt (1981) believes that coordination is closely correlated with relational behavior. He suggests that a party desiring coordination with a trusted other is likely to engage in high-risk coordinated behaviors.

Increased levels of relational behavior support higher levels of cooperation and coordination for several reasons. First, short run conflicts that may arise are addressed more readily when the parties expect to continue to interact into the future (Kelley and Thibaut, 1978). Further, with expectations of continuity and flexibility, each party is more confident that the other will perform in a cooperative manor because "the shadow of the future" has been enlarged (Axelrod, 1984). Essentially, as described by Heide and John (1990), the expectation of future interactions between exchange partners, provides opportunity to reward good behavior and punish opportunism.

Operational Performance

A long standing principle in conventional channels research holds that the more powerful firm can influence an exchange partner to carry out its wishes (e.g.; Stern and El-Ansary, 1992) and hence improve its own performance. For example, Buchanan (1992) suggests that when dependency is asymmetric the performance of the weaker party declines. Noordewier, John, and Nevin (1990) find that decreased dependence may give industrial buying firms more leverage with suppliers.

However, relational exchange theory suggests that channel relationships can be organized and managed through cooperation and coordination resulting from normative relational behavior (Macneil, 1978; Nevin, 1995). As a bilateral form of exchange, relational processes yield highly collaborative behaviors, such as when trading partners are flexible in adjusting to each other's needs and requests. As Heide

(1994) observes, "Individual goals are reached in a bilateral system through joint accomplishments, and concern for the long-run benefit of the system serves as a restraint on individual tendencies." Consequently, the establishment of bilateral cooperation, in a structure of normative relational behavior, is likely to increase the effectiveness and efficiency with which channel tasks are performed. Stern and Reve (1980) explain, "The rational is that cooperative behavior facilitates coordination and programming of activities within the channel which, in turn, provides potential cost advantages and improved competitive strength."

In buyer/supplier relationships, channel performance is not only influenced by the ability to jointly coordinate exchange activity, but also by relational behavior. For example, the more channel firms exchange information with each other, the better they are able to coordinate exchange activity. The better channel members are able to cooperate in the coordination of exchange activity, the higher is the level of performance individual firms and the channel as a whole can attain. Similarly, flexibility is central to cooperative partnerships, which Cavusgil and Zou (1994) observe, "lead to effective implementation of marketing strategy and better performance." Solidarity within the channel promotes operational performance by focusing the attention of the firms on individual and common problems.

In the logistics literature, Larson (1994) reports a significant link between relational outcomes and logistics performance. His results were based on a survey of American Purchasing Managers. Relational outcomes were measured as sentiments of

cooperation and interdepartmental coordination; performance measures were based on total logistics costs.

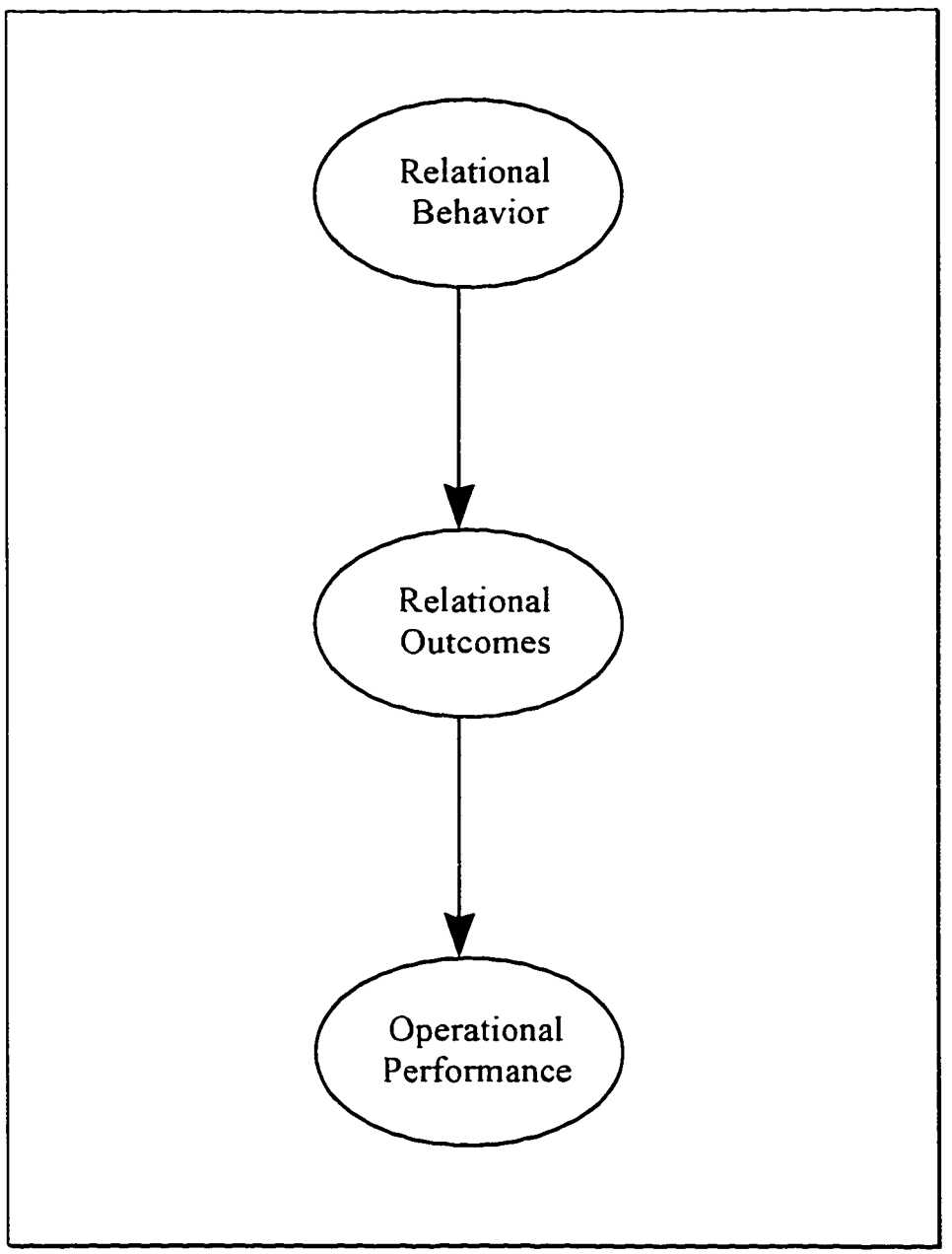
In the marketing literature, Jeuland and Shugan (1983) demonstrate that several mechanisms, including structure of exchange relationships, enhance total channel profits. Anderson and Narus (1991) argue that with increased relational behavior "there is mutual interest in cooperating to find ways to add value or reduce cost and in equitable sharing of relationship benefits. Kalwani and Narayandas (1995) examine the influence of long-term relational behavior on supplier performance, and conclude that long-term commitment to exchange relationships results in higher levels of financial performance, compared to suppliers not involved in long-term relationships.

A model of the interrelationships between the constructs in a structure of relational orientation (relational behavior, relational outcomes, and operational performance) is presented by Figure 2 and summarized by the following hypotheses:

H_1: Relational behavior (norms of expected behavior) has a positive effect on relational outcomes (cooperation, coordination).

H_2: Relational outcomes (cooperation, coordination) has a positive effect on operational performance.

Figure 2 - Interrelationships in Relational Orientation



Construct of Interorganizational Communication

Research on relationship marketing in channels has increasingly focused on the construct of communication. Described as "the most important element for successful interfirm exchange" (Bleeke and Ernst, 1993), effective communication has been linked to trust (Anderson and Weitz, 1989; Anderson and Narus, 1990); power and influence (Boyle, Dwyer, Robicheaux, and Simpson, 1992; Gaski, 1984); channel structure (Brown, 1981; Etgar, 1976); coordination (Guiltinan, Rejab, and Rodgers, 1980), relationship commitment (Anderson and Weitz, 1992; Morgan and Hunt, 1994); cooperation (Anderson and Narus 1990); and resource allocation (Anderson, Lodish, and Weitz, 1987).

Drawing from models in communication theory (e.g., Krone, Jablin, and Putnam, 1987), organization theory (e.g., Porter and Roberts, 1976), and relational exchange theory (e.g., Macneil, 1980), communication research tends to focus on (1) facets that describe flows of information between firms, and (2) quality of the information exchanged. Researchers who have modeled communication flows in marketing channels have examined aspects such as the mode of communication (e.g., Mohr and Nevin, 1990) or the extent to which channel members participate in two way interaction and feedback (e.g., Anderson, Lodish, and Weitz, 1987). Researchers who have focused on evaluative/summary judgments of communication have examined attributes of the information such as helpfulness (Guiltinan, Rejab, and Rodgers,

1980), adequacy (Bialaszewski and Giallourakis, 1985) or efficacy (Anderson and Narus, 1990).

Mode of Communication

Communication modality refers to the technology used to exchange information. As described in *Webster's Dictionary*, technology refers to "a manor to accomplish a task." The manor to which communication is enabled can be described by a continuum of technologies with face-to-face conversation describing the lower anchor point, and digital, electronic data links describing the higher anchor. Numerous classification systems have been employed to describe the continuum of communication technologies between the two end anchors.

A common classification of modality has been to use a formal/informal dichotomy. As described by Stohl and Redding (1987), formal modes are somehow connected with the organization in a structured routinized manner. The technology of formal modes are written communication and formal meetings (Ruekert and Walker, 1987). Informal modes are more personalized and spontaneous, and can occur within or outside the relationship. Informal communication tends toward word-of-mouth contacts, informal memos, and messages.

An alternate communication classification distinguishes modality in a two-by-two matrix of commercial/noncommercial and personal/impersonal modes.

Commercial modes are controlled by firms, such as a manufacturer, who have an advocacy interest in the message. Commercial modes include advertising, sales calls and trade shows. Noncommercial modes are those in which information is controlled by a third party other than those with an advocacy interest. Noncommercial modes include trade journals, industry association reports, and consulting reports. The personal/impersonal distinction corresponds to one-on-one contact versus mass communication.

A third classification suggests that communication modes can be described by two dimensions: (1) the quantity of information transferred to reduce uncertainty; and (2) the richness, or the ability to reduce ambiguity. Daft and Lengal (1984, 1986) and Daft, Lengal, and Trevino (1987) argue that people need to use rich communication channels in the presence of uncertainty and equivocal communication. Uncertainty means that data may be missing and equivocality means that values, schema, or meanings for interpreting events are ambiguous or conflicting.

The richness (or social presence) of a communication mode involves multiple dimensions including capacity and synchrony (e.g., Rice 1993; Steuer, 1992; Zmud, Lind, and Young, 1990). In a communication context, capacity refers to the exchange of information using all human senses, including sight, hearing, and feeling (Nohria and Eccles, 1992). In-person direct communication would be described as having greater capacity than telephone, and telephone has greater capacity than non-voice technologies such as e-mail (Fish, Kraut, Root, and Rice, 1993). Synchrony refers to

whether individuals can communicate at the same time. Telephone enables synchronous communication (with the exception of leaving a message via voice mail), however fax and e-mail would be considered asynchronous, as messages are unidirectional within a given session.

Building on the work of Daft and Lengal (1984, 1986) and Daft, Lengal, and Trevino (1987), three categories of technology provide a means to classify communication in interorganizational relationships. Combining the communication dimensions of richness (capacity and synchrony) with the ability of a medium to transmit information, communication modality can be described as being either direct contact, or enabled by mechanical or electronic technology. The attributes of the classification are also summarized in Table 2.

a) Direct Communication

Direct communication includes teams, task forces, committees, staff meetings, office visits, and face-to-face conversation. Direct communication uses the lowest form of technology relying on in-person conversation or the use of the telephone. The message is conveyed by voice, and with the exception of voice mail, allows for synchronous communication. Individuals who participate in direct contact exchange opinions, perceptions, feelings, and judgments. By means of discussion individuals from two organizations can resolve conflict, find effective solutions, and develop common reference systems. Although

direct contact represents a low form of technology, it is a rich media source that can reduce information ambiguity.

b) Mechanically Enabled Communication

Mechanically enabled communication includes the transfer of information in the form of reports, manuals, memorandums, letters, and procedures. The technology of mechanical communication includes inter- and intra-office mail, courier, and facsimile. Mechanical communication is asynchronous and the message is primarily communicated by paper copy. Compared with direct communication, this media is the least rich but has increased capacity to carry information.

c) Electronically Enabled Communication

Electronically enabled communication represents the newest and fastest evolving media to enable communication. It includes electronic mail (e-mail), Internet, and electronic data interchange (EDI). Electronic communication is primarily asynchronous, although some forms of e-mail do allow for direct response. E-mail and Internet represent non-formatted communication between individuals using video display screens. EDI is a formatted system-to-system communication using interorganizational data links that may or may not have a human interface. Electronic forms of communication are considered the least rich but have the greatest ability to reduce uncertainty due to capacity and speed of communication.

Table 2 - Classification of Communication Modality

Classification	Technology	Message Carrier	Directionality
Direct Communication	Face-to-Face Telephone	Voice	Synchronous
Mechanically Enabled	Mail Fax	Paper	Asynchronous
Electronically Enabled	E-mail/Internet EDI	Electronic display	Asynchronous

Information Quality

A second aspect of communication focuses on the extent to which information is communicated in detail. The direct relationship between the quality of information used by a decision maker and decision making performance has been well established. Communication studies have demonstrated that the relevance of information communicated in a relationship typically improves the accuracy of decisions (Porat and Haas, 1969; Streufert, 1973), but irrelevant information makes the identification of relevant information more difficult and reduces the overall performance. In a general sense, information quality emphasizes the need to go beyond the mode of communication per se and consider the output of the technology -- the information itself -- as a variable of importance in interorganizational relationships.

The choice of medium used to communicate in a relationship may be highly correlated with the perceptions of information quality. Research shows that functional areas within the relationship that are less certain or more complex require higher quality information, enabled by rich communication modes, than will simpler, more

operationally oriented areas. Tushman (1978), for example, reports that more strategically oriented tasks were accompanied by increased requirements for information quality that were enabled only by rich modes of communication. Randolph (1978) found that uncertainty in the task environment was associated with higher communication quality and a reliance on verbal modes of communication.

In an ideal situation, decision makers would select information from those mediums perceived to offer the highest quality information. Typically, information quality would be reflected in messages that are relevant to the problem being addressed, reliable and timely (Gallagher, 1974). Quality information allows a decision maker to justify the basis of a decision to others; if the information is timely and reliable, the decision is likely to result in a positive benefit for the organization (Staw, 1980). Mukhopadhyay and Cooper (1993) suggest that information attributes of IOS technology must include accuracy and coverage (temporal and spatial scope). Bowersox and Closs (1996) discuss six key features of logistics information: availability, accuracy, timeliness, exception-based, flexibility, and appropriate format.

Building on the work of Gallagher (1974) and Zmud (1978), attributes of information quality systems are defined as follows and summarized in Table 3.

a) Fineness

Fineness describes the degree of detail available from the information (Marschak and Radnor, 1972). Fineness includes the format/arrangement of

the information and the ability to use the information as it is received. Format quality describes the physical manor of presenting the information and the ability to read/decipher information as it is presented. Descriptions of fineness include clear, convenient, simple, orderly, and precise.

b) Accuracy

Accuracy addresses the lack of error or "garbling" which can be introduced into information by improper encoding, transcription, and transformation (Hilton, 1979). Facets of accuracy include believable, reliable, valid, and true.

c) Sufficiency

Sufficiency includes some aspects of both fineness and accuracy (Hilton, 1981), but also includes completeness to describe the ability of information to facilitate decision making. Sufficient information is material in nature and effective.

d) Timeliness

The attribute of timeliness describes the age of the information. Timeliness accounts for delays between the occurrence of an event and receipt of information regarding the event. Timeliness of information includes descriptions such as current and opportune (Feltham, 1968).

e) Accessible

Accessible is an attribute that describes the readiness and availability of information. Accessible information is routinely retrievable from the source and of consistent depth.

f) Coverage

Coverage defines the spatial and temporal dimensions of information quality. Spatial detail describes the level of aggregation and can describe the size of objects and events. Temporal scope defines the time period for the decision. Temporal detail may be of any metric but typically is used in long and short term contexts.

Table 3 - Attribute of Information Quality

Information Attribute	Description
Fineness	- degree of detail - formatted and readable - clear, convenient, simple, orderly, precise
Accuracy	- lack of error or garbling - true, reliable, valid
Sufficiency	- completeness - material, effective
Timeliness	- age of information - current, opportune
Accessible	- degree of readiness and availability - consistent retrieval, depth
Coverage	- level of aggregation - temporal scope

Strategic Versus Tactical Communication

The impact of communication on relational behavior, relational outcomes, and operational performance may be a function of the conditions under which it is applied (Mohr and Nevin, 1990). The choice of synchronous/asynchronous communication, enabled by direct/indirect technology, may be conditional on channel task requirements. Bowersox and Closs (1996) discuss logistics information functionality across four levels, anchored by strategic planning and transactions systems. The relationship between task uncertainty/equivocality and communication requirements suggests that individuals prefer the benefit of face-to-face communication or alternate rich technology like telephone, when working on complex, nonroutine, "unanalyzable" problems (Kraut, Fish, and Chalfonte, 1992; Rice, 1992; Straus and McGrath, 1994), including interfirm negotiation (Dwyer, Schurr, and Oh, 1987) and strategic planning. Similarly, managers in interorganizational alliances tend to favor rich mediums such as face-to-face, for lateral communication across the boundaries of the firm, but rely on indirect mediums such as interoffice memos and e-mail for communication downward through the hierarchy (Feldman, 1987; Markus, 1994).

Strategic communication in marketing channels is the process by which participative management is fostered (Frazier and Summers, 1984). Similar to Mohr, Fisher, and Nevin's (1996) construct of collaborative communication, strategic communication can be viewed in terms of a specific combination of relationship building communication attributes (e.g., modality, information quality). Increased levels of strategic communication have been associated with the development of

relational norms (Dwyer, Schurr, and Oh 1987), cooperation (Anderson and Narus 1990; Morgan and Hunt 1994), and coordination (Mohr and Nevin 1990).

The construct of *strategic communication* is conceptually different from the relational norm of information sharing (Heide and John 1992; Noordewier, John, and Nevin 1990). Norms refer to generalized expectations or shared beliefs about appropriate behaviors in the relationship. Strategic communication describes the process that facilitates the development of relational behavior and relational outcomes.

The development and maintenance of a relationship in marketing channels requires the exchange of strategic, competitively sensitive information, enabled primarily by direct forms of modality. The increased information capacity, enabled by direct contact technology, is especially important when the communication requires the inclusion of social information and social context cues. For example, social context cues are necessary when trying to establish trust in a relationship, or when trying to negotiate the terms of a contract (Nohria and Eccles, 1992; Zmud, Lind, and Young, 1990). Social information and context cues increase involvement and comprehension through the ability to interact and provide feedback (Kraut, Fish, and Chalfonte, 1992; Straus and McGrath, 1994). Social content enabled by direct communication modes has been important in the communication of long-term forecasts and structural planning information such as future product designs, production planning schedules, and financial forecasts (Palay, 1984).

The synchrony of strategic communication may also be important in exchanging and discussing complex information such as the details of a technical plan, draft of a document, or interpretation of statistical findings. Synchrony permits a great deal of understanding to be exchanged in a given unit of time, with ongoing feedback so that people can adjust what they say to one another, correct misunderstandings, and fill in details. Synchrony is an important communication attribute for lateral interfirm communication (Zmud et al., 1990), and for collaborative planning and problem solving under uncertainty (Kraut et al., 1992; Reid, 1977).

Communication in marketing channels also focuses on the efficiency and effectiveness of exchange. *Tactical communication* adds value in a channel relationship through an increase in the efficiency of transaction processing, facilitation of related systems such as manufacturing and procurement, and improvements in the coordination of exchange. In contrast to strategic communication, tactical communication involves the flow of timely, formatted information, enabled by asynchronous technology. Malone (1985) and Malone and Smith (1984) suggest that tactical communication, enabled by interorganizational technology, can be divided into two categories; (1) the influence on the efficiency of organizational processes (operational performance), and (2) the effect on the coordination of the business (relational outcomes).

As Eisenberg and Goodall (1993) note, communication is recognized as a way to organize and coordinate interorganizational tasks. The process of tactical

communication by a channel dyad reduces the costs and the risks historically associated with interfirm coordination. Cooperation is the effort required to increase resource utilization and value through higher explicit coordination of relational activities. Increased levels of cooperation have been associated with production economies of scale and operational efficiency (Clemons, Reddi, and Row, 1993).

Tactical communication has at least three aspects which impact operational performance of the channel: (1) faster transmission, (2) greater accuracy, and (3) more complete information about the transactions (Stern and Kaufmann, 1985). The speed and accuracy of transmission helps reduce purchasing lead times. Advances in communication technology have enabled tremendous information gathering, processing, and sharing opportunities for joint decision making. Bar-coding and scanners facilitate detailed data capture throughout the marketing channel. High speed digital networks with a capacity of over 45 million bits per second, coupled with communication protocols, such as the industry-specific standards for EDI, facilitate sharing of information between organizations. Better query languages and database management systems support larger more integrated data bases, allowing more rapid access to, and analysis of, data needed to monitor the performance of an alliance. In industries where the products are physical goods, shorter lead times enable buyers to purchase more frequently and in smaller lot sizes thus reducing inventory costs (Larson and Lusch, 1990).

