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THE EFFECT OF VERTICAL NETWORKS ON CHANNEL GOVERNANCE ADAPTATION: A TRANSACTION COST ECONOMICS APPROACH

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ABSTRACT

THE EFFECT OF VERTICAL NETWORKS ON CHANNEL GOVERNANCE ADAPTATION: A TRANSACTION COST ECONOMICS APPROACH

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This dissertation extends transaction cost economics by incorporating a network perspective to investigate the adaptation and safeguarding problems within a vertical network marketing channel. This dissertation extends the transaction cost economics perspective that dyadic relationships are not isolated transactions but are influenced by the network in which they reside and must adapt to structural changes in the network, thereby examining the boundary parameters of transaction cost economics. The adaptation of the governance structure to safeguard the specific assets of the buyer is necessitated by the addition of a new customer by a supplier in the buyer's supplier network. It is proposed that increased centrality of the supplier's new customer in the industry network will increase the buyer's uncertainty and influence the governance decision with the supplier. In addition, the density of the buyer's supplier network influences the governance decision by allowing the buyer to gather information and reduce the uncertainty caused by the addition of the supplier's new customer and reduce the governance cost with the individual supplier. The results of this dissertation provide evidence that dyadic relationships are influenced by the network in which they exist, and a deeper understanding of adaptive governance is gained when a network perspective is integrated with transaction cost economics logic. Four conclusions are drawn from the results of this dissertation. First, the transaction cost economics prescriptions of

increased transaction asset specificity, behavioral uncertainty, and demand uncertainty in a buyer-supplier dyadic relationship lead to increased vertical coordination with a supplier are supported, providing nomological support and internal consistency of the model. Second, supplier new customers occupying a central position in the industry network increase the future buyer demand uncertainty in low demand uncertainty environments and moderate the dyadic governance concerning buyer asset specificity. Third, in low density buyer supplier networks, buyers increase the degree vertical coordination with the supplier in low buyer demand uncertainty and high buyer technological uncertainty environments. However, buyer supplier network density does not influence the buyer's degree of vertical coordination with the supplier concerning buyer asset specificity and behavioral uncertainty, indicating that buyers use their networks to reduce uncertainty external to the dyad but address concerns internal to the dyad directly with the supplier. Finally, buyer supplier network density has a significant influence on governance choice. In low density buyer supplier networks, buyers opted for market governance, and in high density buyer supplier networks, buyers choose to continue purchasing form the current supplier when a new customer is added by the supplier. The dissertation concludes with managerial implications and directions for future research.

DEDICATION

This is dedicated to the memory of my parents:

Janet M. Pollitte

and

William O. Pollitte

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CHAPTER ONE

MOTIVATION FOR THE DISSERTATION

Introduction

Marketing channel governance has received considerable attention in the marketing literature. Traditionally, marketing channel governance research has relied on transaction cost economics to prescribe the efficient form of governance of an exchange relationship (Geyskens et al. 2006; Heide 1994; Rindfleisch and Heide 1997). The majority of the research has concentrated on the dyadic exchange relationship between the buyer and the supplier. In the last two decades, manufacturers have been moving away from the traditional vertical integration form of governance to a network of autonomous suppliers (Achrol and Kotler 1999; Anderson et al. 1994). Companies such as General Motors, Boeing, Ford, Microsoft, and IBM have subcontracted activities vital to their production that were once vertically integrated (Lunsford 2007; Stremersch et al. 2003). Managing a network of suppliers presents buyers with challenges in controlling resources and adapting to changes in the buyer's supplier network as network membership changes. The prominent focus of research on dyadic exchanges in marketing channel literature to date has led to relatively few studies addressing the influence of network organization in the study of channel governance, and authors have called for research integrating a network perspective with transaction cost economics (Geyskens et al. 2006; Wathne and Heide 2004; Williamson 1991).