Table 4 - Strategic Versus Tactical Communication

Descriptor	Strategic Communication	Tactical Communication
Classification	Direct contact	Mechanical, Electronic
Technology	Face-to-Face, Telephone	Fax, E-mail, EDI
Carrier	Voice	Paper, Video, Computer
Direction	Synchronous	Asynchronous
Information Quantity	Limited	Maximum
Capacity (senses)	Maximum	Limited
Information Attributes	Long-term, Confidential	Timely, Formatted, Accurate

A model of the interrelationships between information, technology, and relational orientation in marketing channels is presented in Figure 3 and summarized by the following hypotheses:

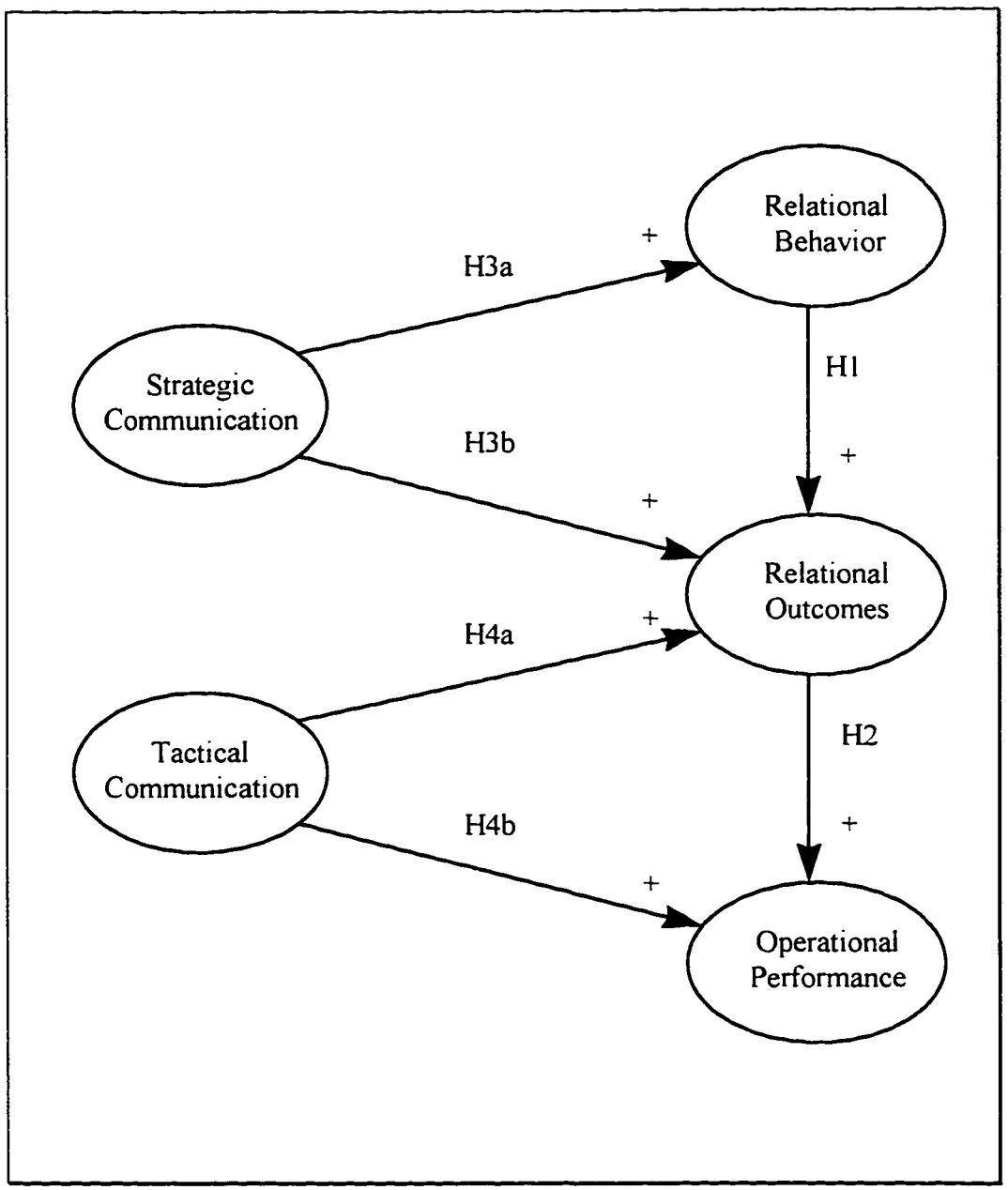
H_{3a}: Strategic communication has a positive effect on relational behavior (solidarity, flexibility, information exchange) in a structure of relational orientation.

H_{3b}: Strategic communication has a positive effect on relational outcomes (cooperation, coordination) in a structure of relational orientation.

H_{4a}: Tactical communication has a positive effect on relational outcomes (cooperation, coordination) in a structure of relational orientation.

H_{4b}: Tactical communication has a positive effect on operational performance (logistics indicators) in a structure of relational orientation.

Figure 3 - Model of Construct Relationships



Conclusion

The purpose of this chapter was to address the research gaps identified in the marketing literature. This chapter establishes a causal link between relational behavior (norms of expected behavior), relational outcomes (coordination and cooperation), and operational performance. The development of the theory produced a set of hypotheses regarding the effects of two forms of communication (strategic and tactical) on relational orientation.

CHAPTER IV

Empirical Methodology

Introduction

This chapter describes the empirical methodology to test the hypotheses. The focus of measurement is the perspective of the buyer. Specifically, purchasing managers will be asked for their perceptions, to estimate communication and relational behavior between buyers and suppliers in the channel. The first section describes the phases of survey development, including field interviews, analysis of secondary data, and pretesting of a questionnaire. The second section describes the "total design" procedures used to ensure a successful response to the survey. The remaining two sections describe the development of measurement scales and methods used to assess construct validity. Exploratory factor analysis is used extensively to refine the measurement scales for structural equation modeling with LISREL.

Survey Development

Development of the survey is the final phase in a research project into information technology and buyer/supplier performance. The research began with field work among purchasing and logistics professionals. In-depth interviews led to a tentative list of measures of information technology and operational performance. The interviews helped establish the importance of the research questions. From the exploratory investigation it was determined that there is substantial variation in communication modes and buyer/supplier ties, and that the constructs identified in Figure 3 are relevant (Larson and Kulchitsky, 1992, 1994).

From discussions with purchasing and logistics managers, and a literature review, multiple measures for each of the constructs were developed. Scales were pretested in a survey on logistics performance that was sent to 410 professional members of the Canadian Association of Logistics Managers (CALM). A 55% response rate provided information on the reliability of measures not reported in previous research. Presentation of the survey results at the annual conference of CALM (Larson and Kulchitsky, 1996) provided the opportunity to interview executives regarding the face validity of the proposed model and the preliminary operationalization of the constructs.

To provide a context for the completion of the survey for this study, the first section of the eight-page survey booklet asked respondents to report on the last item (Item X) purchased from a preferred supplier (Supplier A) that met the following conditions:

1. Item X is frequently purchased for use or distribution, and is delivered in lots.
2. The purchase is a rebuy, meaning that Item X is not new to the firm.
3. Supplier A is the preferred supplier, but not the only possible supplier of Item X. The respondent may be single sourcing with Supplier A, but alternate sources are available.

The remaining sections contained questions specific to relational behavior, technology adoption, strategic and tactical modality, information quality, and relational and operational performance with Supplier A. The survey instrument is provided in Appendix A.

The requirement of respondents to report on suppliers with which they are single sourcing may have introduced some degree of positive response bias (PRB) in the data. Positive-response bias occurs when respondents report on only their best business relationships. Previous studies in marketing channels have controlled for PRB by asking respondents to select the fourth largest supplier (Anderson and Narus, 1990; Bello and Gilliland, 1997), or by randomly assigning the name of a supplier to consider for evaluation (Mohr and Sohi, 1995). It was assumed in this study that PRB

would be reduced by requiring respondents to select the last item purchased, and collect data from a large cross section of businesses.

Data Collection

Questionnaires were mailed to a sample of Purchasing Management Association of Canada (PMAC) members. The PMAC is a nation-wide association representing over 6,000 professional purchasing and materials management practitioners. PMAC staff performed systematic sampling (every n^{th} person) on its list of all CPP members[1]. To ensure that survey respondents were knowledgeable about buyer/supplier relationships, the sample was drawn only from the list of senior PMAC members who have earned the designation of Certified Professional Purchaser (CPP). Individuals with the CPP designation generally had the title of Director of Purchasing, Senior Buyer, or Materials Manager. The mailing list provided by PMAC contained names, titles, and addresses, for 620 purchasing professionals. The elimination of agents, brokers, and consultants, and a reduction in the number of surveys sent to companies with multiple PMAC members, resulted in a final mailing list of 514 individuals. Industry descriptors, including size of firm and type of products purchased, are included in the questionnaire (see Appendix A, Section I and X).

[1] Industry classification was not available from the PMAC database and was not asked in the questionnaire. It was assumed that the random sampling performed by the PMAC would result in adequate representation of Canadian firms by size, geographic location, and industry.

To gain a high response rate, the survey was administered using the "total design method" (Dillman, 1978). Each survey packet contained: a numbered copy of the 7" x 8.5" survey booklet; a stamped return envelope to the University of Alberta; a personalized cover letter (Figure 5); and a $2.00 response incentive. The personalized letter described the importance of the research and indicated the support of the PMAC. The letter offered a copy of the survey results to all respondents, and indicated that the $2.00 was for a cup of coffee to enjoy while completing the survey.

The survey packet was mailed to the 514 professional purchasers[2]. Six weeks later, a second survey packet with a revised cover letter (Figure 6), but no financial incentive, was mailed to nonrespondents. By the end of ten weeks, data collection was terminated, and only five surveys were received after that time. During the ten week data collection period, a total of 338 surveys were returned for a response rate of 66%. After eliminating surveys with incomplete responses, the sample was composed of 301 respondents (59%) who provided usable data.

The responding companies varied in size from 8 to 10,000 employees. The average number of employees was 1,300, although the median was only 540. A distribution of company size, as measured by the number of employees is presented in Figure 4. These organizations had annual sales ranging from $4,600 to $12 billion. The mean was $560 million and the median was $55 million (see Table 5).

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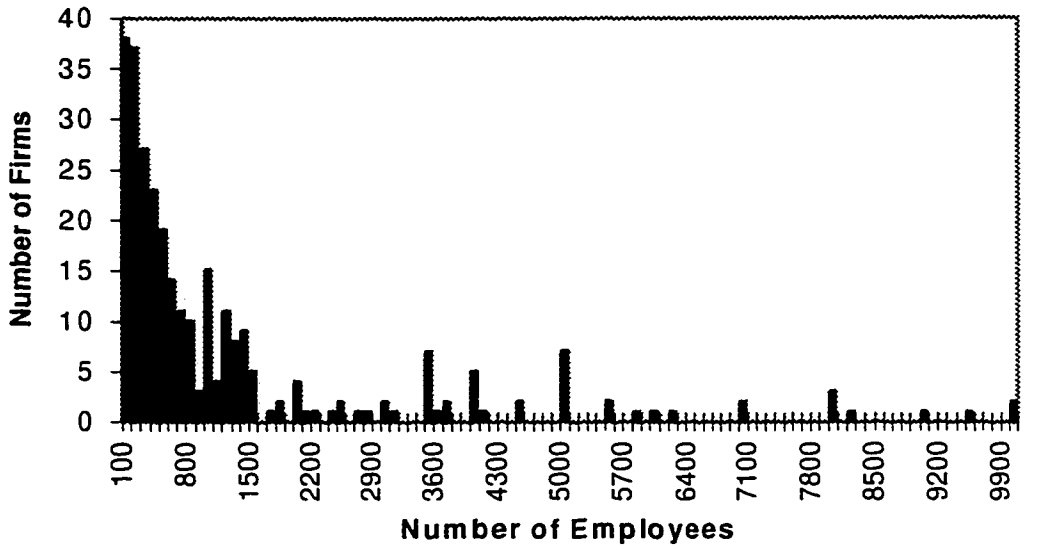
[2] Demographic characteristics of individuals completing the survey, such as length of time in current position, length of time in current organization, and union/management affiliation, were not collected in the survey.

Figure 4 - Distribution of Respondent Firms



The average number of units of Item X purchased by each organization was 6,375,000. However, this average is skewed by 3 companies, each reporting annual purchases of over 350 million units. The median was only 10,000 units of Item X. The majority of the respondents reported that they were able to obtain Item X from a select few suppliers. Although one company could select from 1,000 suppliers, 89% of the companies reported the availability of 10 or less suppliers. Further details about the respondents are provided in Table 5.

Table 5 - Respondent Company Characteristics

1. Total units of Item X purchased per year				(Appendix A; I 1)
Mean	Std. Dev.	Minimum	Median	Maximum
6,375,000	36,825,000	1	10,000	370,000,000

2. Total number of suppliers of Item X				(Appendix A; I 4)
Mean	Std. Dev.	Minimum	Median	Maximum
11	60	1	4	1,000

3. Percentage of Item X purchased from Supplier A				(Appendix A; II 1)
Mean	Std. Dev.	Minimum	Median	Maximum
89	19	2	100	100

4. Time length of contract with Supplier A (months)				(Appendix A; II 2)
Mean	Std. Dev.	Minimum	Median	Maximum
33	40	1	24	420

5. Total sales per year for respondent company (Gross $k)				(Appendix A; X 4)
Mean	Std. Dev.	Minimum	Median	Maximum
560,000	1,640,000	4.6	55,000	12,000,000

6. Total number of employees in respondent company				(Appendix A; X 5)
Mean	Std. Dev.	Minimum	Median	Maximum
1,300	2,430	8	540	10,000

Figure 5 - Covering Letter 1

October 16. 1996

Mr. James Gilmour C.P.P.
3M Canada Inc.
P.O. Box 5757. Station A
London. ON
N6A 4T1

Dear Mr. James Gilmour:

The enclosed survey on 'Information Technology and Relational Orientation in Marketing Channels' is an important component to a study being conducted by the University of Alberta in cooperation with The Purchasing Management Association of Canada. The study is also supported and financed by the Social Sciences and Humanities Research Council of Canada.

The purpose of the survey is to help us understand more about the use and impact of information technology and interorganizational relationships on the structure and performance of supply chains in Canada. As a purchasing management professional. your participation in completing the survey is very important. For your convenience. a stamped return envelop has been provided. The enclosed two-dollar bill cannot compensate you for the ten minutes it may take to complete the survey. but please have a cup of coffee with our compliments.

Your responses to this survey will be kept strictly confidential. The survey numbers are for audit purposes only and will not be used to analyze individual responses. If you would like a summary of the study results. please enclose your business card in the return envelope. If you have any questions about the survey. please feel free to call me. Thank you in advance for your participation.

Yours truly.

Jack D. Kulchitsky
Phone: (403) 492-5367

PS If you are unable to complete the questionnaire. please forward it to a colleague in your organization. or return it in the enclosed stamped envelope.

Figure 6 - Covering Letter 2

December 1, 1996

Mr. James Gilmour C.P.P.
3M Canada Inc.
P.O. Box 5757, Station A
London, ON
N6A 4T1

Dear Mr. James Gilmour:

As a purchasing management professional, you were selected to help us understand more about the use and impact of information technology and interorganizational relationships on the structure and performance of supply chains in Canada. Your participation is an important component of a study being conducted by the University of Alberta in cooperation with The Purchasing Management Association of Canada. The study is also supported and financed by the Social Sciences and Humanities Research Council of Canada.

On October 16, 1996 you were provided with a copy of a survey entitled 'Information Technology and Relational Orientation in Marketing Channels'. If you have already completed the survey, thank you very much for your participation. If you have not yet had the opportunity to respond to our request, may I please impose upon you to take ten minutes and provide us with the data necessary to complete our study. For your convenience, I have enclosed an additional copy of the survey and a stamped return envelope.

Your responses to this survey will be kept strictly confidential. The survey numbers are for audit purposes only and will not be used to analyze individual responses. If you would like a summary of the study results, please enclose your business card in the return envelope. If you have any questions about the survey, please feel free to call me. Thank you in advance for your participation.

Yours truly,

Jack D. Kulchitsky
Phone: (403) 492-5367

PS If you are unable to complete the questionnaire, please forward it to a colleague in your organization, or return it in the enclosed stamped envelope.

Scale Development

In this section, measures are developed for the primary constructs -- relational behavior, relational outcomes, operational performance, strategic communication, and tactical communication. All constructs are measured with respect to the purchase of Item X from Supplier A. A summary of the constructs, indicators, survey items, and variable descriptions is provided in Table 6. The survey instrument is in Appendix A. Construct and indicator labels follow the language of LISREL, to be discussed in Chapter V.

Table 6 - Construct Measurement Summary

Construct / Indicator		Description	Survey Section	Survey Item(s)
Relational Behavior	y_1	Relation Norm	III	Σ (3, 6, 7, 2, 9, 10)
(η1)	y_2	Info Norm	VII	Σ (3, 4, 5, 6)
Relational Outcomes	y_3	Cooperation	VIII	3
(η2)	y_4	Commitment	VIII	9
	y_5	Coordination	VIII	11
Operational Performance	y_6	Cycle Time	IX	5
(η3)	y_7	Back Order	IX	6
	y_8	On-Time	IX	7
Strategic Communication	x_1	Strategic Tech	V	Strategic A+B
(ξ1)	x_2	Strategic Info	VI	Σ (1, 6)
Tactical Communication	x_3	Tactical Tech	V	Tactical C+D+E+F
(ξ2)	x_4	Tactical Info	VI	Σ (2, 3, 4, 5)

Relational Behavior

Three relational norms - solidarity, flexibility, and information exchange - form the basis of relational behavior measurement. Norms define standards on how parties should treat each other, but are not actual forms of behavior. Rather, norms are beliefs about the structure of the relationship and as such, can be expected to lead behavior. As discussed by Heide and John (1992) relational norms can be viewed as arising from a single, second-order factor of relationalism. The theory developed in Chapter III, suggests that relational norms are particularly important in defining the relational behavior of buyers and suppliers.

Though norms are sometimes described as being discrete (i.e., present or absent), the literature has consistently described the strength of a norm in any particular setting to be a matter of degree (Gibbs, 1981; Thibaut and Kelly, 1959). Therefore, norms vary in strength, depending on the extent to which behavioral expectations are shared. In the survey, each respondent is asked to report on their expectation of behavior with Supplier A, using a Likert-type agree/disagree scale where higher scores reflect higher relational norms.

The norm of flexibility defines a bilateral expectation of willingness to make adaptations as circumstances change. In exchange relationships, flexibility represents insurance that the relationship will be subject to good-faith modification if a particular practice proves extremely detrimental to either partner. The norm of flexibility was initially operationalized for this study using a five item Likert-type scale adapted from

Heide and John (1992) and Kaufmann and Dant (1992). The items in this scale measured the extent to which the parties expected that changes in the terms of ongoing transactions would be allowed if unanticipated economic events occurred. Two items were dropped from this scale in the initial reliability analysis because of a low Chronbach's Alpha. The remaining three flexibility items (Appendix A; III 2, 9 and 10) loaded on a single factor during exploratory factor analysis (Eigenvalue = 1.92; Percent of Var. = 64%). The factor loadings ranged from .72 to .87, and coefficient alpha = 0.71.

Solidarity is a norm defining a bilateral expectation that a high value is placed on maintaining the relationship. Similar to flexibility, the norm of solidarity was operationalized with scales adapted from Heide and John (1992) and Kaufmann and Dant (1992). The three items in this scale tap the importance of preserving and extending the joint partnership. The three solidarity items loaded (Appendix A; III 3,6 and 7) on a single factor (Eigenvalue = 2.21; Percent of Var. = 74%) during exploratory factor analysis. Also, factor loadings ranged from .82 to .89, and coefficient alpha = 0.82. Thus, these three items were retained as indicators of solidarity.

The norm of information exchange involves formal and informal sharing of meaningful and timely information. Heide and John (1992) note that an expectation of getting necessary information on an ongoing basis allows firms to cope with the risk of sharing the control of channel management. The norm of information sharing was

initially operationalized by a seven item Likert-type scale adapted from Noordewier, John, and Nevin (1990), Heide and John (1992), and Mohr and Sohi (1995). This scale measures the extent to which parties keep each other fully informed about important issues, changes, and events (following initial reliability and exploratory factor analysis, three items with low factor loadings were dropped from the scale) and four items remained (Appendix A; VII 3, 4, 5 and 6). The remaining single factor (Eigenvalue = 2.67; Percent of Var. = 67%) had coefficient alpha = 0.83, and the factor loadings ranged from .73 to .87.

Communication

Communication facilitates exchange of information. The communication constructs described by Figure 3 are operationalized by indicators of communication medium and information quality, using a combination of scales adapted from prior research (e.g., Mohr and Sohi, 1995; Mohr, Fisher, and Nevin, 1996).

Communication medium refers to the form of technology used to exchange information. This aspect of communication is consistently operationalized as a formative, or checklist scale in which a variety of communication modes are given. "More" of the construct is defined as higher usage frequency across all mode alternatives (Frazier, Gill, and Kale, 1989). Checklist-type scales form the measurement of the construct but may not necessarily be a reflection of it (Howell, 1987).

To ensure that higher scores accurately reflect relationships with greater communication, it is important that the checklist include as many modes of communication as possible. The checklist for communication mode is presented in Appendix A, Section V. The six communication technologies, anchored by face-to-face contact and electronic data interchange, represent a comprehensive checklist to operationalize communication in interorganizational relationships. The scale includes two direct forms of communication (face-to-face and telephone), two mechanically enabling forms of technology (mail and fax), and two electronically enabling technologies (e-mail/Internet and EDI). The respondents to the survey are asked to indicate the percentage of communication, by mode, for both strategic and tactical communication.

To form an indicator of strategic communication, responses to the two direct/synchronous communication technology items (face-to-face, telephone), were summed. Similarly, the sum of responses for the indirect/asynchronous technology items (mail, fax, e-mail, EDI), form an indicator of the degree of tactical communication flows.

When using formative indicators to measure constructs, it is not necessary that the various modes of communication (e.g., telephone and face-to-face) be highly correlated, or unidimensional at the item level. As Howell (1987) explains, "multidimensional composites [formative indicators] are not appropriately modeled in

terms of their individual indicants. Consequently, neither is the calculation of coefficient alpha appropriate."

Strategic information quality was originally operationalized as a three item Likert-type scale adapted from Mukhopadhyay and Cooper (1993). The items of this scale measured the temporal (long-term) orientation, confidentiality, and competitive sensitivity of information. As a result of the initial exploratory factor analysis, and discussion with managers, it was determined that confidentiality and competitive sensitivity were describing the same measure. The final two-item (Appendix A; VI 1 and 6) scale is unidimensional (Eigenvalue = 1.42; Percent of Var. = 71%). Also, factor loadings for both items are .84, and coefficient alpha = 0.67.

Tactical information quality focuses on the attributes of information that are necessary for efficient and effective channel operations. The measure of tactical information quality was adapted from scales used by Zmud (1978), O'Reilly (1982), and Mohr and Sohi (1995). Consistent with the description provided in Table 3, the intent of this scale is to capture the attributes of information quality that describe information, enabled by indirect communication, and associated with exchange. Following the pretest, one item was dropped from the analysis due to low reliability. The remaining four items (Appendix A; VI 2,3,4 and 5) loaded on a single factor during exploratory factor analysis (Eigenvalue = 2.81; Percent of Var. = 70%). Factor loadings ranged from .78 to .87, and coefficient alpha = 0.86.

Relational Outcomes

Theory in social-psychology and empirical studies in marketing channels suggest that the consequences of expectations of behavior are relational outcomes. Two closely related constructs -- cooperation and coordination -- form the basis of the measures of relational outcomes. Robicheaux and El-Ansary (1975) define channel cooperation as "a state or condition characterized by members' willingness to coordinate activities." More recently, Anderson and Narus (1990) define cooperation as "similar or complementary coordinated actions taken by firms in interdependent relationships to achieve mutual outcomes or singular outcomes with expected reciprocity over time."

Similar to the scale developed by Heide and John (1990), the activity items for cooperation and coordination for this study are measured on seven point scales of increasing cooperation and coordination. Heide and John report a reliability coefficient of 0.70 for a scale of cooperation anchored by "minimal joint effort" and "maximum joint effort". Brown (1979) used a similar scale anchored with "not very cooperative" and "very cooperative", to measure the degree of cooperation between manufacturers and dealers in the automobile industry .

Many previous studies of interorganizational behavior, have anchored their scales assuming that conflict and cooperation are polar opposites (e.g., Reynolds, 1986). Others have argued that these two measures are not the same construct, since firms can maintain cooperation even in the face of conflict (e.g., Ross and Lusch,

1982). While the debate around this issue is beyond the scope of this dissertation, the pretest results suggest that industry professionals used the scale "as if" conflict and cooperation were polar opposites.

In the survey instrument, the respondents were presented with 14 pairs of attributes to describe the nature of exchange relationships. Each pair was measured on a seven point scale anchored by -3 and +3 with zero defined as the mid point. In the pretest, four closely related constructs loaded as a single factor in the exploratory factor analysis -- cooperation, commitment, coordination and trust. While theoretical support can be found in the marketing channels literature for all four constructs as outcomes of a relational orientation, the inclusion of trust is problematic. Though the link between communication and trust has received attention (e.g., Bialaszewski and Giallourakis, 1985), researchers do not agree on the direction of the relationship. For instance, Dwyer, Schurr, and Oh (1987) hypothesize that trust causes communication, whereas Anderson, Lodish, and Weitz (1987) contend that communication leads to trust. Anderson and Narus (1990) posit a positive causal path from cooperation to trust, however, Morgan and Hunt (1994) find support for a path from trust to cooperation.

As a result of the uncertainty surrounding trust, this construct was eliminated from the final analysis, and the three remaining constructs were used to form the scale for relational performance -- cooperation, commitment, and coordination (see Appendix A; VIII 3, 9 and 11). These three items loaded on a single factor during

exploratory factor analysis (Eigenvalue = 2.72; Percent of Var. = 75%). Also, the factor loading ranged from .79 to .88, and coefficient alpha = 0.84.

Operational Performance

A long standing principle in channels research holds that the establishment of bilateral cooperation, is likely to increase the effectiveness and efficiency with which channel tasks are performed. As Stern and Reve (1980) explain, "The rational is that cooperative behavior facilitates coordination and programming of activities within the channel which, in turn, provides potential cost advantages and improved competitive strength."

Performance is a multi-dimensional construct. Lusch and Brown (1996) measure business performance of wholesaler/distributor relationships on six aspects of efficiency and productivity -- sales growth, profit growth, overall productivity, liquidity, labor productivity, and cash flow. Noordewier, John and Nevin (1990) focus on buyer transaction performance, as assessed by indicators of possession costs and acquisition costs. Possession costs were measured as inventory turnover, and acquisition costs were operationalized as percentage of on-time deliveries, and percentage of acceptable (not defective or substandard) products.

Because this study focuses on the buyer, the measures developed for operational performance by Noordewier, John, and Nevin (1990) are more appropriate. However, in addition to collecting actual measures of inventory turns, and delivery effectiveness, a scale of logistics performance was also adapted from Larson (1991). To obtain a measure of performance of Supplier A relative to the industry, respondents were presented with an eight item, Likert-type scale where the midpoint on the scale (3) represented average performance (see Appendix A; Section XI). The lower anchor point (1) represented situations where Supplier A was much worse than most suppliers in the industry, and the higher anchor point represented situations where Supplier A was much better than most suppliers in the industry. The three items that loaded the strongest during the exploratory factor analysis (Eigenvalue = 2.30; Percent of Var. = 77%) correspond to the three measures suggested by Noordewier, et al. (1990) -- cycle time; back orders; on-time delivery[3] (see Appendix A; IX 5,6 and 7). The three item scale had a reliability coefficient (alpha) of 0.85, and factor loadings ranged from .84 to .90. These items are also similar to measures of logistics performance discussed by Bowersox and Closs (1996) - speed, availability and consistency.

[3] Because of the wording of the question, it was not necessary to reverse code any of the performance variables. A higher response on each scale indicated that Supplier A performed better than most suppliers in the industry with respect to reducing cycle time, reducing backorders, and maintaining on-time deliveries.

To accommodate the multi-dimensionality of some constructs, certain dimensions were standardized and summed to form uni-dimensional indicators (Madsen 1987). The scales for solidarity and flexibility had similar factor scores, were highly correlated, and were shown by a confirmatory factor analysis to load on a second order construct of relationalism. Consequently, equal weights were used to sum the two scales and form the "relational norms" indicator. Similar factors allowed for the two measures of strategic information, and the four measures of tactical information to be summed with equal weights to form indicators of "strategic information quality" and "tactical information quality" respectively.

Measurement Validity

The construct validity of a measure refers to the extent to which it actually measures what it purports to measure. Key dimensions of construct validity include internal consistency, unidimensionality, and convergent validity. The measures used to empirically test the hypotheses in this dissertation were analyzed for validity and reliability following the guidelines proposed by Anderson and Gerbing (1988) and Joreskog and Sorbom (1993).

The original measures were tested for internal consistency of scales using a combination of exploratory factor analysis and Chronbach's Alpha. Items that had low scale reliability, and items that loaded on multiple factors were eliminated. The remaining items were subject to a confirmatory factor analysis using LISREL 8 (Joreskog and Sorbom, 1993). The fit statistics associated with the model are reported in Table 7. The overall Chi-Square for the model is significant ($\chi^2 = 929.39$, df = 215, $\rho < 0.001$) which is to be expected given the number of parameters being estimated. The Goodness of Fit Index (GFI = 0.82) and the Root Mean Square Residual (RMSR = 0.086) indicate that the data fit the model adequately. Furthermore, the standardized residuals appear normally distributed. All measurement items in the model load significantly on their specified factors, and all other fit indices show an adequate fit to the data.

Having determined unidimensionality, the reliability of the measures was computed for the constructs operationalized by reflective scales. Reliability means low measurement error and indicates the extent to which measures are repeatable and stable (Nunnally, 1978). With the exception of one, all reflective scales exceeded the guideline of 0.70 for Chronbach's Alpha. The one exception, Relational Information Quality, had a coefficient alpha of 0.67, which was considered acceptable for further analysis.

Table 7 - Confirmatory Factor Analysis

Scale	Fit Indices	Survey Items	Standardized Loading (t-value)	Chronbach Alpha
Solidarity	$\chi^2(1) = 46.21$ df = 1 RMSR = 0.16 GFI = 0.92	III 3 III 6 III 7	0.63* (--) 0.92 (16.13) 0.74 (13.05)	.82
Flexibility	$\chi^2(1) = 11.16$ df = 1 RMSR = 0.09 GFI = 0.98	III 2 III 9 III 10	0.46* (--) 0.99 (12.10) 0.60 (9.08)	.71
Information Exchange	$\chi^2(3) = 30.12$ df = 3 RMSR = 0.10 GFI = 0.96	VII 3 VII 4 VII 5 VII 6	0.57* (--) 0.79 (16.02) 0.73 (14.64) 0.87 (18.19)	.83
Strategic Quality	Note: 1	VI 1 VI 6	-- --	.67
Tactical Quality	$\chi^2(3) = 139.20$ df = 3 RMSR = 0.18 GFI = 0.87	VI 2 VI 3 VI 4 VI 5	0.75* (--) 0.83 (16.91) 0.70 (13.57) 0.76 (14.92)	.86
Relational Outcomes	$\chi^2(1) = 35.95$ df = 1 RMSR = 0.15 GFI = 0.94	VIII 3 VIII 9 VIII 10	0.59* (--) 0.71 (11.30) 0.81 (12.46)	.84
Operational Performance	$\chi^2(1) = 55.52$ df = 1 RMSR = 0.18 GFI = 0.91	IX 5 IX 6 IX 7	0.66* (--) 0.83 (15.61) 0.89 (16.86)	.85
Tactical Mode	Note:2			
Strategic Mode	Note:2			

Notes:	Goodness of Fit Indices:
* Value fixed to 1.0 (unstandardized) to set scale 1-Trivial fit for two item scale 2-Formative one item scale	$\chi^2(215) = 929.39$ df = 215 RMSR = 0.086 GFI = 0.82

Convergent validity refers to the degree to which multiple attempts to measure the same construct by maximally different methods are in agreement. Convergent validity was evident in the measurement model. According to Anderson and Gerbing (1988), "Convergent validity can be assessed from the measurement model by determining whether each indicator's estimated pattern of coefficient on its posited underlying construct factor is significant (greater than twice its standard error)." As shown in Table 7, all items load significantly on their specified constructs and have t-values greater than 2.0, providing evidence of convergent validity.

Conclusion

This purpose of this chapter was to define the methodology used to test the hypotheses. Field interviews, analysis of secondary data, and rigorous pretesting of a questionnaire resulted in the development of an instrument with a high degree of construct validity. Low measurement error, and a high degree of convergent validity are requirements to test the hypotheses.

CHAPTER V

Statistical Results

Introduction

The proposed structural model is specified from the hypothesized relationships discussed in Chapter III and shown in Table 8. Taken together, hypotheses H1 and H2 argue that the operational performance of a distribution channel is enhanced by the formation of relational norms and the development of relational outcomes. Hypotheses H3 and H4 argue that specific forms of communication technology and levels of information attributes, are antecedents of relational behavior, relational outcomes, and operational performance. The purpose of this chapter is to present statistical results, culminating in the testing of the research hypotheses, with structural equation modeling.

Table 8 - Research Hypotheses

H_1	Relational behavior (norms of expected behavior) has a positive effect on relational outcomes (cooperation, coordination, commitment)
H_2	Relational outcomes (cooperation, coordination, commitment) have a positive effect on operational performance
H_{3a}	Strategic communication has a positive effect on relational behavior (solidarity, flexibility, information exchange)
H_{3b}	Strategic communication has a positive effect on relational outcomes (cooperation, coordination, commitment)
H_{4a}	Tactical communication has a positive effect on relational outcomes (cooperation, coordination, commitment)
H_{4b}	Tactical communication has a positive effect on operational performance (cycle time, back orders, on-time delivery)

This chapter is organized as follows. The first section describes the data. Although not used specifically for hypothesis testing, the adoption and use of telecommunication technologies are categorized to test the assumption that channel managers rely on different forms of technology to enable strategic versus tactical communication. The second section describes the results of hypothesis testing using structural equation modeling. Three separate models are tested to establish the relationship between information, technology, and relational orientation in marketing channels.

Data Characteristics

A statistical summary of the data is presented in Table 9. The standard deviation for the twelve scales ranges from 0.818 to 25.76, indicating a substantial amount of variance to be explained by the responses. Relational Behavior is the sum of 6 questions and Information Exchange is the sum of 4 questions using six-point Likert-type scales anchored by *Strongly Disagree* (1) and *Strongly Agree* (6). Cooperation, Commitment and Coordination are each measured using seven-point scales ranging from -3 (absolute lack of the characteristic) to +3 (absolute presence of the characteristic). Cycle Time, Back Order, and On-time Delivery are each measured using five-point Likert-type scales anchored by *Supplier A is Much Worse* (1) and *Supplier A is Much Better* (5). Strategic Information Quality is the sum of 2 questions and Tactical Information Quality is the sum of 4 questions using six-point Likert-type scales anchored by *Strongly Disagree* (1) and *Strongly Agree* (6). Strategic Communication Technology is the sum of two questions and Tactical Communication Technology is the sum of 4 questions asking for the percentage of communication between firms using each type of technology. Each question ranged from 0% (not employing this technology) to 100% (only employing this technology).

The measurement variables for the constructs of relational orientation (y_1 to y_8) have means that greatly exceed their medians. The norms of relational behavior (y_1 and y_2) have the greatest variance and operational performance (y_6 to y_8) have the least. This suggests that most of the respondents are reporting on firms with which they have developed a long term relationship, and are satisfied with channel

performance. This result is expected given the respondent characteristics presented in Table 5. The reporting organizations are purchasing an average of 89% of Item X from Supplier A and have entered into contracts for 2 to 3 years.

Table 9 - Measurement Summary Statistics

Construct	Variable	Mean	Std. Dev.	Min.	Max
Relational Behavior	y_1	29.35	2.589	6	36
Information Exchange	y_2	18.864	3.240	7	24
Cooperation	y_3	2.013	1.007	-2	3
Commitment	y_4	1.860	1.070	-2	3
Coordination	y_5	1.580	1.300	-3	3
Cycle Time	y_6	3.815	0.818	1	5
Back Order	y_7	3.844	0.928	1	5
On-Time Delivery	y_8	4.027	0.916	1	5
Strategic Comm. Technology	x_1	66.72	25.76	0	200
Strategic Information Quality	x_2	8.869	2.196	2	12
Tactical Comm Technology	x_3	43.42	14.67	0	345
Tactical Information Quality	x_4	18.381	3.605	4	24

The means for the type of technology (x_1 and x_3) are lower than expected, however the means for the quality of information communicated by the technology (x_2 and x_4) are exceptionally high. This result suggests that organizations may not be using multiple modes of communication or have not adopted advanced forms of electronic information technology. The respondent firms do appear to be very confident in the quality of information exchanged given the technologies they are using.

Previous research suggests that the size of the firm may be an exogenous variable affecting the operation of the relationship and the benefits derived from the adoption of technology. Levin, Levin, and Meisel (1992) and O'Callaghan, Kaufmann, and Konsynski(1992) show that the adoption and use of IOS technology is dependant on the size of firms within the channel. Although larger firms have greater access to capital, smaller firms make implementation decisions quickly, and are more flexible in the application and use of technology. In channel relationships, Dwyer, Schurr, and Oh (1987) found that increased levels of bureaucracy have a negative impact on relationship quality and satisfaction. Similarly, Anderson, Lodish, and Weitz (1987) found that the size of the organization and the amount of excess capacity affected organizational performance by influencing the efforts of sales personnel.

There is the expectation that the size of firm will be an exogenous variable affecting the empirical results in this study. Larger firms should have more formalized and centralized purchasing processes and therefore be more likely to exhibit a high degree of relational behavior with their suppliers. Larger firms are also expected to have access to capital for investment in information technology to improve interorganizational communication and channel operations.

To determine the effect of firm size, the data were partitioned into small and large firms using the number of employees as a measure of size[4]. Multiple methods were used to determine the partition. The first method divided the data into two equal groups using the median of 540 employees. The second method looked for natural breaks in the data to form two clusters. As shown in the bar chart presented in Figure 4, a significant break in the distribution clusters the organizations into a group with less than 1500 employees and a group with 1500 or more employees. A third method used the smallest category presented in Figure 4 and partitioned the data at 100 employees. Statistics for the comparison of the means for the three partitions are presented in Tables 10 to 12.

Table 10 - Firm Size Comparison - 540 Employee Partition

Construct	Small Firm Mean	Large Firm Mean	T-Test Statistic
Relational Behavior	29.32	29.39	-0.11
Information Exchange	18.59	19.16	-1.49
Cooperation	1.97	2.03	-0.58
Commitment	1.85	1.85	-0.06
Coordination	1.44	1.72	-1.87
Cycle Time	3.86	3.76	0.93
Back Order	3.84	3.86	-0.17
On-Time Delivery	4.00	4.06	-0.58
Strategic Comm. Technology	66.02	67.84	-0.56
Strategic Information Quality	8.93	8.74	0.71
Tactical Comm Technology	40.88	44.77	-1.18
Tactical Information Quality	18.28	18.54	-0.61

[4] Prior to partitioning the data, two outliers were eliminated. One respondent listed only one employee but claimed annual sales in excess of $45,000,000. A second respondent indicated that their firm had 2,000,000 employees but failed to provide any supporting detail such as annual sales, number of suppliers, or purchases of item x.

Table 11 - Firm Size Comparison - 1500 Employee Partition

Construct	Small Firm Mean	Large Firm Mean	T-Test Statistic
Relational Behavior	29.51	28.77	1.01
Information Exchange	19.02	18.34	1.47
Cooperation	2.02	1.94	0.56
Commitment	1.85	1.87	-0.54
Coordination	1.59	1.58	0.02
Cycle Time	3.85	3.67	1.53
Back Order	3.87	3.77	0.78
On-Time Delivery	4.06	3.90	1.24
Strategic Comm. Technology	67.57	64.60	0.75
Strategic Information Quality	8.93	8.48	1.42
Tactical Comm Technology	42.19	43.19	-0.74
Tactical Information Quality	18.63	17.61	1.79

Table 12 - Firm Size Comparison - 100 Employee Partition

Construct	Small Firm Mean	Large Firm Mean	T-Test Statistic
Relational Behavior	28.4	29.4	-1.05
Information Exchange	18.50	18.91	-0.67
Cooperation	1.83	2.02	-0.95
Commitment	1.67	1.87	-1.00
Coordination	1.07	1.64	-1.84
Cycle Time	3.62	3.83	-1.32
Back Order	3.66	3.87	-1.19
On-Time Delivery	3.73	4.06	-1.87
Strategic Comm. Technology	56.63	68.12	-1.81
Strategic Information Quality	8.93	8.82	0.25
Tactical Comm Technology	51.23	41.86	1.74
Tactical Information Quality	17.60	18.50	-1.30

The t-statistics for the comparison of means presented in Table 10 through Table 12 show no significant difference between large and small firms in the use of communication technology and the development of a relational orientation. As a final test for the effect of firm size, the difference in means between large and small firms was tested by comparing firms with less than 100 employees with firm that employ more than 1500 people. The results of the comparison is presented in Table 13.

The comparison of very large firms with very small firms presented in Table 13 shows no significant difference in the use of communication technology and the development of a relational orientation that can be attributed to the size of firms. This result suggests that the data represents a homogenous sample suitable for testing the research hypotheses without the requirement to control for size of firm. [5]

To gain insight into the use of interorganizational systems, the adoption and use of communication technology was analyzed by type and category (see Appendix A Section IV; Selection of 1 through 4 on each scale is considered to be partial deployment). Consistent with the findings of Grover and Gosler (1993) and Grover, Gosler, and Segars (1995), the most common forms of communication technology are fax and telephone. As summarized in Table 14, greater than 95% of survey respondents have fax technology, and all have mail service and telephone. Electronic mail is fully deployed in 59% of all responding firms. The more complex forms of

[5] The lack of a significant difference in the size of firms may be the result of the presence of positive response bias. Further research is required to determine the effect of size of organization on the use of communication technology and relational behavior in channels of distribution.

technology are in the earlier stages of adoption with only 10% of all companies reporting fully functional barcode and EDI systems. In addition, 17% of all companies report no interest in EDI, although 36% of the firms were analyzing the possibility of adopting EDI in the future.

Table 13 - Firm Size Comparison - 100 Vs. 1500 Employee Partition

Construct	Small Firm Mean	Large Firm Mean	T-Test Statistic
Relational Behavior	28.2	28.76	-0.31
Information Exchange	18.50	18.34	0.19
Cooperation	1.83	1.94	-0.43
Commitment	1.67	1.87	-0.91
Coordination	1.07	1.58	-1.60
Cycle Time	3.62	3.67	-0.22
Back Order	3.66	3.77	-0.51
On-Time Delivery	3.73	3.90	-0.80
Strategic Comm. Technology	56.63	64.59	-0.22
Strategic Information Quality	8.93	8.48	0.85
Tactical Comm Technology	51.23	45.19	1.02
Tactical Information Quality	17.60	17.61	-0.02

Table 14 - Communication Technology Adoption

	Adoption Stage (Percentage Respondents)			
Communication Technology	No Plans (%)	Planning Stage (%)	Partial Deploy (%)	Fully Deploy (%)
Bar Coding	26	29	35	10
Fax	0.5	0.5	4	95
Mail*	0	0	0	100
Telephone*	0	0	0	100
Electronic Mail	3	6	32	59
Internet	8	15	53	24
EDI	17	36	36	11

Note: *All respondents provided a mailing address and telephone number through PMAC

Consistent with the assumption that firms would rely on different forms of technology for strategic versus tactical communication, Table 15 summarizes the amount of communication by preference for technology. Table 15 uses data from Appendix A, Section V. The data suggests that channel managers prefer to use synchronous forms of communication to convey strategic information. An average of 70% of strategic information was conveyed using direct communication modes, while an average of only 51% was conveyed by tactical communication. Direct communication (face to face and phone) was used by 89% of the respondents to enable medium and high volumes[6] of strategic information exchange. But only 40% of the firms surveyed used face-to-face meetings or telephone to convey similar amounts of tactical information. The difference in the mean response for the use of direct modes for strategic communication (69.9%) as opposed to tactical information (52.7%) was statistically significant at a 1% confidence interval (t = 8.48).

Mechanical technology (mail and fax) is the prime enabler of tactical communication. Over 71% of the managers reported the use of fax and mail to facilitate most of their tactical communication. But only 21% of the companies reported that mechanical technologies would be used to convey strategic information. The mean response for the use of mechanical modes was 43.4% for tactical communication and 26.3% for strategic communication. This difference in the use of mechanical technology was also statistically significant (t = -7.93).

[6] Low volume is defined as less than 33% of all communication, medium volume is 33% to 66% and high volume is defined as a minimum of 67% of total communication.

In the responding firms, electronic communication technology is the most under utilized form of technology. Over 95% of the organizations surveyed use electronic communication for none or minimal amounts of all strategic or tactical communication. Although the mean percentage of communication using electronic modes was slightly higher for tactical communication (mean = 5.5%) as opposed to strategic communication (mean = 3.8%), the difference was not statistically significant (t = -1.35).