Transaction cost economics has been useful in prescribing the structure of interorganizational governance based on the transaction cost of safeguarding transaction

specific assets and adapting to environmental uncertainty (Williamson 1985; 1975). The primary proposition that increasing transaction cost leads to vertical integration has received support in the literature (Geyskens et al. 2006; Rindfleisch and Heide 1997). However, transaction cost economics focuses on the dyadic and neglects the influence of other entities in the network. Williamson (1985, p. 393) recognized this limitation, "Although transaction cost economics insistently addresses both ex ante and ex post conditions of the contract,...it normally examines each trading nexus separately...interdependencies among a series of related contracts may be missed or undervalued as a consequence. Greater attention to the multilateral ramifications of contract is sometimes needed." By considering the influence of the network on dyadic relationships, another dimension is added to our understanding of interorganizational governance. Incorporating a network approach with transaction cost economics allows the consideration of optimizing not just a single relationship but a firm's entire network of relationships (Anderson et al. 1994; Geyskens et al. 2006).

Researchers have suggested that to fully understand the dyadic relationship in interorganizational governance, research should incorporate the effect of the network in which the dyadic relationship resides (Achrol 1997; Achrol and Kotler 1999; Anderson et al. 1994; Iacobucci 1996). Research in network governance of marketing channels has begun to address the relationship between dyadic exchange and the influence of network dimensions in buyer-seller relationships. Research applying network analysis to dyadic exchange relationships has investigated channel adaptation (Wathne and Heide 2004), cooperation (Iacobucci and Hopkins 1992), contract enforcement (Antia and Frazier 2001), and stability (Gadde and Mattsson 1987). The results of these empirical studies

suggest that the network where the dyadic relationship resides influences the governance of the focal relationship (Powell and Smith-Doerr 1994), but little research has addressed how exchange relationships adapt to changes in network structure to account for uncertainty and safeguarding of assets invested with members of a buyer's supplier network.

This dissertation investigates the adaptation of dyadic interorganizational governance in a network context due to the addition of a new customer by a supplier in a buyer's supplier network (See Figure 1), thereby extending the analysis of the adaptation and safeguarding problems of transaction cost economics to include a network perspective. The adaptation by organizations to uncertainty in the presence of nontrivial transaction specific assets is a fundamental prescription of transaction cost economics (Williamson 1985; 1975). Failing to adapt the dyadic governance to account for changes in the network structure surrounding the dyad introduces maladaptation costs (Williamson 1991). Considering network effects on dyadic governance provides an efficient means of acquiring information to reduce governance cost. Supplier networks allow purchasing organizations to access information within the network to enhance innovation (Bell 2005; Zaheer and Bell 2005) and provide flexibility to adapt to technological changes within the market (Balakrishnan and Wernerfelt 1986). The ability to adapt to change in a marketing channel organized as a network of autonomous suppliers represents a departure in managing a marketing channel as a vertical integrated organization. The benefits of a network of suppliers are realized from the ability to access information from members of the network and the flexibility of the buyer to add and subtract members to access the advances in technology (Powell and Smith-Doerr

1994). However, the benefits of the network are countered by the loss of control of information (Oxley 1999; Williamson 1991) and dependence on suppliers (Cook and Emerson 1978). To reap the benefits of a network of suppliers and guard against opportunistic behavior, the buyer must strike a balance between sharing and restricting information with suppliers by adapting governance mechanisms as changes in the network arise.

This research postulates that the effect of a supplier in a buyer's supplier network adding a new customer to the network will be contingent on the centrality of the new customer in the industry network and the density of the buyer's supplier network. Supplier new customer centrality is the number of organizations an organization can access independently (Freeman 1979) and translates into the influence an organization has within the industry network (Boje and Whetten 1981). The density of the buyer's supplier network influences the ability of the buyer to access information and is dependent on the extent of interconnection among the organizations of the buyer's supplier network (Coleman 1988). The network dimensions of centrality and density can have considerable influence on the level of uncertainty concerning the governance between the buyer and supplier (Burt 1992b; Coleman 1988). The addition of the new customer by the supplier may require the buyer to adapt the governance with the supplier due to changes in uncertainty and potential of opportunistic behavior. If the supplier's new customer's centrality in the industry network is high, then the level of buyer uncertainty and the threat of information leaking to the new customer will increase, increasing the likelihood the buyer will adapt the governance to reduce uncertainty and safeguard assets. The density of the buyer's supplier network serves to moderate the

uncertainty and potential for opportunism. If the density of the buyer's supplier network is high, then the buyer can gather information through its supplier network to decrease the uncertainty and detect and sanction opportunistic behavior (Granovetter 1985), decreasing the likelihood of the buyer adapting the governance directly with the supplier.