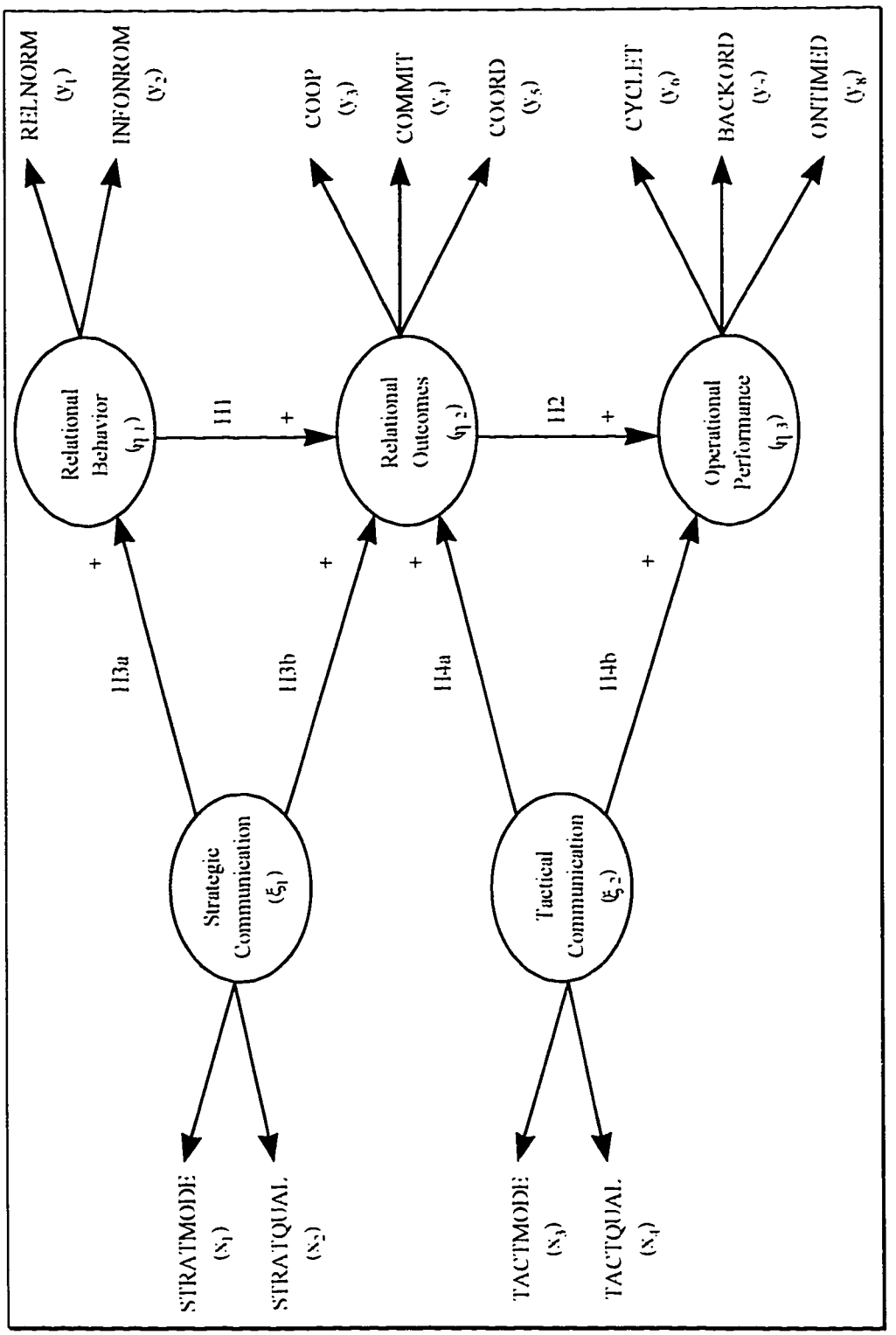
Table 15 - Technology/Communication Preference

Mode	Volume of Strategic Communication (Percentage of Firms)		
	Low	Medium	High
Direct	11	30	59
Mechanical	79	16	5
Electronic	96	3	1

Mode	Volume of Tactical Communication (Percentage of Firms)		
	Low	Medium	High
Direct	60	32	8
Mechanical	29	54	17
Electronic	93	5	2

Mode	Mean Response (Percentage of Communication)		
	Strategic	Tactical	T-Statistic
Direct	69.9	51.1	8.48
Mechanical	26.3	43.4	-7.93
Electronic	3.8	5.5	-1.35

Figure 7 - Structural Equation Measurement Model



Hypotheses Testing

Estimation Method

The hypothesized model was tested using structural equation modeling. Three equations represent the proposed model: (1) the structural model, (2) the measurement model for y, and (3) the measurement model for x (Joreskog and Sorbom, 1993).

$$\eta = B\eta + \Gamma\xi + \varsigma \qquad \text{(1) Structural Equation Model}$$

$$y = \Lambda_y\eta + \varepsilon \qquad \text{(2) Measurement Model for Y}$$

$$x = \Lambda_x\xi + \delta \qquad \text{(3) Measurement Model for X}$$

The measurement model defines the relationship between constructs and their indicators. The structural model describes hypothesized links between constructs. Figure 7 shows the full (measurement and structural) model. The variables in these equations are defined as follows (the matrices under some variables express our case):

y is an (8 x 1) vector of observed dependent or response variables. In this model y_1 and y_2 are the observed dependent variables for the unobserved construct η_1 (Relational Behavior). y_3, y_4, and y_5 are the observed dependent variables for the construct η_2 (Relational Outcomes), and y_6 to y_8 are the observed variables for the construct η_3 (Operational Performance).

$$\begin{bmatrix} y_1 \\ y_2 \\ y_3 \\ y_4 \\ y_5 \\ y_6 \\ y_7 \\ y_8 \end{bmatrix}$$

x is a (4 x 1) vector of observed independent, or input variables. x_1 and x_2 are the observed independent variables for ξ_1 (Strategic Communication), and x_3 and x_4 are the observed variables for ξ_2 (Tactical Communication).

$$\begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{bmatrix}$$

η is defined as a (3 x 1) random vector of latent dependent (endogenous) variables. In this model the three latent endogenous variables are Relational Behavior (η_1), Relational Outcomes (η_2), and Operational Performance (η_3).

$$\begin{bmatrix} \eta_1 \\ \eta_2 \\ \eta_3 \end{bmatrix}$$

ξ is defined as a (2 x 1) random vector of latent independent (exogenous) variables. The latent independent variables in the model are Strategic Communication (ξ_1) and Tactical Communication(ξ_2).

$$\begin{bmatrix} \xi_1 \\ \xi_2 \end{bmatrix}$$

Λy is an (8 x 3) matrix of coefficients of the regression of y on η. For example, Λ_{yi1} describes the coefficients resulting from the regression of y_1 (Relnorm) and y_2 (Infonorm) on η_1 (Relational Behavior). The remaining Λyij describe the coefficients resulting from the regression of y_3 to y_5 on Relational Outcomes and y_6 to y_8 on Operational Performance.

$$\begin{bmatrix} \Lambda_{y11} & 0 & 0 \\ \Lambda_{y21} & 0 & 0 \\ 0 & \Lambda_{y32} & 0 \\ 0 & \Lambda_{y42} & 0 \\ 0 & \Lambda_{y52} & 0 \\ 0 & 0 & \Lambda_{y63} \\ 0 & 0 & \Lambda_{y73} \\ 0 & 0 & \Lambda_{y83} \end{bmatrix}$$

Λx is a (4 x 2) matrix of coefficients of the regression of x on ξ. For example, Λ_{xi1} describes the coefficients resulting from the regression of x_1 (Stratmode) and x_2 (Stratqual) on ξ_1 (Strategic Communication). Λ_{yi2} describe the coefficients resulting from the regression of x_3 and x_4 on Tactical Communication

$$\begin{bmatrix} \Lambda_{x11} & 0 \\ \Lambda_{x21} & 0 \\ 0 & \Lambda_{x32} \\ 0 & \Lambda_{x42} \end{bmatrix}$$

Γ is a (3 x 2) matrix of coefficients of the ξ variables in the structural relationship. For example Γ_{11} is a measure of the effect of the latent independent variable, Strategic Communication on the latent dependent variable, Relational Behavior, and Γ_{21} is a measure of the effect of Strategic Communication on Relational Outcomes. Similarly, Γ_{i2} is a measure of the effect of Tactical Communication on Relational Outcomes and Operational Performance.

$$\begin{bmatrix} \Gamma_{11} & 0 \\ \Gamma_{21} & \Gamma_{22} \\ 0 & \Gamma_{32} \end{bmatrix}$$

In the structural model, B is a (3 x 3) matrix of coefficients describing the relationship among the η variables. B_{21} is a measure of the effect of η_1 (Relational Behavior) on η_2 (Relational Outcomes), and B_{32} is the measure of the effect of η_2 (Relational Outcomes) on η_3 (Operational Performance).

$$\begin{bmatrix} 0 & 0 & 0 \\ B_{21} & 0 & 0 \\ 0 & B_{32} & 0 \end{bmatrix}$$

ε an (8 x 1) vector of measurement error in y

δ a (4 x 1) vector of measurement error in x

ς a (3 x 1) vector of equation errors in the structural relationship between η and ξ

Assumptions the model makes are:

ε is uncorrelated with η

ς is uncorrelated with ξ

δ is uncorrelated with ξ

ς, ε, and δ are mutually uncorrelated

B has zeros in the diagonal, and I - B is non-singular

Structural equation models have the useful property that submodels of the full structural model can be developed in which the result is a factor analysis model or a multiple regression model. Thus it is possible that all six hypotheses described by Figure 7, can be tested with a single structural equation model. This assumes that the model fits the data reasonably well.

Original criticisms of structural equation modeling focused on requirements for the data to be homoscedastic and normally distributed. However, more recent developments (Anderson and Gerbing, 1988) have substantially relaxed these requirements due to use of the weighted least squares approach to parameter estimation. Goodness-of-fit indicators in programs such as LISREL VIII (Joreskog and Sorbom, 1993) are less sensitive to sample size and non-normality of the data.

Estimation Results

Three models are tested using LISREL VIII and the correlation matrix presented in Table 16 as input data. The base model is a test of the interrelationships between relational behavior, relational outcomes, and operational performance, in the absence of communication. The full model tests the hypotheses summarized in Table 8 and shown in Figure 7. The revised model tests the relationships after eliminating

paths not supported in the full model, and/or by adding paths suggested by the modification indices providing the paths are supported by theory. The results of the structural models are assessed using the statistical and theoretical criteria recommended for structural modeling by Bagozzi and Yi (1988), and Marsh and Hocevar (1985).

Table 16 - Correlation Matrix

Indicators		Correlation											
		y_1	y_2	y_3	y_4	y_5	y_6	y_7	y_8	x_1	x_2	x_3	x_4
RELNORM	y_1	1											
INFONORM	y_2	.39	1										
COOP	y_3	.43	.23	1									
COMMIT	y_4	.57	.26	.49	1								
COORD	y_5	.44	.25	.52	.56	1							
CYCLET	y_6	.25	.15	.34	.30	.34	1						
BACKORD	y_7	.22	.20	.34	.24	.37	.60	1					
ONTIMED	y_8	.25	.13	.35	.23	.33	.62	.73	1				
STRATMODE	x_1	.45	.36	.34	.39	.44	.24	.28	.27	1			
STRATQUAL	x_2	.31	.20	.22	.33	.19	.08	.11	.11	.42	1		
TACTMODE	x_3	.31	.16	.41	.33	.40	.31	.38	.40	.39	.20	1	
TACTQUAL	x_4	.31	.12	.33	.36	.33	.28	.32	.36	.39	.25	.74	1

The base model appears to have an adequate fit to the data (Table 17). The Chi-Square for the overall model is 39.37 and Chi-Square divided by the degrees-of-freedom is approximately 2, indicating the data fit the model reasonably well. In addition, the Adjusted Goodness-of-Fit (AGFI = 0.94) exceeds the minimum suggested criteria of 0.90. Further evidence of model fit is indicated by the low Root Mean Square Residual (RMSR = 0.04).

The base model is a preliminary model to examine the structural paths of relational orientation and confirm assumptions regarding the influence among the constructs of behavior and performance. As shown in Table 17, the coefficients for all measurement variables are significant as well as the structural paths from relational behavior to relational outcomes and from relational outcomes to operational performance. The modification indices produced by LISREL VIII do not suggest the addition or deletion of any structure paths that would improve the fit of the data to the model.

The full model (Figure 7) also displays an adequate fit to the data. Chi-Square = 83.29, Chi-Square/d.f < 2, and an evaluation of all indicators provide evidence of model fit. The Goodness-of-Fit Indicators (GFI = 0.96; AGFI = 0.93) are in the acceptable range and AGFI exceeds the minimum suggested guideline of 0.90. The estimation results show no negative variances, no non-significant error variances, and no correlations greater than, or close to, a value of one. The Root Mean Square Residual (RMSR = 0.037) for the full model is slightly smaller than the RMSR for the base model. The modification indices do not suggest the addition of any structural paths that would improve the fit of the model to the data. These statistics indicate that the hypothesized model is parsimonious and has an acceptable level of fit.

Table 17 - Estimation Results

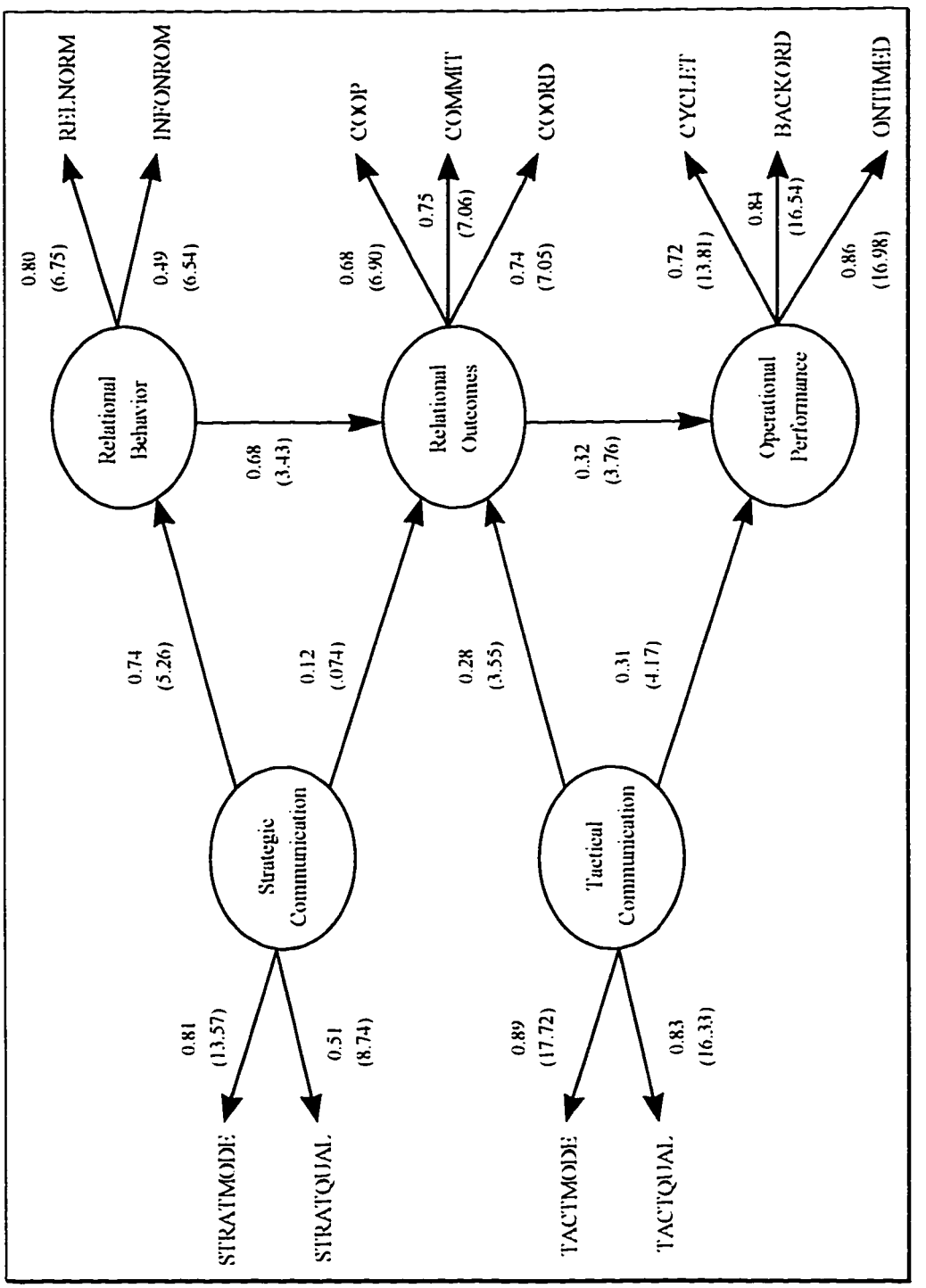
	Base Model Std. Coeff. (t-value)	**Full Model** Std. Coeff. (t-value)	**Revised Model** Std. Coeff. (t-value)
Construct Indicators:			
RBehavior (η_1) →			
RELNORM (y_1)	0.87 (11.84)	0.80 (6.75)	0.80 (8.30)
INFONORM (y_2)	0.45 (7.52)	0.49 (6.54)	0.49 (6.91)
ROutcomes (η_2) →			
COOP (y_3)	0.68 (7.71)	0.68 (6.90)	0.68 (7.83)
COMMIT (y_4)	0.76 (8.01)	0.75 (7.06)	0.75 (8.07)
COORD (y_5)	0.74 (7.94)	0.74 (7.05)	0.74 (8.05)
OpPerf (η_3) →			
CYCLET (y_6)	0.72 (13.89)	0.72 (13.81)	0.72 (13081)
BACKORD (y_7)	0.84 (16.50)	0.84 (16.54)	0.84 (16.54)
ONTIMED (y_8)	0.86 (16.82)	0.86 (16.98)	0.86 (16.98)
StrtComm (ξ_1) →			
RELMODE (x_1)		0.81 (13.57)	0.81 (13.60)
RELQUAL (x_2)		0.51 (8.74)	0.51 (8.74)
TactComm (ξ_2) →			
OPMODE (x_3)		0.89 (17.72)	0.89 (17.72)
OPQUAL (x_4)		0.83 (16.33)	0.83 (16.33)
Structural Paths:			
RBehavior (η_1) → ROutcomes (η_2)	0.76 (5.27)	0.68 (3.43)	0.69 (5.40)
ROutcomes (η_2) → OpPerf (η_3)	0.50 (5.78)	0.32 (3.76)	0.32 (3.90)
StrtComm (ξ_1) → RBehavior (η_1)		0.74 (5.26)	0.74 (6.02)
StrtComm (ξ_1) → ROutcomes (η_2)		0.012 (0.074)	--
TactComm (ξ_2) → ROutcomes (η_2)		0.28 (3.55)	0.29 (4.36)
TactComm (ξ_2) → OpPerf (η_3)		0.31 (4.17)	0.31 (4.17)
Model Fit Indicators:			
Chi-Square	39.37	83.29	83.29
Degrees of Freedom	18	47	48
Probability	P = 0.0025	P = 0.00087	P = 0.0012
Root Mean Square Residual	0.040	0.037	0.037
Goodness of Fit Index (GFI)	0.97	0.96	0.96
Adjusted GFI (AGFI)	0.94	0.93	0.93
Chi-Square / Degrees of Freedom	2.19	1.77	1.74

The statistical results from the estimation of the full model are summarized in Table 17 and Figure 8. The measurement coefficients for the five constructs are all significant and, with the exception of the path from strategic communication to relational outcomes, the structural paths are also significant. The estimated coefficients and t-values for the structural paths provide tests for hypotheses 1 - 4.

The relational orientation hypotheses (H1, H2) predict that behavioral norms would be positively associated with relational outcomes, and relational outcomes would be positively associated with operational performance. These hypotheses are supported by the data (H1: Std. Coeff. = 0.68, t-value = 3.43; H2: Std. Coeff. = 0.32, t-value = 3.76). When channel managers adopt bilateral expectations about relationships, joint effort toward cooperative and coordinated effort increases, resulting in increased operational performance.

Hypothesis H3 predicts that strategic communication, defined as synchronous communication of long-term, strategically sensitive information, would be positively associated with relational behavior (H3a) and relational outcomes (H3b). Hypothesis H3a (Std. Coeff. = 0.74, t-value = 5.26) is supported, however, the model finds no support for H3b (Std. Coeff. = 0.12, t-value = 0.074). This suggests that channel managers rely on strategic communication for the development and maintenance of the interorganizational relationship, however strategic communication, enabled by direct forms of technology, may not directly affect the cooperation and coordination of channel activity.

Figure 8 - Full Model Estimation Results



Hypothesis H4 predicts that tactical communication, defined as asynchronous communication necessary for the efficiency and effectiveness of business operations, would be positively associated with relational outcomes (H4a) and operational performance (H4b). Hypothesis H4a (Std. Coeff. = 0.28, t-value = 3.55) and hypothesis H4b (Std. Coeff. = 0.28, t-value = 4.17) are both supported. Channel managers utilize tactical communication to facilitate coordination efforts to improve logistics performance.

The revised model eliminates any paths that were insignificant in the previous model, and adds any additional paths that may be supported by theory. Because the modification indices suggest no changes to the structural model that could be supported by theory, the revised model differs from the previous model only in the elimination of the path between strategic communication and relational outcomes.

Similar to the two previous models, the revised model demonstrates an adequate fit to the data and continues to support the remaining hypotheses. Chi-Square is 83.29 and the fit indices (Table 17) show an acceptable fit. The coefficients and t-values for the revised model are presented in Figure 9.