To date, the research of network organization of marketing channels is only beginning to address how dyadic exchange relationships are influenced by other members of a network (Antia and Frazier 2001; Iacobucci 1996; Iacobucci and Hopkins 1992; Wathne and Heide 2004). In a study examining the effect of governance in a supply chain, Wathne and Heide (2004) showed that flexibility of downstream customers was dependent on the governance mechanisms of upstream suppliers. The flexible nature of supplier networks introduces a new form of uncertainty into existing dyadic buyer-supplier relationships. Adaptation of the governance structure to this form of uncertainty is a fundamental issue of network marketing channels. Managers of suppliers and buyers alike confront the possibility of having to renegotiate the governance structure of exchange relationships when a supplier in a buyer's network adds a new customer or incur maladaption costs (Grossman and Hart 1986; Williamson 1991).

Purpose of the Study

The purpose of this study is to extend transaction cost economics by incorporating a network perspective to investigate the adaptation and safeguarding problems within a vertical network marketing channel. As highlighted in the introduction, research investigating interorganizational relationships has focused on dyadic exchange. As organizations have increasingly adopted vertical network marketing channels, the importance of understanding the influences of the network on a dyad within the network

has grown (Geyskens et al. 2006; Wathne and Heide 2004). Analysis of dyads independent of network influences does not provide a complete understanding of the exchange relationship (Achrol and Kotler 1999; Antia and Frazier 2001).

This research extends the analysis of the adaptation and safeguarding problems of transaction cost economics. In this research, the adaptation of the governance structure to safeguard the specific assets of the buyer is necessitated by the addition of a new customer by a supplier in the buyer's supplier network. This research contributes to the literature by extending transaction cost economics by incorporating a network perspective in the analysis of adaptation to unanticipated events of dyadic exchange relationships, thereby examining the boundary parameters of transaction cost economics. As a fundamental paradigm in interorganizational governance, transaction cost economics incorporating network influences provides a greater understanding of exchange relationships in vertical supplier networks where vertical integration is no longer the primary option for controlling transaction costs.

This dissertation is organized as follows. Chapter Two provides an overview of the theoretical background of transaction cost economics and network theory. Chapter Three presents the theoretical model and hypotheses. Chapter Four discusses the research design. Chapter Five presents the results. Chapter Six discusses the theoretical and managerial contributions of the research.

CHAPTER TWO

THEORETICAL BACKGROUND

The understanding of the mechanisms of interorganizational governance in marketing has been greatly influenced by transaction cost economics (Geyskens et al. 2006; Heide 1994; Rindfleisch and Heide 1997; Wathne and Heide 2004). Recent research in marketing has begun to extend transaction cost economics by investigating the effect of being embedded in a network on the dyadic relationship (Anderson et al. 1994; Antia and Frazier 2001; Gadde and Mattsson 1987; Iacobucci and Hopkins 1992; Wathne and Heide 2004). This dissertation builds on this stream of research by incorporating network effects in transaction cost economic analysis of interorganizational relationships and by investigating how a buyer adapts its governance structure due to the addition of a new customer by one of its suppliers in its supplier network. This chapter first presents an overview of the dimensions and behavioral assumptions of transaction cost economics followed by an overview of network theory. The chapter concludes with a discussion of the influence a network has on the classical safeguarding and adaptation problems advanced by transaction cost economics.

Transaction Cost Economics

Transaction cost economics has become a dominant paradigm in the literature for explaining interorganizational governance and belongs to the "New Institutional Economics" paradigm (Rindfleisch and Heide 1997). Coase (1937) proposed that the existence of the firm was due to market failure where the firm is able to organize labor and production more efficiently. Building on Coase's insights, Williamson (1975)

proposed the efficiencies of an exchange were determined by the attributes of the transaction and firms economized on the cost of the transaction rather that the cost of production prominent in neoclassical economics. Transactions cost economics takes the view that exchanges are a form of contract between two exchange partners where the transaction is the unit of analysis. Transaction cost economics incorporates the ex ante costs, such as drafting, negotiating, and safeguarding the contract, and ex post costs, such as monitoring and enforcing the contract. Information asymmetry between the exchange parties complicates the organization and execution of the transaction, increasing the transaction cost of the exchange (Dutta et al. 1999). The governance structure is organized around the transaction to minimize cost and reduce information asymmetry to the actors involved (Williamson 1985). The governance structure is either organized as a market transaction, for simple exchanges, or is integrated into the firm, for complex exchanges. A third form of governance, hybrid governance, where the parties remain autonomous but are dependent, has emerged as a form of governance that is intermediate to market and hierarchical forms of governance (Heide 1994; Williamson 1991).

Transaction cost economics proposes that the dimensions of the exchange determine the most efficient governance structure (Williamson 1985; 1975). Depending on the dimensions of the exchange, transaction cost economics provides a prescription for the choice of governance to minimize transaction cost and exposure to risk. Organizations entering into exchanges are exposed to hazards of opportunism and maladaptation due to an inherent degree of incompleteness of the contract where all possible contingencies cannot be explicitly known in advance (Grossman and Hart 1986; Williamson 1975). Organizations that enter into these exchanges and invest in

transaction specific assets expose themselves to expropriation of these assets and the cost of governance structure misalignment as changes in the external environment occur (Heide and John 1988). As rationale actors, managers of organizations entering into an exchange compare governance structures to minimize the transition costs and choose the most efficient governance form for managing exposure to hazards of opportunism and maladaptation. According to transaction cost economics, the dimensions of the exchange that determine the governance structure are transaction specific assets, environmental uncertainty, behavioral uncertainty, and transaction frequency (Williamson 1985; 1975). In addition, the behavioral assumptions of the actors engaged in the transaction are opportunism, bounded rationality, and risk neutrality (Williamson 1985; 1975). Table 1 presents empirical studies of transaction cost economics of interorganizational relationships. The four dimensions and three behavioral assumptions will discussed individually next.

Dimensions of Transaction Cost Economics. The first dimension is transaction specific assets, or asset specificity. Asset specificity refers to investments that are undertaken in support of a particular transaction, the opportunity cost of which investments is much lower in best alternative uses or by alternative users should the original transaction be prematurely terminated (Williamson 1985). Asset specificity is the principle dimension within transaction cost economics. Asset specificity can be in the form of site specificity, physical asset specificity, human asset specificity, and dedicated assets (Williamson 1985). As asset specificity increases, as part of an exchange, the ability to redeploy the assets decreases and the bilateral dependency between parties increases (Heide and John 1988). As transaction specific assets increase, the potential for

opportunistic behavior increases and leads to a safeguarding problem to prevent expropriation of the assets or ensure collection of rents generated from the assets. A fundamental proposition of transaction cost economics is when asset specificity increases the cost of managing and safeguarding these assets increases (Williamson 1985; 1975). When the transaction costs exceed the cost of market governance, organizations internalize the exchange since the relative transaction cost of hierarchical governance to manage and safeguard these assets is lower than market governance (Anderson 1985; Heide et al. 1998; Williamson 1985; 1975).

The second dimension is environmental uncertainty. Williamson (1985) argues that uncertainty has an influence on the governance structure. He proposes two types of uncertainty, environmental uncertainty which is exogenous to the exchange and behavioral uncertainty which is attributable to human action of the exchange partners. In his classic works, Williamson did not explicitly define environmental uncertainty. Later research, defined environmental uncertainty as unanticipated changes in circumstances surrounding an exchange (Noordewier et al. 1990). Proposing that environmental uncertainty is a multidimensional construct, Walker and Weber (1984) distinguish between demand uncertainty, the inability to accurately forecast the volume requirements, and technological uncertainty, the inability to accurately forecast the technical requirements, as factors that comprise environmental uncertainty. Environmental uncertainty combined with bounded rationality leads to a problem of adaptation due to the incompleteness of contracts to specify all possible contingencies (Grossman and Hart 1986). When asset specificity is present to a nontrivial degree, environmental uncertainty increases the transaction cost due to the need for renegotiation

of contracts (Williamson 1985; 1975). Transaction cost economics proposes that high levels of environmental uncertainty combined with nontrivial asset specificity will lead to a greater degree of hierarchical governance (Williamson 1985; 1975).