Figure 9 - Revised Model Estimation Results

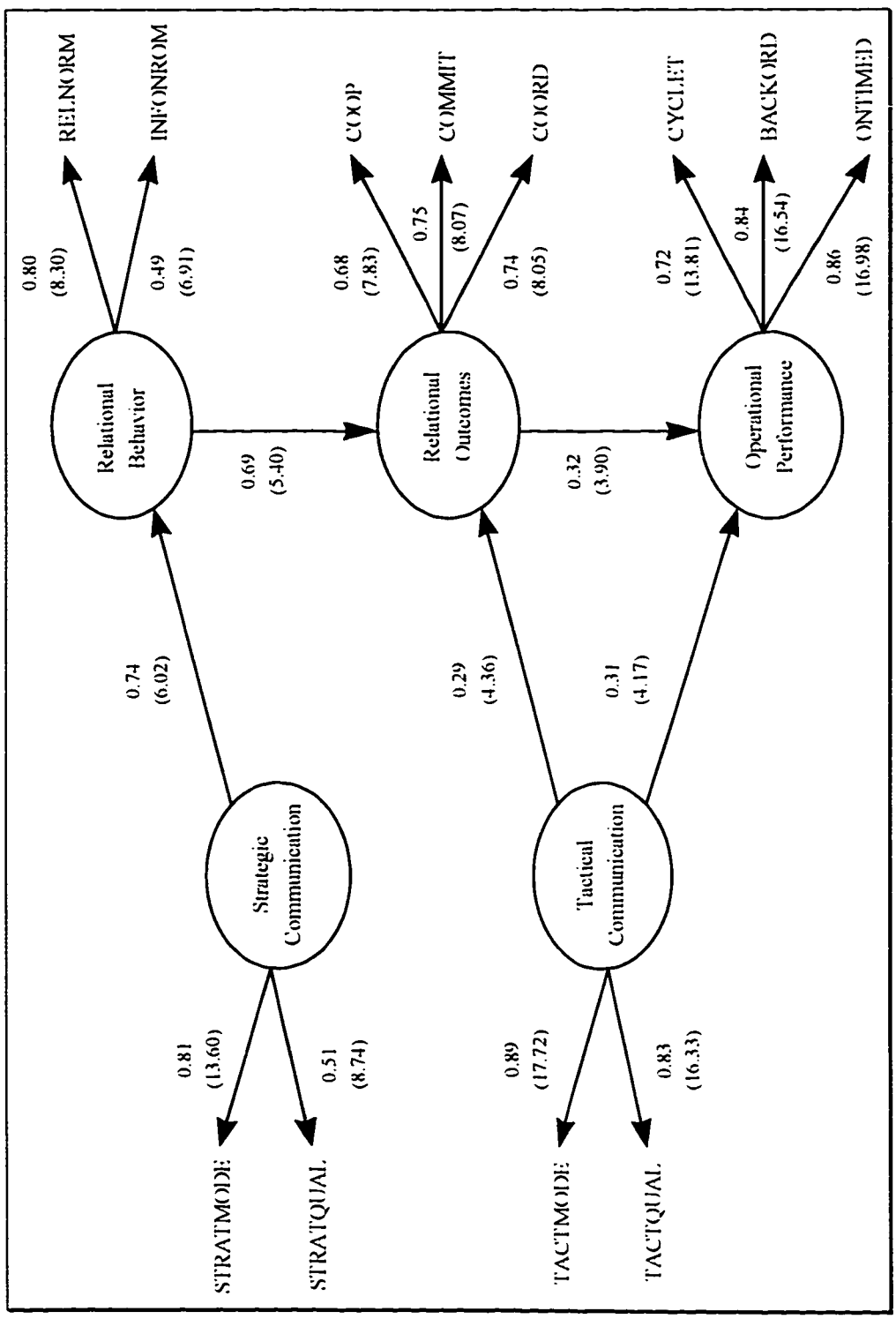


Table 18 - Summary of Hypotheses Tests

H_1	Relational behavior has a positive effect on relational outcomes	Supported
H_2	Relational outcomes have a positive effect on operational performance	Supported
H_{3a}	Strategic communication has a positive effect on relational behavior	Supported
H_{3b}	Strategic communication has a positive effect on relational outcomes	Not Supported
H_{4a}	Tactical communication has a positive effect on relational, outcomes	Supported
H_{4b}	Tactical communication has a positive effect on operational performance	Supported

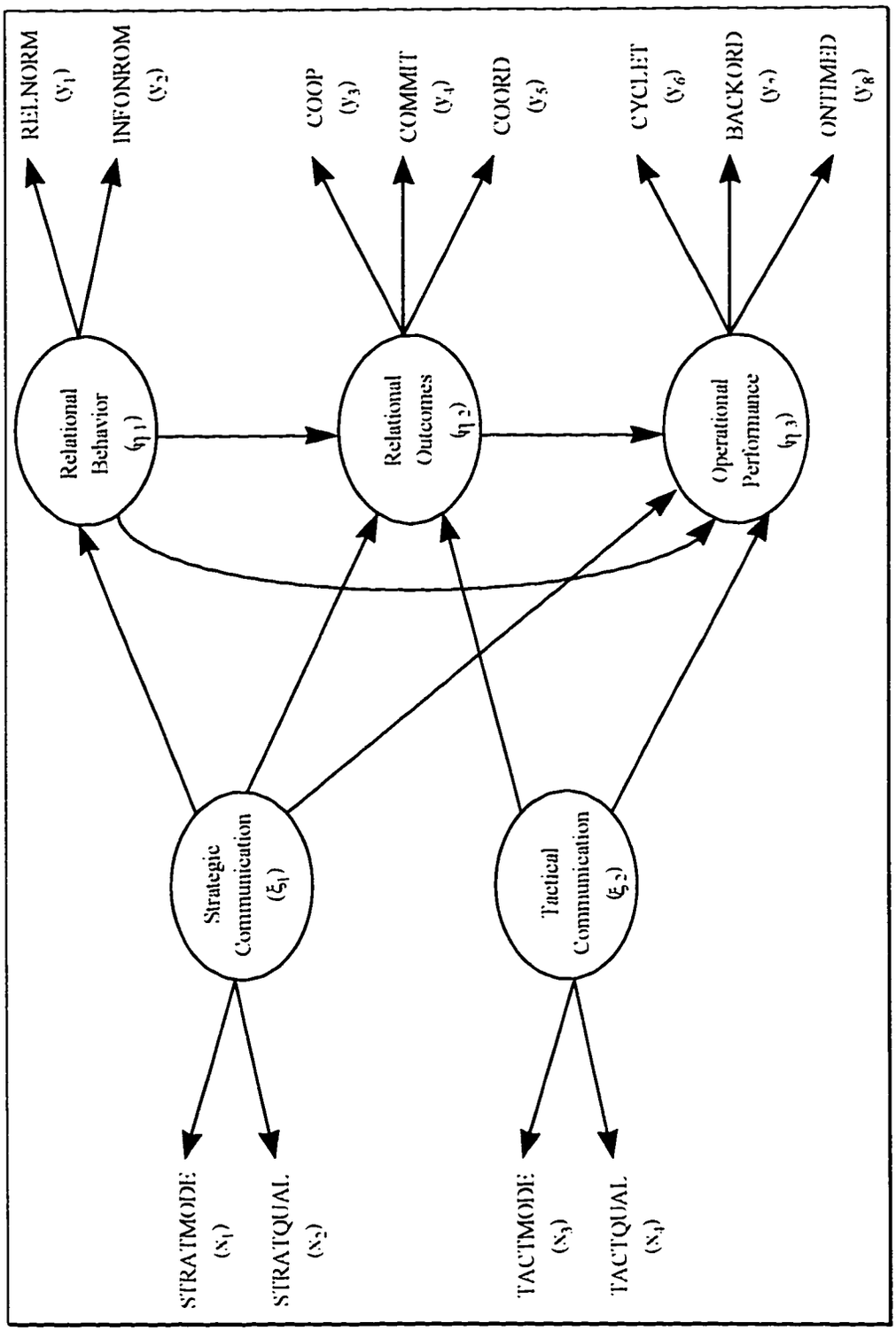
Competing Model

An emerging consensus in structural equation modeling is that researchers should compare competing models, not just test the proposed model (Bollen and Long, 1992). Although the modification indices produced by Lisrel VIII (Joreskog and Sorbom, 1993) did not suggest the addition/deletion of any structural paths to improve the fit of the model to the data, alternate structural paths are considered to form a competing model.

Lusch and Brown (1996) hypothesized that channel performance is directly influenced by relational behavior. Lusch and Brown argue that greater flexibility among channel firms enables them to adapt more quickly to environmental change. The quicker they can respond to these changes, the greater will be the performance. Similarly, if channel members behave toward each other with solidarity, the pooling of talent, skills, and financial resources should result in increased performance. The full model (Figure 7) does not include this path, but hypothesizes an indirect effect of relational behavior on operational performance through the construct of relational outcomes. For the development of a competing model, a direct path from relational behavior to operational performance is included in addition to the already existing indirect path through relational outcomes.

There is weak evidence that strategic communication can also have a direct effect on channel performance. Fulk and DeSanctis (1995) argue that emerging forms of technology (e.g., voice mail and LAN) in flatter organizations is enabling the direct communication of strategic information throughout the organization. Nohria and Berkley (1994) describe the emerging "matrix organizations" where (1) electronic files replace material files, (2) networking across firms creates ambiguous external boundaries, and (3) face-to-face communication by senior management maintains organizational cohesion. The direct communication of higher level information is postulated to have a direct effect on organizational and interorganizational performance. To test this hypothesis, a direct path has is added in the competing

Figure 10 - Competing Model



model between the constructs of strategic communication and operational performance. Figure 10 presents the proposed competing model.

The fit characteristics of the competing model are not dissimilar to the characteristics of the full model (Table 19). The competing model displays an adequate fit to the data. Chi-Square = 82.68, Chi-Square/d.f < 2, and the Goodness-of-Fit Indicators (GFI = 0.96; AGFI = 0.93; RMSR = 0.037) are unchanged from the full model. Three structural paths, however, are not statistically significant. Similar to previous results,

Table 19 - Competing Model Estimation Results

	Full Model Std. Coeff. (t-value)	**Competing Model** Std. Coeff. (t-value)
Structural Paths:		
RBehavior (η_1) → ROutcomes (η_2)	0.68 (3.43)	0.68 (3.41)
ROutcomes (η_2) → OpPerf (η_3)	0.32 (3.76)	0.44 (2.56)
StrtComm (ξ_1) → RBehavior (η_1)	0.74 (5.26)	0.74 (5.27)
StrtComm (ξ_1) → ROutcomes (η_2)	0.012 (0.074)	0.017 (0.11)
StrtComm (ξ_1) → OpPerf (η_3)		0.016 (0.12)
RBehavior (η_1) → OpPerf (η_3)		-0.13 (-0.64)
TactComm (ξ_2) → ROutcomes (η_2)	0.28 (3.55)	0.28 (3.51)
TactComm (ξ_2) → OpPerf (η_3)	0.31 (4.17)	0.29 (3.18)
Model Fit Indicators:		
Chi-Square	83.29	82.68
Degrees of Freedom	47	45
Probability	P = 0.00087	P = 0.00052
Root Mean Square Residual	0.037	0.037
Goodness of Fit Index (GFI)	0.96	0.96
Adjusted GFI (AGFI)	0.93	0.93
Chi-Square / Degrees of Freedom	1.77	1.84

the path from strategic communication to relational outcomes remains unsupported. In addition, the two paths added to form the competing model are also not significant. The model finds no support for the theory that strategic communication and/or relational behavior directly affects operational performance. This result suggests that the revised model (Figure 9), formed by deleting the three non-significant paths, remains the best fit to the data.

Conclusion

The purpose of this chapter was to present results of testing of hypotheses 1 - 4. Through structural equation modeling, support was found for all hypothesized construct relationships, with the exception of the effect of strategic communication on relational outcomes. However, the direct effect of tactical communication, and the indirect effect of strategic communication through relational behavior, had significant links to relational outcomes. A summary of conclusions for hypotheses 1 - 4 are presented in Table 18.

CHAPTER VI

Implications of the Research

Introduction

The central theme of this dissertation has been the role of information and technology on relational behavior and operational performance in marketing channels. Strategic information, enabled by synchronous modes of communication, reinforces the formation and maintenance of relational behavior. Reliable and timely tactical information, facilitated by asynchronous forms of technology, is associated with cooperative behavior and has a positive impact on operational performance.

This final chapter is organized as follows. The next two sections describe the contributions of this dissertation to marketing theory and practice. The final section discusses limitations of the study and suggestions for future research.

Contributions To Marketing Theory

In contrast to the channels research that has focused solely on the process of communication, this dissertation has addressed the research gaps identified by Achabal and McIntyre (1987) and Weitz and Jap (1995). It has focused on the enabler of communication in relationship marketing – technology. Since the first call for research on the behavioral and economic impact of adopting interorganizational information technology in distribution channels (Achabal and McIntyre, 1987), research in marketing has been limited to: the development of theoretical frameworks to position information technology in marketing channels (e.g., Larson and Lusch, 1990); characteristics of early adopters of information technology (e.g., Levin, Levin, and Meisel, 1992; O'Callaghan, Kaufmann, and Konsynski, 1992); and empirical analyses of the correlation between the rate of technology diffusion and industry performance (e.g., Larson and Sijbrands, 1991).

This dissertation makes at least three distinct and important contributions to the understanding of the effects of information and technology in relationship marketing:

1. Development and testing of a theoretical model to explain the effect of information technology on the structure of relational exchange in marketing channels.

2. Separation of information and technology into two distinct dimensions of interorganizational communication.
3. Separation of the construct of interorganizational communication into strategic and tactical.

This dissertation contributes to marketing knowledge by developing a classification system for interfirm communication modality. By examining the communication dimensions of richness and the ability of a technology to facilitate information exchange, technologies were classified into three groups: (1) direct contact technologies (e.g., face-to-face, telephone); (2) mechanically enabling technologies (e.g., mail, fax); and (3) electronic enabling technologies (e.g., e-mail/Internet, EDI). Differences among the categories are determined by levels of richness, synchrony, and capacity.

It was determined that the choice of communication mode was conditional on strategic vs. tactical needs for information. Rich communication modes, like face-to-face and telephone, are necessary for individuals required to work on complex, non-routine problems, including negotiation and long-term strategic planning. This dissertation found that channel managers prefer to use direct forms of technology to convey strategic information, and less direct forms for the communication of tactical information.

This dissertation also contributes to marketing knowledge by examining issues of communication that extend beyond the physical aspects of technology and focusing on the output of technology – the information itself – as a variable of importance in marketing relationships. Traditional attempts at measuring the value of information have been inherently problematic as the construct is context-dependent and multi-dimensional (Glazer 1991).

This dissertation addresses this issue by developing and testing a scale of six information attributes determined by industry professionals to be important in buyer/supplier relationships. The empirical analysis resulted in two factors of information quality: (1) strategic attributes that describe the long-term, strategic, and competitive sensitivity of information, and (2) tactical attributes data must be timely, accurate, and formatted. Correlated with the modes of technology that enable the information flow, these attributes are associated with the efficiency and effectiveness of communication and exchange.

The third contribution of this dissertation is the development and testing of a model of communication in the context of a relational orientation in marketing channels. This dissertation establishes the role of information sharing norms in the communication process. The construct of communication is conceptually different from the relational norm of information sharing (Heide and John, 1992; Noordewier, John, and Nevin 1990). Norms refer to generalized expectations or shared beliefs about appropriate behaviors in the relationship. Strategic communication describes the

process that facilitates the development of relational behavior and relational outcomes. Tactical communication is less associated with relational information sharing norms, and is shown to have a joint influence with relational behavior on the cooperation and coordination of exchange activities, resulting in increased operational performance.

Contributions To Marketing And Logistics Practice

This dissertation also contributes to practice. The channels trade press contains numerous articles reporting productivity benefits that are the direct result of adopting interorganizational telecommunications technology such as e-mail, internet, and EDI. The problems with claims of improved performance reported in the trade press are: (1) they are anecdotes of individual cases, (2) they focus solely on the adoption of technology, and (3) they often ignore the cooperative relationship necessary for the flow of information enabled by technology. This dissertation provides practitioners with a framework to consider information and technology in the development and maintenance of channel relationships.

Improving the efficiency and effectiveness of exchange is the traditional domain of interorganizational technology systems. Technology applications can affect performance by impacting strategic and tactical processes. As discussed by Stern and Kaufmann (1985), the direct efficiencies resulting from the adoption of telecommunication technology include: "(1) reduced order lead time; (2) higher

service levels; (3) fewer out-of-stock situations; (4) improved communication about deals promotions, price changes, and product availability; (5) lower inventory cost; (6) better accuracy in ordering, shipping, and receiving; and (7) a reduction in labor costs."

Information technology, in the form of telephone, fax, Internet and EDI, is needed to capture and exchange real-time information on product flows in a distribution channel. However, technology is most powerful amidst cooperative relations. "Both information technology and interorganizational cooperation represent necessary conditions for effective productivity improvement. The power of the data is not realized unless buyers and suppliers are willing to work toward improved performance in a spirit of cooperation" (Larson and Sijbrands, 1991).

Marketing practitioners benefit from the understanding that communication has direct effects on the development of relational norms of behavior, the coordination and cooperation of functional areas, and on operational outcomes. While tactical communication may facilitate operational performance, joint productivity improvements also require "low-tech" forms of technology (e.g., face-to-face) for the establishment and maintenance of relational behavior.

Limitations and Future Research

Limitations on the generalizability of the results must be recognized. The hypotheses were tested with a sample of Purchasing Management Association of Canada (PMAC) members. PMAC is dominated by manufacturing firms in eastern Canada. To generalize the results, further research is required by testing the hypotheses with other respondent groups, such as: logistics managers (buyers of logistics services), buyers in other countries, retail buyers, etc.

A second limitation is related to the sample characteristics. Although the survey addressed issues of interest to marketing, logistics, and purchasing managers, the final survey instrument was sent only to purchasing managers. Gathering similar information from suppliers (marketing) would yield bilateral perceptions of channel relationships. Further research, with data from both sides of the buyer/supplier relationship, would provide greater insight into the synchronous aspects of communication and assist in generalizing the results.

A third limitation of this dissertation is the cross-sectional nature of the research design. Even though the methodology used structural equation modeling, the interpretation of causality between constructs should be treated with caution. The direction of causality may be dependent upon whether the dyad is in the development as opposed to the maintenance stage of the relationship. Further research utilizing longitudinal data is important to understanding causality in long-term relationships.

A fourth limitation of the research pertains to the lack of direct applicability to purchasing and logistics managers. The results of this study include empirical support for key relationships centered around communication and relational orientation. However, these findings do not provide channel managers with direction on how to use information and technology to enhance the strength of the relationship or improve performance. Additional research is required to supplement the theory with "how to" specifics for managers.

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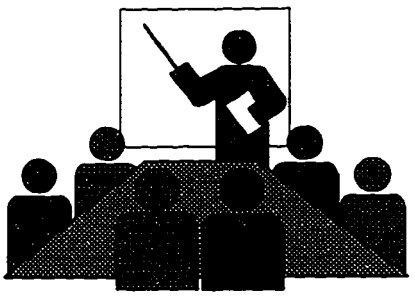
Appendix A - Survey Instrument

The University of Alberta
Faculty of Business



Survey on
Information Technology and Relational Orientation in Marketing Channels

This survey is part of a research project conducted by the Faculty of Business at the University of Alberta and is designed to study the impact of information technology and interorganizational relationships on the structure and performance of supply chains. Your participation in this project will contribute greatly to knowledge about buyer/supplier relationships in Canada.

Your responses to this survey are strictly confidential. Please answer all questions and return the questionnaire in the envelope provided. If you would like to receive a copy of the survey results, please include your name and address or attach a business card.

The surveys are numbered for tracking purposes only and will not be analyzed on an individual basis. If you have any questions about this survey, please call Jack Kulchitsky at the University of Alberta: (403) 492-5367.

Thank you very much for your participation.

To answer the questions in this survey, please think of an *item* (referred to as Item X below) you have recently purchased from a *supplier* (referred to as Supplier A below), which meets the following conditions:

1. *Item X* is frequently purchased for use or distribution, and delivered in lots.
2. The purchase is a rebuy, meaning that *Item X* is not new to your firm.
3. *Supplier A* is the preferred supplier, but not the only possible supplier of *Item X*. You may be single sourcing with *Supplier A*, but alternate sources are available.

I. In the space below please provide a brief description of ***Item X*** and answer the following questions. Give estimates if you are not sure about exact values.

Description of *Item X*: _____

_____

Total units of *Item X* purchased per year: _____ Units

Standard incoming lot size for shipments of *Item X*: _____ Units

Incoming inspection: _____none _____sampling ____100% inspection

Total number of suppliers that can provide *Item X* to you: _____

II. Please answer the following questions about ***Supplier A***. Give estimates if you are not sure about exact values.

Percent of *Item X* usage supplied by *Supplier A*: _____ %

Time length of current contract with *Supplier A*: _____ months/years

Is *Supplier A* a "certified" vendor? _____Yes _____No

Is *Supplier A* ISO9000 registered? _____Yes _____No

How long has your firm conducted business with *Supplier A*? _____

3.

III. In this section please indicate how strongly you agree or disagree that the **relationship** between your company and *Supplier A* is characterized by the phrases listed below:

	Strongly Disagree		Disagree	Agree		Strongly Agree
1. My firm usually gets at least a fair share of the benefit from this relationship ----------	1	2	3	4	5	6
2. We are apt to rework prior agreements with *Supplier A* when unforeseen supply or market disturbances arise ----------	1	2	3	4	5	6
3. The relationship with *Supplier A* is expected to last a long time ----------	1	2	3	4	5	6
4. The benefits of the relationship balance out over time between my firm and *Supplier A* ----------	1	2	3	4	5	6
5. *Supplier A* is considered to be more than "just another supplier" ----------	1	2	3	4	5	6
6. The continuation of a relationship with *Supplier A* is important to my firm ----------	1	2	3	4	5	6
7. My firm is committed to the preservation of good working relationships with *Supplier A* ----------	1	2	3	4	5	6
8. Our benefits from this relationship are proportional to our level of input on cooperative efforts with *Supplier A* ----------	1	2	3	4	5	6
9. My firm will make adjustments to contracts with *Supplier A* in the face of problems ----	1	2	3	4	5	6
10. Flexibility in response to changes is a characteristic of this relationship ----------	1	2	3	4	5	6
11. A very high level of trust exists between the two organizations ----------	1	2	3	4	5	6

IV. Listed below are several technologies. Using the scale provided, please indicate the degree to which these **technologies** are currently implemented in your firm:

	No Plans To Deploy	Planning Stage	Initial Deployment		Partially Deployed		Fully Deployed
1. Barcoding	N	P	1	2	3	4	5
2. Optical scanning	N	P	1	2	3	4	5
3. Local Area Network	N	P	1	2	3	4	5
4. Handheld data entry devices	N	P	1	2	3	4	5
5. EDI	N	P	1	2	3	4	5
6. Electronic Mail	N	P	1	2	3	4	5
7. Internet	N	P	1	2	3	4	5
8. Fax	N	P	1	2	3	4	5
9. Voice Mail	N	P	1	2	3	4	5
10. ISDN	N	P	1	2	3	4	5
11. Interorganizational Data Links (E.g. T1)	N	P	1	2	3	4	5
12. Voice/Data PBX	N	P	1	2	3	4	5
13. 1-800/WATS	N	P	1	2	3	4	5
14. Computerized Inventory Management	N	P	1	2	3	4	5
15._____	N	P	1	2	3	4	5

5.

Strategic communication supports or shapes competitive advantage and may include information such as new market/product plans, long term forecasts, and financial indicators. **Tactical communication** involves day to day operations and may include information on sales, purchase orders, and delivery notices.

V. With respect to purchases of *Item X* from *Supplier A*, what percentage of strategic and tactical **communication** can be described as occurring using the following media:

Strategic:	Tactical:
_____Face to face contact	_____Face to face contact
_____Telephone (voice)	_____Telephone (voice)
_____Mail / Courier	_____Mail / Courier
_____Fax	_____Fax
_____Electronic-Mail / Internet	_____Electronic-Mail / Internet
_____EDI (computer to computer link)	_____EDI (computer to computer link)
100%	100%

VI. Please indicate how strongly you agree or disagree that the characteristics of **information exchanged** with *Supplier A* are described by the phrases listed below:

	Strongly Disagree		Disagree	Agree		Strongly Agree
1. Strategic / Long term orientation ----------	1	2	3	4	5	6
2. Timely ----------	1	2	3	4	5	6
3. Readily available ----------	1	2	3	4	5	6
4. Formatted to facilitate use ----------	1	2	3	4	5	6
5. Accurate / Reliable ----------	1	2	3	4	5	6
6. Confidential / Sensitive ----------	1	2	3	4	5	6
7. Complete and sufficient ----------	1	2	3	4	5	6

6.

VII. In this section please indicate how strongly you agree or disagree that the **information** exchanged between your company and *Supplier A* is characterized by the phrases listed below:

	Strongly Disagree		Disagree	Agree		Strongly Agree
1. Exchange of information with *Supplier A* concentrates more on strategic, long term issues, rather than specific courses of action our business should take. ----------	1	2	3	4	5	6
2. Exchange of information attempts to change our perspective by looking at how our business decisions affect the big picture. ----------	1	2	3	4	5	6
3. *Supplier A* communicates as quickly as possible any unexpected problems with such things such as lead times, delivery schedules, or product quality.----------	1	2	3	4	5	6
4. In this relationship it is expected that any information that may help the other party will be provided to them. ----------	1	2	3	4	5	6
5. Exchange of information with *Supplier A* takes place frequently.----------	1	2	3	4	5	6
6. It is expected that we keep each other informed about events or changes that may affect the other party. ----------	1	2	3	4	5	6
7. Exchange of information with *Supplier A* takes place bi-laterally.----------	1	2	3	4	5	6
8. We readily provide *Supplier A* with long range forecasts of supply requirements ----	1	2	3	4	5	6
9. We readily exchange information with *Supplier A* on product changes, and market trends ----------	1	2	3	4	5	6

VIII. Listed below are 14 pairs of attributes that describe the nature of exchange relationships. Using the scale provided, please describe the **nature** of your firm's relationship with *Supplier A* by selecting a number between each of the two extreme opposites:

1. Rivals	-3	-2	-1	0	1	2	3	Allies
2. Doubt	-3	-2	-1	0	1	2	3	Trust
3. Conflict	-3	-2	-1	0	1	2	3	Cooperation
4. Unequal Power	-3	-2	-1	0	1	2	3	Equal Power
5. Adversarial	-3	-2	-1	0	1	2	3	Friendly
6. Relationship Dissatisfaction	-3	-2	-1	0	1	2	3	Relationship Satisfaction
7. High Risk	-3	-2	-1	0	1	2	3	Low Risk
8. Propensity to Dissolve Relationship	-3	-2	-1	0	1	2	3	Propensity to Maintain Relationship
9. Casual	-3	-2	-1	0	1	2	3	Committed
10. Focus on Individual Firm Sales/Profit	-3	-2	-1	0	1	2	3	Focus on Alliance Sales/Profit
11. Low Coordination of Effort	-3	-2	-1	0	1	2	3	High Coordination of Effort
12. Individual Goals	-3	-2	-1	0	1	2	3	Mutual Goals
13. High Environmental Uncertainty	-3	-2	-1	0	1	2	3	Low Environmental Uncertainty
14. Discord	-3	-2	-1	0	1	2	3	Harmony

IX. In this section compare the **performance** of *Supplier A* to the average performance of *All Suppliers* in your industry (Circle N/A if not applicable):

		A is Much Worse		A is Average		A is Much Better
1. Meeting Specifications	N/A	1	2	3	4	5
2. Stockouts	N/A	1	2	3	4	5
3. Order Processing	N/A	1	2	3	4	5
4. Shipping Errors	N/A	1	2	3	4	5
5. Cycle Time	N/A	1	2	3	4	5
6. Backorders	N/A	1	2	3	4	5
7. On-Time delivery	N/A	1	2	3	4	5
8. Loss and Damage In-transit	N/A	1	2	3	4	5

X. In this section please answer the following questions about **your organization**:

1. On average, what is the annual inventory turnover of *Item X* bought from *Supplier A*? _____Turns

2. On average, what percentage of deliveries of *Item X*, ordered from *Supplier A*, arrive late? _____%

3. What percentage of *Item X* delivered by *Supplier A* are defective, not up to specifications, or otherwise unacceptable? _____%

4. What were the annual gross dollar sales of your business during the most recent fiscal year? $_____

5. How many people are currently employed at your facility? _____

Thank you very much for participating in this survey.

Appendix B - Exploratory Factor Analysis

---------- FACTOR ANALYSIS ----------

Analysis number 1 Listwise deletion of cases with missing values

Extraction 1 for analysis 1, Principal Components Analysis (PC)

Initial Statistics:

Variable	Communality	*	Factor	Eigenvalue	Pct of Var	Cum Pct
SOL1	1.00000	*	1	2.20547	73.5	73.5
SOL2	1.00000	*	2	.47547	15.8	89.4
SOL3	1.00000	*	3	.31906	10.6	100.0

PC extracted 1 factors.

Factor Matrix:

	Factor 1
SOL1	.82339
SOL2	.88796
SOL3	.85967

Final Statistics:

Variable	Communality	*	Factor	Eigenvalue	Pct of Var	Cum Pct
SOL1	.67797	*	1	2.20547	73.5	73.5
SOL2	.78847	*				
SOL3	.73903	*				

---------- FACTOR ANALYSIS ----------

OBLIMIN rotation 1 for extraction 1 in analysis 1 - Kaiser Normalization.

>Warning # 11310
>Only one factor was extracted. The solution cannot be rotated.

RELIABILITY ANALYSIS - SCALE (ALPHA)

Reliability Coefficients

N of Cases = 299.0 N of Items = 3

Alpha = .8186

SOL1

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
	1.00	1	.3	.3	.3
	2.00	5	1.7	1.7	2.0
	3.00	21	7.0	7.0	9.0
	4.00	74	24.6	24.7	33.7
	5.00	99	32.9	33.0	66.7
	6.00	100	33.2	33.3	100.0
	9.00	1	.3	Missing	
	Total	301	100.0	100.0	

Mean 4.883 Std dev 1.026 Variance 1.053

Valid cases 300 Missing cases 1

SOL2

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
	1.00	3	1.0	1.0	1.0
	2.00	3	1.0	1.0	2.0
	3.00	17	5.6	5.7	7.7
	4.00	82	27.2	27.4	35.1
	5.00	110	36.5	36.8	71.9
	6.00	84	27.9	28.1	100.0
	9.00	2	.7	Missing	
	Total	301	100.0	100.0	

Mean 4.823 Std dev 1.003 Variance 1.005

Valid cases 299 Missing cases 2

SOL3

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
	1.00	1	.3	.3	.3
	2.00	3	1.0	1.0	1.3
	3.00	16	5.3	5.3	6.7
	4.00	71	23.6	23.7	30.3
	5.00	112	37.2	37.3	67.7
	6.00	97	32.2	32.3	100.0
	9.00	1	.3	Missing	
	Total	301	100.0	100.0	

Mean 4.937 Std dev .957 Variance .916

Valid cases 300 Missing cases 1

---------- FACTOR ANALYSIS ----------

Analysis number 1 Listwise deletion of cases with missing values

Extraction 1 for analysis 1, Principal Components Analysis (PC)

Initial Statistics:

Variable	Communality	*	Factor	Eigenvalue	Pct of Var	Cum Pct
		*				
FLEX1	1.00000	*	1	1.92128	64.0	64.0
FLEX2	1.00000	*	2	.68894	23.0	87.0
FLEX3	1.00000	*	3	.38978	13.0	100.0

PC extracted 1 factors.

Factor Matrix:

	Factor 1
FLEX1	.71810
FLEX2	.86954
FLEX3	.80593

Final Statistics:

Variable	Communality	*	Factor	Eigenvalue	Pct of Var	Cum Pct
		*				
FLEX1	.51567	*	1	1.92128	64.0	64.0
FLEX2	.75610	*				
FLEX3	.64952	*				

---------- FACTOR ANALYSIS ----------

OBLIMIN rotation 1 for extraction 1 in analysis 1 - Kaiser Normalization.

>Warning # 11310
>Only one factor was extracted. The solution cannot be rotated.

RELIABILITY ANALYSIS - SCALE (ALPHA)

Reliability Coefficients

N of Cases = 290.0 N of Items = 3

Alpha = .7081

FLEX1

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
	1.00	10	3.3	3.4	3.4
	2.00	15	5.0	5.1	8.4
	3.00	30	10.0	10.1	18.6
	4.00	121	40.2	40.9	59.5
	5.00	70	23.3	23.6	83.1
	6.00	50	16.6	16.9	100.0
	9.00	5	1.7	Missing	
	Total	301	100.0	100.0	

Mean 4.270 Std dev 1.205 Variance 1.452

Valid cases 296 Missing cases 5

--

FLEX2

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
	1.00	4	1.3	1.4	1.4
	2.00	14	4.7	4.7	6.1
	3.00	39	13.0	13.2	19.3
	4.00	111	36.9	37.6	56.9
	5.00	96	31.9	32.5	89.5
	6.00	31	10.3	10.5	100.0
	9.00	6	2.0	Missing	
	Total	301	100.0	100.0	

Mean 4.268 Std dev 1.059 Variance 1.122

Valid cases 295 Missing cases 6

FLEX3

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
	1.00	4	1.3	1.3	1.3
	2.00	6	2.0	2.0	3.4
	3.00	24	8.0	8.1	11.4
	4.00	93	30.9	31.2	42.6
	5.00	115	38.2	38.6	81.2
	6.00	56	18.6	18.8	100.0
	9.00	3	1.0	Missing	
	Total	301	100.0	100.0	

Mean 4.601 Std dev 1.031 Variance 1.062

Valid cases 298 Missing cases 3

---------- FACTOR ANALYSIS ----------

Analysis number 1 Listwise deletion of cases with missing values

Extraction 1 for analysis 1, Principal Components Analysis (PC)

Initial Statistics:

Variable	Communality	*	Factor	Eigenvalue	Pct of Var	Cum Pct
		*				
INFEX1	1.00000	*	1	2.67349	66.8	66.8
INFEX2	1.00000	*	2	.58704	14.7	81.5
INFEX3	1.00000	*	3	.43855	11.0	92.5
INFEX4	1.00000	*	4	.30093	7.5	100.0

PC extracted 1 factors.

Factor Matrix:

	Factor 1
INFEX1	.73092
INFEX2	.84942
INFEX3	.81294
INFEX4	.86997

Final Statistics:

Variable	Communality	*	Factor	Eigenvalue	Pct of Var	Cum Pct
		*				
INFEX1	.53424	*	1	2.67349	66.8	66.8
INFEX2	.72152	*				
INFEX3	.66088	*				
INFEX4	.75685	*				

---------- FACTOR ANALYSIS ----------

OBLIMIN rotation 1 for extraction 1 in analysis 1 - Kaiser Normalization.

>Warning # 11310
>Only one factor was extracted. The solution cannot be rotated.

RELIABILITY ANALYSIS - SCALE (ALPHA)

Reliability Coefficients

N of Cases = 301.0 N of Items = 4

Alpha = .8286

INFEX1

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
	1.00	3	1.0	1.0	1.0
	2.00	11	3.7	3.7	4.7
	3.00	33	11.0	11.0	15.6
	4.00	92	30.6	30.6	46.2
	5.00	106	35.2	35.2	81.4
	6.00	56	18.6	18.6	100.0
	Total	301	100.0	100.0	

Mean 4.512 Std dev 1.088 Variance 1.184

Valid cases 301 Missing cases 0

INFEX2

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
	1.00	1	.3	.3	.3
	2.00	4	1.3	1.3	1.7
	3.00	11	3.7	3.7	5.3
	4.00	90	29.9	29.9	35.2
	5.00	118	39.2	39.2	74.4
	6.00	77	25.6	25.6	100.0
	Total	301	100.0	100.0	

Mean 4.831 Std dev .921 Variance .848

Valid cases 301 Missing cases 0

INFEX3

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
	1.00	1	.3	.3	.3
	2.00	6	2.0	2.0	2.3
	3.00	29	9.6	9.6	12.0
	4.00	87	28.9	28.9	40.9
	5.00	115	38.2	38.2	79.1
	6.00	63	20.9	20.9	100.0
	Total	301	100.0	100.0	

Mean 4.654 Std dev 1.000 Variance 1.000

Valid cases 301 Missing cases 0

- -

INFEX4

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
	1.00	1	.3	.3	.3
	2.00	7	2.3	2.3	2.7
	3.00	12	4.0	4.0	6.6
	4.00	76	25.2	25.2	31.9
	5.00	120	39.9	39.9	71.8
	6.00	85	28.2	28.2	100.0
	Total	301	100.0	100.0	

Mean 4.867 Std dev .971 Variance .942

Valid cases 301 Missing cases 0

---------- FACTOR ANALYSIS ----------

Analysis number 1 Listwise deletion of cases with missing values

Extraction 1 for analysis 1, Principal Components Analysis (PC)

Initial Statistics:

Variable	Communality *	Factor	Eigenvalue	Pct of Var	Cum Pct
SOL1	1.00000 *	1	4.22497	42.2	42.2
SOL2	1.00000 *	2	1.52967	15.3	57.5
SOL3	1.00000 *	3	1.23438	12.3	69.9
FLEX1	1.00000 *	4	.62221	6.2	76.1
FLEX2	1.00000 *	5	.58146	5.8	81.9
FLEX3	1.00000 *	6	.47003	4.7	86.6
INFEX1	1.00000 *	7	.38650	3.9	90.5
INFEX2	1.00000 *	8	.37722	3.8	94.3
INFEX3	1.00000 *	9	.29943	3.0	97.3
INFEX4	1.00000 *	10	.27413	2.7	100.0

PC extracted 3 factors.

Factor Matrix:

	Factor 1	Factor 2	Factor 3
SOL1	.65983	.18781	-.49254
SOL2	.69571	.19161	-.51242
SOL3	.72905	-.00628	-.42494
FLEX1	.29212	.60052	.47782
FLEX2	.54114	.60390	.28695
FLEX3	.70300	.37456	.14424
INFEX1	.58851	-.34330	.29975
INFEX2	.68654	-.50403	.13670
INFEX3	.75458	-.23935	.15265
INFEX4	.71738	-.40354	.29215

---------- FACTOR ANALYSIS ----------

Final Statistics:

Variable	Communality *	Factor	Eigenvalue	Pct of Var	Cum Pct
SOL1	.71323 *	1	4.22497	42.2	42.2
SOL2	.78329 *	2	1.52967	15.3	57.5
SOL3	.71213 *	3	1.23438	12.3	69.9
FLEX1	.67427 *				
FLEX2	.73986 *				
FLEX3	.65530 *				
INFEX1	.55405 *				
INFEX2	.74408 *				
INFEX3	.64998 *				
INFEX4	.76283 *				

OBLIMIN rotation 1 for extraction 1 in analysis 1 - Kaiser Normalization.

OBLIMIN converged in 6 iterations.

Pattern Matrix:

	Factor 1	Factor 2	Factor 3
SOL1	-.05410	.03621	-.85597
SOL2	-.04815	.03703	-.89404
SOL3	.17370	-.06431	-.77157
FLEX1	-.02863	.85348	.16272
FLEX2	.00040	.80887	-.14704
FLEX3	.18798	.57906	-.30436
INFEX1	.76801	.05288	.09704
INFEX2	.85493	-.14973	-.06732
INFEX3	.69733	.09468	-.15628
INFEX4	.88294	.03317	.04262

Structure Matrix:

	Factor 1	Factor 2	Factor 3
SOL1	.31844	.25357	-.84265

---------- FACTOR ANALYSIS ----------

	Factor 1	Factor 2	Factor 3
SOL2	.34078	.26593	-.88347
SOL3	.48777	.18149	-.82828
FLEX1	.09340	.80344	-.05391
FLEX2	.24431	.84838	-.36407
FLEX3	.44736	.70280	-.53964
INFEX1	.73855	.19901	-.24411
INFEX2	.85003	.05996	-.39116
INFEX3	.78508	.29288	-.47854
INFEX4	.87223	.21965	-.34218

Factor Correlation Matrix:

	Factor 1	Factor 2	Factor 3
Factor 1	1.00000		
Factor 2	.22415	1.00000	
Factor 3	-.42574	-.26810	1.00000

---------- FACTOR ANALYSIS ----------

Analysis number 1 Listwise deletion of cases with missing values

Extraction 1 for analysis 1, Principal Components Analysis (PC)

Initial Statistics:

Variable	Communality	*	Factor	Eigenvalue	Pct of Var	Cum Pct
RQUAL1	1.00000	*	1	1.41723	70.9	70.9
RQUAL2	1.00000	*	2	.58277	29.1	100.0

PC extracted 1 factors.

Factor Matrix:

	Factor 1
RQUAL1	.84179
RQUAL2	.84179

Final Statistics:

Variable	Communality	*	Factor	Eigenvalue	Pct of Var	Cum Pct
RQUAL1	.70861	*	1	1.41723	70.9	70.9
RQUAL2	.70861	*				

---------- FACTOR ANALYSIS ----------

OBLIMIN rotation 1 for extraction 1 in analysis 1 - Kaiser Normalization.

>Warning # 11310
>Only one factor was extracted. The solution cannot be rotated.

RELIABILITY ANALYSIS - SCALE (ALPHA)

Reliability Coefficients

N of Cases = 296.0 N of Items = 2

Alpha = .6708

RQUAL1

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
	1.00	7	2.3	2.3	2.3
	2.00	13	4.3	4.4	6.7
	3.00	37	12.3	12.4	19.1
	4.00	128	42.5	43.0	62.1
	5.00	80	26.6	26.8	88.9
	6.00	33	11.0	11.1	100.0
	9.00	3	1.0	Missing	
	Total	301	100.0	100.0	

Mean 4.208 Std dev 1.087 Variance 1.182

Valid cases 298 Missing cases 3

RQUAL2

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
	1.00	1	.3	.3	.3
	2.00	15	5.0	5.1	5.4
	3.00	36	12.0	12.1	17.5
	4.00	102	33.9	34.3	51.9
	5.00	88	29.2	29.6	81.5
	6.00	55	18.3	18.5	100.0
	9.00	4	1.3	Missing	
	Total	301	100.0	100.0	

Mean 4.434 Std dev 1.098 Variance 1.206

Valid cases 297 Missing cases 4

---------- FACTOR ANALYSIS ----------

Analysis number 1 Listwise deletion of cases with missing values

Extraction 1 for analysis 1, Principal Components Analysis (PC)

Initial Statistics:

Variable	Communality	*	Factor	Eigenvalue	Pct of Var	Cum Pct
		*				
OPQUAL1	1.00000	*	1	2.81041	70.3	70.3
OPQUAL2	1.00000	*	2	.50535	12.6	82.9
OPQUAL3	1.00000	*	3	.42454	10.6	93.5
OPQUAL4	1.00000	*	4	.25970	6.5	100.0

PC extracted 1 factors.

Factor Matrix:

	Factor 1
OPQUAL1	.87199
OPQUAL2	.87100
OPQUAL3	.78265
OPQUAL4	.82393

Final Statistics:

Variable	Communality	*	Factor	Eigenvalue	Pct of Var	Cum Pct
		*				
OPQUAL1	.76037	*	1	2.81041	70.3	70.3
OPQUAL2	.75864	*				
OPQUAL3	.61254	*				
OPQUAL4	.67886	*				

---------- FACTOR ANALYSIS ----------

OBLIMIN rotation 1 for extraction 1 in analysis 1 - Kaiser Normalization.

>Warning # 11310
>Only one factor was extracted. The solution cannot be rotated.

RELIABILITY ANALYSIS - SCALE (ALPHA)

Reliability Coefficients

N of Cases = 295.0 N of Items = 4

Alpha = .8568

OPQUAL1

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
	2.00	3	1.0	1.0	1.0
	3.00	14	4.7	4.7	5.7
	4.00	120	39.9	40.3	46.0
	5.00	121	40.2	40.6	86.6
	6.00	40	13.3	13.4	100.0
	9.00	3	1.0	Missing	
	Total	301	100.0	100.0	

Mean 4.607 Std dev .815 Variance .664

Valid cases 298 Missing cases 3

OPQUAL2

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
	1.00	1	.3	.3	.3
	2.00	3	1.0	1.0	1.3
	3.00	24	8.0	8.0	9.4
	4.00	106	35.2	35.5	44.8
	5.00	119	39.5	39.8	84.6
	6.00	46	15.3	15.4	100.0
	9.00	2	.7	Missing	
	Total	301	100.0	100.0	

Mean 4.595 Std dev .901 Variance .812

Valid cases 299 Missing cases 2

OPQUAL3

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
	1.00	1	.3	.3	.3
	2.00	9	3.0	3.0	3.4
	3.00	25	8.3	8.4	11.8
	4.00	141	46.8	47.6	59.5
	5.00	92	30.6	31.1	90.5
	6.00	28	9.3	9.5	100.0
	9.00	5	1.7	Missing	
	Total	301	100.0	100.0	

Mean 4.345 Std dev .900 Variance .810

Valid cases 296 Missing cases 5

- -

OPQUAL4

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
	1.00	1	.3	.3	.3
	2.00	4	1.3	1.3	1.7
	3.00	11	3.7	3.7	5.4
	4.00	99	32.9	33.1	38.5
	5.00	116	38.5	38.8	77.3
	6.00	68	22.6	22.7	100.0
	9.00	2	.7	Missing	
	Total	301	100.0	100.0	

Mean 4.769 Std dev .911 Variance .829

Valid cases 299 Missing cases 2

---------- FACTOR ANALYSIS ----------

Analysis number 1 Listwise deletion of cases with missing values

Extraction 1 for analysis 1, Principal Components Analysis (PC)

Initial Statistics:

Variable	Communality	*	Factor	Eigenvalue	Pct of Var	Cum Pct
OPQUAL1	1.00000	*	1	3.25354	54.2	54.2
OPQUAL2	1.00000	*	2	1.00657	16.8	71.0
OPQUAL3	1.00000	*	3	.56398	9.4	80.4
OPQUAL4	1.00000	*	4	.50720	8.5	88.9
RQUAL1	1.00000	*	5	.41329	6.9	95.7
RQUAL2	1.00000	*	6	.25543	4.3	100.0

PC extracted 2 factors.

Factor Matrix:

	Factor 1	Factor 2
OPQUAL1	.83536	-.27168
OPQUAL2	.83765	-.22736
OPQUAL3	.75967	-.17415
OPQUAL4	.80959	-.13125
RQUAL1	.64522	.46496
RQUAL2	.45304	.78570

Final Statistics:

Variable	Communality	*	Factor	Eigenvalue	Pct of Var	Cum Pct
OPQUAL1	.77163	*	1	3.25354	54.2	54.2
OPQUAL2	.75335	*	2	1.00657	16.8	71.0
OPQUAL3	.60742	*				
OPQUAL4	.67266	*				
RQUAL1	.63249	*				
RQUAL2	.82256	*				

---------- FACTOR ANALYSIS ----------

OBLIMIN rotation 1 for extraction 1 in analysis 1 - Kaiser Normalization.

OBLIMIN converged in 4 iterations.

Pattern Matrix:

	Factor 1	Factor 2
OPQUAL1	.90046	-.06243
OPQUAL2	.87371	-.01532
OPQUAL3	.77159	.01973
OPQUAL4	.78707	.07806
RQUAL1	.25798	.65988
RQUAL2	-.11660	.94522

Structure Matrix:

	Factor 1	Factor 2
OPQUAL1	.87653	.28268
OPQUAL2	.86784	.31954
OPQUAL3	.77916	.31546
OPQUAL4	.81698	.37971
RQUAL1	.51089	.75876
RQUAL2	.24567	.90054

Factor Correlation Matrix:

	Factor 1	Factor 2
Factor 1	1.00000	
Factor 2	.38326	1.00000

---------- FACTOR ANALYSIS ----------

Analysis number 1 Listwise deletion of cases with missing values

Extraction 1 for analysis 1, Principal Components Analysis (PC)

Initial Statistics:

Variable	Communality	*	Factor	Eigenvalue	Pct of Var	Cum Pct
		*				
RPERF1	1.00000	*	1	2.71885	75.3	75.3
RPERF2	1.00000	*	2	.54944	13.7	89.0
RPERF3	1.00000	*	3	.43960	11.0	100.0

PC extracted 1 factors.

Factor Matrix:

	Factor 1
RPERF1	.87798
RPERF2	.81710
RPERF3	.78838

Final Statistics:

Variable	Communality	*	Factor	Eigenvalue	Pct of Var	Cum Pct
		*				
RPERF1	.77085	*	1	2.71885	75.3	75.3
RPERF2	.66766	*				
RPERF3	.62154	*				

---------- FACTOR ANALYSIS ----------

OBLIMIN rotation 1 for extraction 1 in analysis 1 - Kaiser Normalization.