The third dimension is behavioral uncertainty. Behavioral uncertainty is defined as the difficulty in ascertaining ex post whether contractual compliance has taken place (Williamson 1985; 1975). Behavioral uncertainty combined with bounded rationality leads to a performance evaluation problem. As behavioral uncertainty increases the cost of monitoring supplier compliance increases, and buyer can exert greater control at a lower cost within the organization to monitor compliance. Transaction cost economics postulates that as behavioral uncertainty increases, in the presence of nontrivial asset specificity, the likelihood of vertical integration increases (Buvik and John 2000; Williamson 1985; 1975).

The fourth dimension is transaction frequency. Transaction frequency refers to how often transactions occur between exchange partners. Williamson (1985, p. 60) recognized the importance of transaction frequency and that 'specialized governance structures are more sensitively attuned to the governance needs of nonstandard transactions than are unspecialized structures.' For recurring transactions, investments in specialized assets will be easier to recover for larger transactions. Thus, transaction cost economics postulates a conditional effect. If asset specificity is nontrivial, then the cost of hierarchical governance for a high transaction frequency will be higher than the cost of market governance, leading to hierarchical governance (Williamson 1985; 1975).

Behavioral Assumptions of Transaction Cost Economics. The first behavioral assumption of transaction cost economics is bounded rationality. Bounded rationality is

the semi-strong form of rationality where economic actors are 'intentionally rational, but only limitedly so' (Simon 1961). The semi-strong form stipulates that human minds are limited cognitively and do not have access to all available information. Thus, concerning governance structure decisions, economic actors assign transactions in a discriminating way (Williamson 1985). Bounded rationality when combined with uncertainty, both environmental and behavioral, operates in the ex ante and ex post phases of the exchange. In the ex ante phase, it limits economic actors from writing complete contracts that account for every possible future contingency (Grossman and Hart 1986). In the ex post phase, it creates a performance evaluation problem in regards to contract compliance and adaptation to changes in the external environment. Transaction cost economics postulates that uncertainty, both behavioral and environmental, increases the cost to monitor and adapt contracts will increase, leading to a desire for greater control and a greater likelihood of hierarchical governance (Williamson 1985; 1975)

The second assumption is opportunism. Opportunism is defined as 'self-interest seeking with guile' (Williamson 1985; 1975). Opportunism is the strong form of self-interest and includes, but is not limited to, blatant forms, such as lying, stealing, and cheating and subtle forms of deceit. Opportunism can be present either ex ante or ex post (John 1984; Wathne and Heide 2000). Ex ante opportunism may involve deliberate misrepresentation, due to information asymmetry, by parties during the negotiation of an exchange, leading to a problem of adverse selection. Ex post opportunism involves violations of the contract over the duration of the agreement, leading to a problem of moral hazard. Transaction cost economics postulates that in situations where asset specificity is nontrivial the cost to protect against opportunism will increase, leading to a

desire for greater control and greater likelihood of hierarchical governance (Provan and Skinner 1989; Rokkan et al. 2003; Williamson 1985; 1975).

In the study of interorganizational relationships, opportunism emerges as a central construct and is increasingly relevant in the presence of nontrivial asset specificity. In conjunction with the adaptation problem, Williamson (1993) notes that bounded rationality alone would never give rise to the interesting economic organization problems in the absence of opportunism. Without considering opportunism, parties to a contract could adjust to unanticipated disturbances by self-enforcement of agreements and no ex post maladaption problems would arise. However, considering opportunism, where each party will attempt to maximize its position due to unanticipated events introduces substantial governance costs into the organization of interorganizational relationships. Since partners to an exchange are well-socialized, opportunism is not present in each transition; however, transaction cost economics recognizes that a partner may act opportunistically (Williamson 1993).