>Warning # 11310
>Only one factor was extracted. The solution cannot be rotated.

RELIABILITY ANALYSIS - SCALE (ALPHA)

Reliability Coefficients

N of Cases = 298.0 N of Items = 3

Alpha = .8362

RPERF1

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
	-2.00	2	.7	.7	.7
	-1.00	10	3.3	3.3	4.0
	.00	13	4.3	4.3	8.4
	1.00	51	16.9	17.1	25.4
	2.00	140	46.5	46.8	72.2
	3.00	83	27.6	27.8	100.0
	9.00	2	.7	Missing	
	Total	301	100.0	100.0	

Mean 1.893 Std dev 1.011 Variance 1.022

Valid cases 299 Missing cases 2

RPERF2

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
	-2.00	1	.3	.3	.3
	-1.00	8	2.7	2.7	3.0
	.00	17	5.6	5.7	8.7
	1.00	40	13.3	13.4	22.1
	2.00	127	42.2	42.5	64.5
	3.00	106	35.2	35.5	100.0
	9.00	2	.7	Missing	
	Total	301	100.0	100.0	

Mean 2.013 Std dev 1.007 Variance 1.013

Valid cases 299 Missing cases 2

RPERF3

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
	-2.00	3	1.0	1.0	1.0
	-1.00	7	2.3	2.3	3.3
	.00	25	8.3	8.3	11.7
	1.00	48	15.9	16.0	27.7
	2.00	128	42.5	42.7	70.3
	3.00	89	29.6	29.7	100.0
	9.00	1	.3	Missing	
	Total	301	100.0	100.0	

Mean 1.860 Std dev 1.070 Variance 1.144

Valid cases 300 Missing cases 1

---------- FACTOR ANALYSIS ----------

Analysis number 1 Listwise deletion of cases with missing values

Extraction 1 for analysis 1, Principal Components Analysis (PC)

Initial Statistics:

Variable	Communality	*	Factor	Eigenvalue	Pct of Var	Cum Pct
		*				
EPERF1	1.00000	*	1	2.29837	76.6	76.6
EPERF2	1.00000	*	2	.42555	14.2	90.8
EPERF3	1.00000	*	3	.27608	9.2	100.0

PC extracted 1 factors.

Factor Matrix:

	Factor 1
EPERF1	.83998
EPERF2	.88891
EPERF3	.89590

Final Statistics:

Variable	Communality	*	Factor	Eigenvalue	Pct of Var	Cum Pct
		*				
EPERF1	.70557	*	1	2.29837	76.6	76.6
EPERF2	.79017	*				
EPERF3	.80263	*				

---------- FACTOR ANALYSIS ----------

OBLIMIN rotation 1 for extraction 1 in analysis 1 - Kaiser Normalization.

>Warning # 11310
>Only one factor was extracted. The solution cannot be rotated.

RELIABILITY ANALYSIS - SCALE (ALPHA)

Reliability Coefficients

N of Cases = 281.0 N of Items = 3

Alpha = .8469

EPERF1

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
	1.00	2	.7	.7	.7
	2.00	8	2.7	2.8	3.5
	3.00	90	29.9	31.4	34.8
	4.00	129	42.9	44.9	79.8
	5.00	57	18.9	19.9	99.7
	6.00	1	.3	.3	100.0
	8.00	6	2.0	Missing	
	9.00	8	2.7	Missing	
	Total	301	100.0	100.0	

Mean 3.815 Std dev .818 Variance .669

Valid cases 287 Missing cases 14

EPERF2

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
	1.00	5	1.7	1.7	1.7
	2.00	12	4.0	4.2	5.9
	3.00	83	27.6	28.7	34.6
	4.00	113	37.5	39.1	73.7
	5.00	75	24.9	26.0	99.7
	6.00	1	.3	.3	100.0
	8.00	6	2.0	Missing	
	9.00	6	2.0	Missing	
	Total	301	100.0	100.0	

Mean 3.844 Std dev .928 Variance .861

Valid cases 289 Missing cases 12

EPERF3

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
	1.00	4	1.3	1.3	1.3
	2.00	11	3.7	3.7	5.0
	3.00	63	20.9	21.1	26.1
	4.00	117	38.9	39.1	65.2
	5.00	103	34.2	34.4	99.7
	6.00	1	.3	.3	100.0
	9.00	2	.7	Missing	
	Total	301	100.0	100.0	

Mean 4.027 Std dev .916 Variance .838

Valid cases 299 Missing cases 2

Appendix C - Model Estimation: Base Model

DATE: 5/ 9/97
TIME: 14:52

WINDOWS L I S R E L 8.12a

BY

KARL G JORESKOG AND DAG SORBOM

The following lines were read from file C:\LISREL8W\RELMDL3.SPL:

Communication / Relational Orientation Model
by J.D. Kulchitsky

BASE MODEL OF RELATIONAL ORIENTATION

Observed Variables

RELNORM INFONORM FLEX COOP COMMIT COORD
CYCLET BACKORD ONTIMED RELMODE RELQUAL
OPMODE OPQUAL SPECS DAMAGE

CORRELATION MATRIX

1
.39 1
.46 .31 1
.43 .23 .55 1
.57 .26 .52 .49 1
.44 .25 .56 .52 .56 1
.25 .15 .41 .34 .30 .34 1
.22 .20 .40 .34 .24 .37 .60 1
.25 .13 .42 .35 .23 .33 .62 .73 1
.45 .36 .51 .34 .39 .44 .24 .28 .27 1
.31 .20 .36 .22 .33 .19 .08 .11 .11 .42 1
.31 .16 .50 .41 .33 .40 .31 .38 .40 .39 .20 1
.31 .12 .47 .33 .36 .33 .28 .32 .36 .39 .25 .74 1
.35 .13 .44 .30 .31 .36 .23 .25 .21 .39 .23 .54 .56 1
.33 .17 .54 .43 .34 .31 .26 .40 .36 .42 .29 .62 .60 .56 1

SAMPLE SIZE: 341

LATENT VARIABLES:
RELBEHAV RELPERF ECONPERF RELCOMM OPCOMM

PATHS

RELBEHAV -> RELNORM INFONORM
RELPERF -> COOP COMMIT COORD
ECONPERF-> CYCLET BACKORD ONTIMED
RELBEHAV -> RELPERF
RELPERF -> ECONPERF
!RELCOMM-> RELMODE RELQUAL
!OPCOMM-> OPMODE OPQUAL
!RELCOMM-> RELBEHAV RELPERF
!OPCOMM-> RELPERF ECONPERF

ADMISSIBILITY CHECK = 100
PATH DIAGRAM
END OF PROBLEM

Sample Size = 341

Communication / Relational Orientation Model

CORRELATION MATRIX TO BE ANALYZED

	COOP	COMMIT	COORD	CYCLET	BACKORD	ONTIMED
COOP	1.00					
COMMIT	0.49	1.00				
COORD	0.52	0.56	1.00			
CYCLET	0.34	0.30	0.34	1.00		
BACKORD	0.34	0.24	0.37	0.60	1.00	
ONTIMED	0.35	0.23	0.33	0.62	0.73	1.00
RELNORM	0.43	0.57	0.44	0.25	0.22	0.25
INFONORM	0.23	0.26	0.25	0.15	0.20	0.13

CORRELATION MATRIX TO BE ANALYZED

	RELNORM	INFONORM
RELNORM	1.00	
INFONORM	0.39	1.00

Communication / Relational Orientation Model
Number of Iterations = 6

LISREL ESTIMATES (MAXIMUM LIKELIHOOD)

COOP = 0.68*RELPERF, Errorvar.= 0.54 , R^2 = 0.46
(0.088) (0.051)
7.71 10.43

COMMIT = 0.76*RELPERF, Errorvar.= 0.42 , R^2 = 0.58
(0.095) (0.048)
8.01 8.91

COORD = 0.74*RELPERF, Errorvar.= 0.46 , R^2 = 0.54
(0.093) (0.048)
7.94 9.42

CYCLET = 0.72*ECONPERF, Errorvar.= 0.48 , R^2 = 0.52
(0.052) (0.044)
13.89 10.73

BACKORD = 0.84*ECONPERF, Errorvar.= 0.29 , R^2 = 0.71
(0.051) (0.039)
16.50 7.38

ONTIMED = 0.86*ECONPERF, Errorvar.= 0.26 , R^2 = 0.74
(0.051) (0.039)
16.82 6.70

RELNORM = 0.87*RELBEHAV, Errorvar.= 0.25 , R^2 = 0.75
(0.073) (0.10)
11.84 2.41

INFONORM = 0.45*RELBEHAV, Errorvar.= 0.80 , R^2 = 0.20
(0.060) (0.067)
7.52 11.87

RELPERF = 0.76*RELBEHAV, Errorvar.= 0.42, R^2 = 0.58
(0.14)
5.27

ECONPERF = 0.50*RELPERF, Errorvar.= 0.75, R^2 = 0.25
(0.086)
5.78

CORRELATION MATRIX OF INDEPENDENT VARIABLES

	RELBEHAV
RELBEHAV	1.00

COVARIANCE MATRIX OF LATENT VARIABLES

	RELPERF	ECONPERF	RELBEHAV
RELPERF	1.00		
ECONPERF	0.50	1.00	
RELBEHAV	0.76	0.38	1.00

GOODNESS OF FIT STATISTICS

CHI-SQUARE WITH 18 DEGREES OF FREEDOM = 39.37 (P = 0.0025)
ESTIMATED NON-CENTRALITY PARAMETER (NCP) = 21.37
90 PERCENT CONFIDENCE INTERVAL FOR NCP = (6.98 ; 43.49)

MINIMUM FIT FUNCTION VALUE = 0.12
POPULATION DISCREPANCY FUNCTION VALUE (F0) = 0.063
90 PERCENT CONFIDENCE INTERVAL FOR F0 = (0.021 ; 0.13)
ROOT MEAN SQUARE ERROR OF APPROXIMATION (RMSEA) = 0.059
90 PERCENT CONFIDENCE INTERVAL FOR RMSEA = (0.034 ; 0.084)
P-VALUE FOR TEST OF CLOSE FIT (RMSEA < 0.05) = 0.25

EXPECTED CROSS-VALIDATION INDEX (ECVI) = 0.22
90 PERCENT CONFIDENCE INTERVAL FOR ECVI = (0.18 ; 0.29)
ECVI FOR SATURATED MODEL = 0.21
ECVI FOR INDEPENDENCE MODEL = 3.05

CHI-SQUARE FOR INDEPENDENCE MODEL WITH 28 DEGREES OF FREEDOM = 1019.38
INDEPENDENCE AIC = 1035.38
MODEL AIC = 75.37
SATURATED AIC = 72.00
INDEPENDENCE CAIC = 1074.03
MODEL CAIC = 162.35
SATURATED CAIC = 245.95

ROOT MEAN SQUARE RESIDUAL (RMR) = 0.040
STANDARDIZED RMR = 0.040
GOODNESS OF FIT INDEX (GFI) = 0.97
ADJUSTED GOODNESS OF FIT INDEX (AGFI) = 0.94
PARSIMONY GOODNESS OF FIT INDEX (PGFI) = 0.49

NORMED FIT INDEX (NFI) = 0.96
NON-NORMED FIT INDEX (NNFI) = 0.97
PARSIMONY NORMED FIT INDEX (PNFI) = 0.62
COMPARATIVE FIT INDEX (CFI) = 0.98
INCREMENTAL FIT INDEX (IFI) = 0.98
RELATIVE FIT INDEX (RFI) = 0.94

CRITICAL N (CN) = 301.57

Communication / Relational Orientation Model

SUMMARY STATISTICS FOR FITTED RESIDUALS
SMALLEST FITTED RESIDUAL = -0.10
MEDIAN FITTED RESIDUAL = 0.00
LARGEST FITTED RESIDUAL = 0.09

STEMLEAF PLOT
- 8|5
- 6|9
- 4|87
- 2|370
- 0|704321000000000
0|16248
2|66
4|468
6|094
8|4

SUMMARY STATISTICS FOR STANDARDIZED RESIDUALS
SMALLEST STANDARDIZED RESIDUAL = -3.34
MEDIAN STANDARDIZED RESIDUAL = 0.00
LARGEST STANDARDIZED RESIDUAL = 4.16

STEMLEAF PLOT
- 3|3
- 2|76
- 1|7740
- 0|943110000000000
0|13567
1|1268
2|0024
3|
4|2
LARGEST NEGATIVE STANDARDIZED RESIDUALS
RESIDUAL FOR BACKORD AND COMMIT -2.68
RESIDUAL FOR ONTIMED AND COMMIT -3.34
RESIDUAL FOR RELNORM AND COORD -2.59
LARGEST POSITIVE STANDARDIZED RESIDUALS
RESIDUAL FOR RELNORM AND COMMIT 4.16

THE MODIFICATION INDICES SUGGEST TO ADD THE

PATH TO	FROM	DECREASE IN CHI-SQUARE	NEW ESTIMATE
COMMIT	ECONPERF	9.4	-0.18

THE MODIFICATION INDICES SUGGEST TO ADD AN ERROR COVARIANCE

BETWEEN	AND	DECREASE IN CHI-SQUARE	NEW ESTIMATE
RELNORM	COMMIT	16.9	0.16

THE PROBLEM USED 9816 BYTES (= 0.1% OF AVAILABLE WORKSPACE)

TIME USED: 1.1 SECONDS

Appendix D - Model Estimation: Full Model

DATE: 5/ 9/97
TIME: 14:54

WINDOWS L I S R E L 8.12a

BY

KARL G JORESKOG AND DAG SORBOM

The following lines were read from file C:\LISREL8W\RELMDL3.SPL:

Communication / Relational Orientation Model
by J.D. Kulchitsky

FULL MODEL OF RELATIONAL ORIENTATION, OPERATIONAL AND RELATIONAL COMMUNICATION

Observed Variables

RELNORM INFONORM FLEX COOP COMMIT COORD
CYCLET BACKORD ONTIMED RELMODE RELQUAL
OPMODE OPQUAL SPECS DAMAGE

CORRELATION MATRIX

1
.39 1
.46 .31 1
.43 .23 .55 1
.57 .26 .52 .49 1
.44 .25 .56 .52 .56 1
.25 .15 .41 .34 .30 .34 1
.22 .20 .40 .34 .24 .37 .60 1
.25 .13 .42 .35 .23 .33 .62 .73 1
.45 .36 .51 .34 .39 .44 .24 .28 .27 1
.31 .20 .36 .22 .33 .19 .08 .11 .11 .42 1
.31 .16 .50 .41 .33 .40 .31 .38 .40 .39 .20 1
.31 .12 .47 .33 .36 .33 .28 .32 .36 .39 .25 .74 1
.35 .13 .44 .30 .31 .36 .23 .25 .21 .39 .23 .54 .56 1
.33 .17 .54 .43 .34 .31 .26 .40 .36 .42 .29 .62 .60 .56 1

SAMPLE SIZE: 341

LATENT VARIABLES:
RELBEHAV RELPERF ECONPERF RELCOMM OPCOMM

PATHS

RELBEHAV -> RELNORM INFONORM
RELPERF -> COOP COMMIT COORD
ECONPERF-> CYCLET BACKORD ONTIMED
RELBEHAV -> RELPERF
RELPERF -> ECONPERF
RELCOMM-> RELMODE RELQUAL
OPCOMM-> OPMODE OPQUAL
RELCOMM-> RELBEHAV RELPERF
OPCOMM-> RELPERF ECONPERF

ADMISSIBILITY CHECK = 100
PATH DIAGRAM
END OF PROBLEM

Sample Size = 341

Communication / Relational Orientation Model

CORRELATION MATRIX TO BE ANALYZED

	RELNORM	INFONORM	COOP	COMMIT	COORD	CYCLET
RELNORM	1.00					
INFONORM	0.39	1.00				
COOP	0.43	0.23	1.00			
COMMIT	0.57	0.26	0.49	1.00		
COORD	0.44	0.25	0.52	0.56	1.00	
CYCLET	0.25	0.15	0.34	0.30	0.34	1.00
BACKORD	0.22	0.20	0.34	0.24	0.37	0.60
ONTIMED	0.25	0.13	0.35	0.23	0.33	0.62
RELMODE	0.45	0.36	0.34	0.39	0.44	0.24
RELQUAL	0.31	0.20	0.22	0.33	0.19	0.08
OPMODE	0.31	0.16	0.41	0.33	0.40	0.31
OPQUAL	0.31	0.12	0.33	0.36	0.33	0.28

CORRELATION MATRIX TO BE ANALYZED

	BACKORD	ONTIMED	RELMODE	RELQUAL	OPMODE	OPQUAL
BACKORD	1.00					
ONTIMED	0.73	1.00				
RELMODE	0.28	0.27	1.00			
RELQUAL	0.11	0.11	0.42	1.00		
OPMODE	0.38	0.40	0.39	0.20	1.00	
OPQUAL	0.32	0.36	0.39	0.25	0.74	1.00

Communication / Relational Orientation Model
Number of Iterations = 9

LISREL ESTIMATES (MAXIMUM LIKELIHOOD)

RELNORM = 0.80*RELBEHAV, Errorvar.= 0.36 , R^2 = 0.64
(0.12) (0.077)
6.75 4.65

INFONORM = 0.49*RELBEHAV, Errorvar.= 0.76 , R^2 = 0.24
(0.075) (0.064)

6.54 11.85

COOP = 0.68*RELPERF, Errorvar.= 0.53 , R^2 = 0.47
(0.099) (0.050)
6.90 10.62

COMMIT = 0.75*RELPERF, Errorvar.= 0.44 , R^2 = 0.56
(0.11) (0.046)
7.06 9.47

COORD = 0.74*RELPERF, Errorvar.= 0.45 , R^2 = 0.55
(0.11) (0.047)
7.05 9.63

CYCLET = 0.72*ECONPERF, Errorvar.= 0.48 , R^2 = 0.52
(0.052) (0.044)
13.81 10.87

BACKORD = 0.84*ECONPERF, Errorvar.= 0.29 , R^2 = 0.71
(0.051) (0.038)
16.54 7.67

ONTIMED = 0.86*ECONPERF, Errorvar.= 0.25 , R^2 = 0.75
(0.051) (0.038)
16.98 6.68

RELMODE = 0.81*RELCOMM, Errorvar.= 0.35 , R^2 = 0.65
(0.060) (0.069)
13.57 5.03

RELQUAL = 0.51*RELCOMM, Errorvar.= 0.74 , R^2 = 0.26
(0.059) (0.064)
8.74 11.49

OPMODE = 0.89*OPCOMM, Errorvar.= 0.21 , R^2 = 0.79
(0.050) (0.052)
17.72 3.99

OPQUAL = 0.83*OPCOMM, Errorvar.= 0.31 , R^2 = 0.69
(0.051) (0.049)
16.33 6.36

RELBEHAV = 0.74*RELCOMM, Errorvar.= 0.45, R^2 = 0.55

(0.14)
5.26

RELPERF = 0.68*RELBEHAV + 0.012*RELCOMM + 0.28*OPCOMM, Errorvar.= 0.28,
(0.20) (0.16) (0.080)
3.43 0.074 3.55

$R^2 = 0.72$

ECONPERF = 0.32*RELPERF + 0.31*OPCOMM, Errorvar.= 0.68, $R^2 = 0.32$
(0.086) (0.075)
3.76 4.17

CORRELATION MATRIX OF INDEPENDENT VARIABLES

	RELCOMM	OPCOMM
RELCOMM	1.00	
OPCOMM	0.55	1.00
	(0.05)	
	10.26	

COVARIANCE MATRIX OF LATENT VARIABLES

	RELBEHAV	RELPERF	ECONPERF	RELCOMM	OPCOMM
RELBEHAV	1.00				
RELPERF	0.81	1.00			
ECONPERF	0.39	0.50	1.00		
RELCOMM	0.74	0.67	0.39	1.00	
OPCOMM	0.41	0.57	0.50	0.55	1.00

GOODNESS OF FIT STATISTICS

CHI-SQUARE WITH 47 DEGREES OF FREEDOM = 83.29 (P = 0.00087)
ESTIMATED NON-CENTRALITY PARAMETER (NCP) = 36.29
90 PERCENT CONFIDENCE INTERVAL FOR NCP = (14.69 ; 65.73)

MINIMUM FIT FUNCTION VALUE = 0.24
POPULATION DISCREPANCY FUNCTION VALUE (F0) = 0.11
90 PERCENT CONFIDENCE INTERVAL FOR F0 = (0.043 ; 0.19)
ROOT MEAN SQUARE ERROR OF APPROXIMATION (RMSEA) = 0.048
90 PERCENT CONFIDENCE INTERVAL FOR RMSEA = (0.030 ; 0.064)
P-VALUE FOR TEST OF CLOSE FIT (RMSEA < 0.05) = 0.57

EXPECTED CROSS-VALIDATION INDEX (ECVI) = 0.43
90 PERCENT CONFIDENCE INTERVAL FOR ECVI = (0.36 ; 0.51)
ECVI FOR SATURATED MODEL = 0.46
ECVI FOR INDEPENDENCE MODEL = 4.95

CHI-SQUARE FOR INDEPENDENCE MODEL WITH 66 DEGREES OF FREEDOM = 1658.36
INDEPENDENCE AIC = 1682.36
MODEL AIC = 145.29
SATURATED AIC = 156.00
INDEPENDENCE CAIC = 1740.34
MODEL CAIC = 295.08
SATURATED CAIC = 532.89

ROOT MEAN SQUARE RESIDUAL (RMR) = 0.037
STANDARDIZED RMR = 0.037
GOODNESS OF FIT INDEX (GFI) = 0.96
ADJUSTED GOODNESS OF FIT INDEX (AGFI) = 0.93
PARSIMONY GOODNESS OF FIT INDEX (PGFI) = 0.58

NORMED FIT INDEX (NFI) = 0.95
NON-NORMED FIT INDEX (NNFI) = 0.97
PARSIMONY NORMED FIT INDEX (PNFI) = 0.68
COMPARATIVE FIT INDEX (CFI) = 0.98
INCREMENTAL FIT INDEX (IFI) = 0.98
RELATIVE FIT INDEX (RFI) = 0.93

CRITICAL N (CN) = 296.73

Communication / Relational Orientation Model

SUMMARY STATISTICS FOR FITTED RESIDUALS
SMALLEST FITTED RESIDUAL = -0.09
MEDIAN FITTED RESIDUAL = 0.00
LARGEST FITTED RESIDUAL = 0.09

STEMLEAF PLOT
- 8|5
- 6|6543
- 4|820611
- 2|874418610
- 0|9866508843100000000
0|1111224466677893445558 89
2|46078
4|1247
6|4923
8|84

SUMMARY STATISTICS FOR STANDARDIZED RESIDUALS
SMALLEST STANDARDIZED RESIDUAL = -3.23
MEDIAN STANDARDIZED RESIDUAL = 0.03
LARGEST STANDARDIZED RESIDUAL = 4.50

STEMLEAF PLOT
- 3|2
- 2|650
- 1|99544332111111
- 0|8775555444321000000000
0|1111222223334444466688999
1|0225669
2|01244
3|
4|5
LARGEST NEGATIVE STANDARDIZED RESIDUALS
RESIDUAL FOR ONTIMED AND COMMIT -3.23
RESIDUAL FOR RELMODE AND RELNORM -2.58
LARGEST POSITIVE STANDARDIZED RESIDUALS
RESIDUAL FOR COMMIT AND RELNORM 4.50

THE MODIFICATION INDICES SUGGEST TO ADD THE

PATH TO	FROM	DECREASE IN CHI-SQUARE	NEW ESTIMATE
COMMIT	RELBEHAV	13.0	0.49
COMMIT	ECONPERF	8.9	-0.17

THE MODIFICATION INDICES SUGGEST TO ADD AN ERROR COVARIANCE

BETWEEN	AND	DECREASE IN CHI-SQUARE	NEW ESTIMATE
COMMIT	RELNORM	16.1	0.15
RELQUAL	COMMIT	7.9	0.10

THE PROBLEM USED 21392 BYTES (= 0.3% OF AVAILABLE WORKSPACE)

TIME USED: 3.2 SECONDS

Appendix E - Model Estimation: Revised Model

DATE: 5/ 9/97
TIME: 14:59

WINDOWS L I S R E L 8.12a

BY

KARL G JORESKOG AND DAG SORBOM

The following lines were read from file C:\LISREL8W\RELMDL3.SPL:

Communication / Relational Orientation Model
by J.D. Kulchitsky

REVISED MODEL OF RELATIONAL ORIENTATION, OPERATIONAL AND RELATIONAL COMMUNICATION - (RELCOMM -> RELPERF) PATH DELETED

Observed Variables

RELNORM INFONORM FLEX COOP COMMIT COORD
CYCLET BACKORD ONTIMED RELMODE RELQUAL
OPMODE OPQUAL SPECS DAMAGE

CORRELATION MATRIX

1
.39 1
.46 .31 1
.43 .23 .55 1
.57 .26 .52 .49 1
.44 .25 .56 .52 .56 1
.25 .15 .41 .34 .30 .34 1
.22 .20 .40 .34 .24 .37 .60 1
.25 .13 .42 .35 .23 .33 .62 .73 1
.45 .36 .51 .34 .39 .44 .24 .28 .27 1
.31 .20 .36 .22 .33 .19 .08 .11 .11 .42 1
.31 .16 .50 .41 .33 .40 .31 .38 .40 .39 .20 1
.31 .12 .47 .33 .36 .33 .28 .32 .36 .39 .25 .74 1
.35 .13 .44 .30 .31 .36 .23 .25 .21 .39 .23 .54 .56 1
.33 .17 .54 .43 .34 .31 .26 .40 .36 .42 .29 .62 .60 .56 1

SAMPLE SIZE: 341

LATENT VARIABLES:
RELBEHAV RELPERF ECONPERF RELCOMM OPCOMM

PATHS

RELBEHAV -> RELNORM INFONORM
RELPERF -> COOP COMMIT COORD
ECONPERF-> CYCLET BACKORD ONTIMED
RELBEHAV -> RELPERF
RELPERF -> ECONPERF
RELCOMM-> RELMODE RELQUAL
OPCOMM-> OPMODE OPQUAL
RELCOMM-> RELBEHAV
OPCOMM-> RELPERF ECONPERF

ADMISSIBILITY CHECK = 100
PATH DIAGRAM
END OF PROBLEM

Sample Size = 341

Communication / Relational Orientation Model

CORRELATION MATRIX TO BE ANALYZED

	RELNORM	INFONORM	COOP	COMMIT	COORD	CYCLET
RELNORM	1.00					
INFONORM	0.39	1.00				
COOP	0.43	0.23	1.00			
COMMIT	0.57	0.26	0.49	1.00		
COORD	0.44	0.25	0.52	0.56	1.00	
CYCLET	0.25	0.15	0.34	0.30	0.34	1.00
BACKORD	0.22	0.20	0.34	0.24	0.37	0.60
ONTIMED	0.25	0.13	0.35	0.23	0.33	0.62
RELMODE	0.45	0.36	0.34	0.39	0.44	0.24
RELQUAL	0.31	0.20	0.22	0.33	0.19	0.08
OPMODE	0.31	0.16	0.41	0.33	0.40	0.31
OPQUAL	0.31	0.12	0.33	0.36	0.33	0.28

CORRELATION MATRIX TO BE ANALYZED

	BACKORD	ONTIMED	RELMODE	RELQUAL	OPMODE	OPQUAL
BACKORD	1.00					
ONTIMED	0.73	1.00				
RELMODE	0.28	0.27	1.00			
RELQUAL	0.11	0.11	0.42	1.00		
OPMODE	0.38	0.40	0.39	0.20	1.00	
OPQUAL	0.32	0.36	0.39	0.25	0.74	1.00

Communication / Relational Orientation Model
Number of Iterations = 9

LISREL ESTIMATES (MAXIMUM LIKELIHOOD)

RELNORM = 0.80*RELBEHAV, Errorvar.= 0.36 , R^2 = 0.64
(0.096) (0.062)
8.30 5.87

INFONORM = 0.49*RELBEHAV, Errorvar.= 0.76 , R^2 = 0.24
(0.071) (0.064)

6.91 11.85

COOP = 0.68*RELPERF, Errorvar.= 0.53 , R^2 = 0.47
(0.087) (0.050)
7.83 10.62

COMMIT = 0.75*RELPERF, Errorvar.= 0.44 , R^2 = 0.56
(0.093) (0.046)
8.07 9.47

COORD = 0.74*RELPERF, Errorvar.= 0.45 , R^2 = 0.55
(0.092) (0.047)
8.05 9.63

CYCLET = 0.72*ECONPERF, Errorvar.= 0.48 , R^2 = 0.52
(0.052) (0.044)
13.81 10.87

BACKORD = 0.84*ECONPERF, Errorvar.= 0.29 , R^2 = 0.71
(0.051) (0.038)
16.54 7.67

ONTIMED = 0.86*ECONPERF, Errorvar.= 0.25 , R^2 = 0.75
(0.051) (0.038)
16.98 6.68

RELMODE = 0.81*RELCOMM, Errorvar.= 0.35 , R^2 = 0.65
(0.059) (0.069)
13.60 5.04

RELQUAL = 0.51*RELCOMM, Errorvar.= 0.74 , R^2 = 0.26
(0.059) (0.064)
8.74 11.49

OPMODE = 0.89*OPCOMM, Errorvar.= 0.21 , R^2 = 0.79
(0.050) (0.051)
17.72 4.00

OPQUAL = 0.83*OPCOMM, Errorvar.= 0.31 , R^2 = 0.69
(0.051) (0.049)
16.33 6.37

RELBEHAV = 0.74*RELCOMM, Errorvar.= 0.45, R^2 = 0.55

(0.12)
6.02

RELPERF = 0.69*RELBEHAV + 0.29*OPCOMM, Errorvar.= 0.28, R^2 = 0.72
(0.13) (0.066)
5.40 4.36

ECONPERF = 0.32*RELPERF + 0.31*OPCOMM, Errorvar.= 0.68, R^2 = 0.32
(0.083) (0.075)
3.90 4.17

CORRELATION MATRIX OF INDEPENDENT VARIABLES

	RELCOMM	OPCOMM
RELCOMM	1.00	
OPCOMM	0.55	1.00
	(0.05)	
	10.27	

COVARIANCE MATRIX OF LATENT VARIABLES

	RELBEHAV	RELPERF	ECONPERF	RELCOMM	OPCOMM
RELBEHAV	1.00				
RELPERF	0.81	1.00			
ECONPERF	0.39	0.50	1.00		
RELCOMM	0.74	0.67	0.39	1.00	
OPCOMM	0.41	0.57	0.50	0.55	1.00

GOODNESS OF FIT STATISTICS

CHI-SQUARE WITH 48 DEGREES OF FREEDOM = 83.29 (P = 0.0012)
ESTIMATED NON-CENTRALITY PARAMETER (NCP) = 35.29
90 PERCENT CONFIDENCE INTERVAL FOR NCP = (13.81 ; 64.64)

MINIMUM FIT FUNCTION VALUE = 0.24
POPULATION DISCREPANCY FUNCTION VALUE (F0) = 0.10
90 PERCENT CONFIDENCE INTERVAL FOR F0 = (0.041 ; 0.19)
ROOT MEAN SQUARE ERROR OF APPROXIMATION (RMSEA) = 0.047
90 PERCENT CONFIDENCE INTERVAL FOR RMSEA = (0.029 ; 0.063)
P-VALUE FOR TEST OF CLOSE FIT (RMSEA < 0.05) = 0.62

EXPECTED CROSS-VALIDATION INDEX (ECVI) = 0.42
90 PERCENT CONFIDENCE INTERVAL FOR ECVI = (0.36 ; 0.51)
ECVI FOR SATURATED MODEL = 0.46
ECVI FOR INDEPENDENCE MODEL = 4.95

CHI-SQUARE FOR INDEPENDENCE MODEL WITH 66 DEGREES OF FREEDOM = 1658.36
INDEPENDENCE AIC = 1682.36
MODEL AIC = 143.29
SATURATED AIC = 156.00
INDEPENDENCE CAIC = 1740.34
MODEL CAIC = 288.25
SATURATED CAIC = 532.89

ROOT MEAN SQUARE RESIDUAL (RMR) = 0.037
STANDARDIZED RMR = 0.037
GOODNESS OF FIT INDEX (GFI) = 0.96
ADJUSTED GOODNESS OF FIT INDEX (AGFI) = 0.93
PARSIMONY GOODNESS OF FIT INDEX (PGFI) = 0.59

NORMED FIT INDEX (NFI) = 0.95
NON-NORMED FIT INDEX (NNFI) = 0.97
PARSIMONY NORMED FIT INDEX (PNFI) = 0.69
COMPARATIVE FIT INDEX (CFI) = 0.98
INCREMENTAL FIT INDEX (IFI) = 0.98
RELATIVE FIT INDEX (RFI) = 0.93

CRITICAL N (CN) = 301.77

Communication / Relational Orientation Model

SUMMARY STATISTICS FOR FITTED RESIDUALS
SMALLEST FITTED RESIDUAL = -0.09
MEDIAN FITTED RESIDUAL = 0.00
LARGEST FITTED RESIDUAL = 0.09

STEMLEAF PLOT
- 8|5
- 6|6543
- 4|820621
- 2|975409710
- 0|987650884210000000
0|1111122446667789334555889
2|46088
4|0247
6|3733
8|83

SUMMARY STATISTICS FOR STANDARDIZED RESIDUALS
SMALLEST STANDARDIZED RESIDUAL = -3.23
MEDIAN STANDARDIZED RESIDUAL = 0.05
LARGEST STANDARDIZED RESIDUAL = 4.45

STEMLEAF PLOT
- 3|2
- 2|540
- 1|98543332111110
- 0|876555544432100000000
0|1111122222333344446668899 9
1|0224569
2|00224
3|
4|4
LARGEST NEGATIVE STANDARDIZED RESIDUALS
RESIDUAL FOR ONTIMED AND COMMIT -3.23
LARGEST POSITIVE STANDARDIZED RESIDUALS
RESIDUAL FOR COMMIT AND RELNORM 4.45

THE MODIFICATION INDICES SUGGEST TO ADD THE

PATH TO	FROM	DECREASE IN CHI-SQUARE	NEW ESTIMATE
COMMIT	RELBEHAV	12.9	0.49
COMMIT	ECONPERF	9.0	-0.17

THE MODIFICATION INDICES SUGGEST TO ADD AN ERROR COVARIANCE

BETWEEN	AND	DECREASE IN CHI-SQUARE	NEW ESTIMATE
COMMIT	RELNORM	15.9	0.14

THE PROBLEM USED 21056 BYTES (= 0.3% OF AVAILABLE WORKSPACE)

TIME USED: 3.2 SECONDS

Appendix F - Model Estimation: Competing Model

DATE: 9/10/97
TIME: 16:50

WINDOWS L I S R E L 8.12a

BY

KARL G JORESKOG AND DAG SORBOM

The following lines were read from file D:\LISREL8W\JACK\UPIC1.SPL:

Communication / Relational Orientation Model
by J.D. Kulchitsky

COMPETING MODEL OF RELATIONAL ORIENTATION, OPERATIONAL AND
RELATIONAL COMMUNICATION

Observed Variables

RELNORM INFONORM FLEX COOP COMMIT COORD
CYCLET BACKORD ONTIMED RELMODE RELQUAL
OPMODE OPQUAL SPECS DAMAGE

CORRELATION MATRIX

1
.39 1
.46 .31 1
.43 .23 .55 1
.57 .26 .52 .49 1
.44 .25 .56 .52 .56 1
.25 .15 .41 .34 .30 .34 1
.22 .20 .40 .34 .24 .37 .60 1
.25 .13 .42 .35 .23 .33 .62 .73 1
.45 .36 .51 .34 .39 .44 .24 .28 .27 1
.31 .20 .36 .22 .33 .19 .08 .11 .11 .42 1
.31 .16 .50 .41 .33 .40 .31 .38 .40 .39 .20 1
.31 .12 .47 .33 .36 .33 .28 .32 .36 .39 .25 .74 1
.35 .13 .44 .30 .31 .36 .23 .25 .21 .39 .23 .54 .56 1
.33 .17 .54 .43 .34 .31 .26 .40 .36 .42 .29 .62 .60 .56 1

SAMPLE SIZE: 341

LATENT VARIABLES:
RELBEHAV RELPERF ECONPERF RELCOMM OPCOMM

PATHS

RELBEHAV -> RELNORM INFONORM
RELPERF -> COOP COMMIT COORD
ECONPERF -> CYCLET BACKORD ONTIMED
RELBEHAV -> RELPERF ECONPERF
RELPERF -> ECONPERF
RELCOMM -> RELMODE RELQUAL ECONPERF
OPCOMM -> OPMODE OPQUAL
RELCOMM -> RELBEHAV RELPERF
OPCOMM -> RELPERF ECONPERF

ADMISSIBILITY CHECK = 100
PATH DIAGRAM
END OF PROBLEM

Sample Size = 341

Communication / Relational Orientation Model

CORRELATION MATRIX TO BE ANALYZED

	RELNORM	INFONORM	COOP	COMMIT	COORD	CYCLET
RELNORM	1.00					
INFONORM	0.39	1.00				
COOP	0.43	0.23	1.00			
COMMIT	0.57	0.26	0.49	1.00		
COORD	0.44	0.25	0.52	0.56	1.00	
CYCLET	0.25	0.15	0.34	0.30	0.34	1.00
BACKORD	0.22	0.20	0.34	0.24	0.37	0.60
ONTIMED	0.25	0.13	0.35	0.23	0.33	0.62
RELMODE	0.45	0.36	0.34	0.39	0.44	0.24
RELQUAL	0.31	0.20	0.22	0.33	0.19	0.08
OPMODE	0.31	0.16	0.41	0.33	0.40	0.31
OPQUAL	0.31	0.12	0.33	0.36	0.33	0.28

CORRELATION MATRIX TO BE ANALYZED

	BACKORD	ONTIMED	RELMODE	RELQUAL	OPMODE	OPQUAL
BACKORD	1.00					
ONTIMED	0.73	1.00				
RELMODE	0.28	0.27	1.00			
RELQUAL	0.11	0.11	0.42	1.00		
OPMODE	0.38	0.40	0.39	0.20	1.00	
OPQUAL	0.32	0.36	0.39	0.25	0.74	1.00

Communication / Relational Orientation Model
Number of Iterations = 10

LISREL ESTIMATES (MAXIMUM LIKELIHOOD)

RELNORM = 0.80*RELBEHAV, Errorvar.= 0.36 , R^2 = 0.64
(0.12) (0.078)
6.77 4.56

INFONORM = 0.49*RELBEHAV, Errorvar.= 0.76 , R^2 = 0.24
(0.074) (0.064)
6.56 11.86

COOP = 0.68*RELPERF, Errorvar.= 0.53 , R^2 = 0.47
(0.10) (0.050)
6.79 10.64

COMMIT = 0.75*RELPERF, Errorvar.= 0.44 , R^2 = 0.56
(0.11) (0.046)
6.94 9.54

COORD = 0.74*RELPERF, Errorvar.= 0.45 , R^2 = 0.55
(0.11) (0.047)
6.93 9.67

CYCLET = 0.72*ECONPERF, Errorvar.= 0.48 , R^2 = 0.52
(0.053) (0.044)
13.50 10.87

BACKORD = 0.84*ECONPERF, Errorvar.= 0.29 , R^2 = 0.71
(0.053) (0.038)
16.00 7.66

ONTIMED = 0.86*ECONPERF, Errorvar.= 0.25 , R^2 = 0.75
(0.053) (0.038)
16.37 6.71

RELMODE = 0.81*RELCOMM, Errorvar.= 0.35 , R^2 = 0.65
(0.059) (0.069)
13.56 5.06

RELQUAL = 0.51*RELCOMM, Errorvar.= 0.74 , R^2 = 0.26
(0.059) (0.064)
8.75 11.48

OPMODE = 0.89*OPCOMM, Errorvar.= 0.21 , R^2 = 0.79
(0.050) (0.052)
17.70 4.00

OPQUAL = 0.83*OPCOMM, Errorvar.= 0.31 , R^2 = 0.69
(0.051) (0.049)
16.33 6.35

RELBEHAV = 0.74*RELCOMM, Errorvar.= 0.45, R^2 = 0.55
(0.14)
5.27

RELPERF = 0.68*RELBEHAV + 0.017*RELCOMM + 0.28*OPCOMM, Errorvar.= 0.28,
(0.20) (0.16) (0.080)
3.41 0.11 3.51

R^2 = 0.72

ECONPERF = - 0.13*RELBEHAV + 0.44*RELPERF + 0.016*RELCOMM + 0.29*OPCOMM,
(0.20) (0.17) (0.14) (0.091)
-0.64 2.56 0.12 3.18

Errorvar.= 0.67, R^2 = 0.33

CORRELATION MATRIX OF INDEPENDENT VARIABLES

	RELCOMM	OPCOMM
RELCOMM	1.00	
OPCOMM	0.55	1.00
	(0.05)	
	10.29	

COVARIANCE MATRIX OF LATENT VARIABLES

	RELBEHAV	RELPERF	ECONPERF	RELCOMM	OPCOMM
RELBEHAV	1.00				
RELPERF	0.81	1.00			
ECONPERF	0.36	0.51	1.00		
RELCOMM	0.74	0.68	0.38	1.00	
OPCOMM	0.41	0.57	0.50	0.55	1.00

GOODNESS OF FIT STATISTICS

CHI-SQUARE WITH 45 DEGREES OF FREEDOM = 82.68 (P = 0.00052)
ESTIMATED NON-CENTRALITY PARAMETER (NCP) = 37.68
90 PERCENT CONFIDENCE INTERVAL FOR NCP = (15.99 ; 67.20)

MINIMUM FIT FUNCTION VALUE = 0.24
POPULATION DISCREPANCY FUNCTION VALUE (F0) = 0.11
90 PERCENT CONFIDENCE INTERVAL FOR F0 = (0.047 ; 0.20)
ROOT MEAN SQUARE ERROR OF APPROXIMATION (RMSEA) = 0.050
90 PERCENT CONFIDENCE INTERVAL FOR RMSEA = (0.032 ; 0.066)
P-VALUE FOR TEST OF CLOSE FIT (RMSEA < 0.05) = 0.49

EXPECTED CROSS-VALIDATION INDEX (ECVI) = 0.44
90 PERCENT CONFIDENCE INTERVAL FOR ECVI = (0.37 ; 0.52)
ECVI FOR SATURATED MODEL = 0.46
ECVI FOR INDEPENDENCE MODEL = 4.95

CHI-SQUARE FOR INDEPENDENCE MODEL WITH 66 DEGREES OF FREEDOM = 1658.36
INDEPENDENCE AIC = 1682.36
MODEL AIC = 148.68
SATURATED AIC = 156.00
INDEPENDENCE CAIC = 1740.34
MODEL CAIC = 308.14
SATURATED CAIC = 532.89

ROOT MEAN SQUARE RESIDUAL (RMR) = 0.036
STANDARDIZED RMR = 0.036
GOODNESS OF FIT INDEX (GFI) = 0.96
ADJUSTED GOODNESS OF FIT INDEX (AGFI) = 0.93
PARSIMONY GOODNESS OF FIT INDEX (PGFI) = 0.55

NORMED FIT INDEX (NFI) = 0.95
NON-NORMED FIT INDEX (NNFI) = 0.97
PARSIMONY NORMED FIT INDEX (PNFI) = 0.65
COMPARATIVE FIT INDEX (CFI) = 0.98
INCREMENTAL FIT INDEX (IFI) = 0.98
RELATIVE FIT INDEX (RFI) = 0.93

CRITICAL N (CN) = 288.67

Communication / Relational Orientation Model

SUMMARY STATISTICS FOR FITTED RESIDUALS
SMALLEST FITTED RESIDUAL = -0.10
MEDIAN FITTED RESIDUAL = 0.00
LARGEST FITTED RESIDUAL = 0.09

STEMLEAF PLOT
-10|0
- 8|1
- 6|60
- 4|8438500
- 2|83287200
- 0|977773885100000000
0|11112223446677788456789
2|0355577
4|36814
6|3712
8|68

SUMMARY STATISTICS FOR STANDARDIZED RESIDUALS
SMALLEST STANDARDIZED RESIDUAL = -3.56
MEDIAN STANDARDIZED RESIDUAL = 0.06
LARGEST STANDARDIZED RESIDUAL = 4.45

STEMLEAF PLOT
- 3|6
- 2|860
- 1|9954433211110
- 0|97766555443 10000000000
0|11111222233444566667 89
1|000223345679
2|1235
3|
4|4
LARGEST NEGATIVE STANDARDIZED RESIDUALS
RESIDUAL FOR BACKORD AND COMMIT -2.76
RESIDUAL FOR ONTIMED AND COMMIT -3.56
RESIDUAL FOR RELMODE AND RELNORM -2.60
LARGEST POSITIVE STANDARDIZED RESIDUALS
RESIDUAL FOR COMMIT AND RELNORM 4.45

THE MODIFICATION INDICES SUGGEST TO ADD THE

PATH TO	FROM	DECREASE IN CHI-SQUARE	NEW ESTIMATE
COMMIT	RELBEHAV	13.9	0.50
COMMIT	ECONPERF	12.0	-0.22

THE MODIFICATION INDICES SUGGEST TO ADD AN ERROR COVARIANCE

BETWEEN	AND	DECREASE IN CHI-SQUARE	NEW ESTIMATE
COMMIT	RELNORM	15.1	0.14

THE PROBLEM USED 22088 BYTES (= 0.1% OF AVAILABLE WORKSPACE)

TIME USED: 0.5 SECONDS