The third assumption is risk neutrality. Risk neutrality is the least studied of the three assumptions. Williamson (1991) conceptualizes risk neutrality as a point where firms are indifferent between market and hierarchy governance, and researchers have interpreted risk neutrality as defined in neoclassical economics (Chiles and McMackin 1996). Contrasting risk neutrality to risk adverse and risk seeking positions, a risk neutral position assumes a position between the two extremes. Chiles and McMackin (1996) propose that the risk position a firm takes will influence the choice of governance relative to the asset specificity level. Firms that are risk seeking will continue to transact in the market at higher levels of asset specificity than risk neutral or risk adverse firms, and risk

adverse firms will vertically integrate at lower levels of asset specificity than risk neural or risk seeking firms.

Extensive empirical studies have been conducted using the transaction cost economics framework in the business disciplines of accounting, finance, marketing, and organizational theory, as well as, law, political science and economics (David and Han 2004; Geyskens et al. 2006; Rindfleisch and Heide 1997; Shelanski and Klein 1995). This body of research has been generally supportive of governance choice being largely determined by the cost of transactions and the characteristics underlying the framework. In qualitative studies of the tenants of transaction cost economics (David and Han 2004; Rindfleisch and Heide 1997; Shelanski and Klein 1995), strong support is found for propositions concerning asset specificity and the safeguarding of these assets from opportunistic behavior. Mixed support is offered for the role of governance concerning environmental uncertainty and adaptation and behavioral uncertainty and performance evaluation proposed by transaction cost economics. In a quantitative meta-analysis, Geyskens, Steenkamp and Kumar (2006) find strong support for the role of governance in asset specificity and the safeguarding problem. The authors find that elevated volume and behavioral uncertainty promote a choice of hierarchal governance over market governance. Conversely, increased technological uncertainty promotes market governance over hierarchical governance, suggesting organizations desire flexibility to adapt to new technology. In addition, the authors suggest that relational governance may be a more suitable alternative than market governance when an organization is confronted with high volume or technological uncertainty if it is embedded in a network that allows a firm the flexibility of using different production facilities and access to alternative

technology. The results of these qualitative and quantitative studies, comprised of 30 years of empirical research, demonstrates the usefulness of transaction cost economics as a robust approach for predicting interorganizational governance choice.

Governance Forms. Williamson (1985; 1975) originally proposed two forms of governance structure, market and hierarchy, culminating from the attributes of the transaction. A fundamental proposition of this conceptualization is as transaction costs exceed the cost of governing a market exchange, organizations would internalize the exchange in the form of vertical integration. Further refinement of the outcome of exchange led to an intermediate form of hybrid governance, where two organizations engaged in the exchange remained independent but incorporated some of the features of market and hierarchical governance (Williamson 1991). Williamson (1991) argues that the form of governance in a bilateral relationship will be determined by a combination of the transaction specific assets and governance cost arising from adaptation. Figure 2, adopted from Williamson (1991), shows the relationship between asset specificity and governance cost and the resulting governance structure. In this conceptualization, the most efficient governance structure depends on the level of asset specificity invested in the relationship by each of the partners. If k^* is the optimal value of k, where k is the level of asset specificity invested in the exchange relationship, then the efficient level of asset specificity is use markets for $k^* < \bar{k}_1$, use hybrids for $\bar{k}_1 < k^* < \bar{k}_2$, and hierarchy for $k^* > \bar{k}_2$. Moving to the right along the curves implies increasing governance cost and escalating application of controls for governing the relationship. Increasing governance costs due to adaptation have the effect of shifting the optimal value of k^* to the left, and decreasing governance costs shift the optimal value of k^* to the right. For instance, in the

vicinity of $\bar{k}_2$, decreases in governance cost would shift $\bar{k}_2$ to the right, increasing the asset specificity level that hybrid governance would support. Conversely, increases in governance cost would shift $\bar{k}_2$ to the left, decreasing the asset specificity that hybrid governance would support.

The distinguishing characteristics of the three governance structures are the costs of different coordination and control mechanisms and the ability to govern transactions. Accordingly, the governance costs are dependent on the asset specificity of the exchange and the need to protect these assets in the face of uncertainty (Williamson 1991). Uncertainty increases the governance costs due to the threat of expropriation and leakage of information. As expropriation and leakage hazards increase, the amount of transaction specific assets needed to support hybrid governance decreases in favor of hierarchical governance. In other words, as the cost of adapting to uncertainty increases, organizations will tend to favor hierarchical governance as the efficient form of governance for decreasing levels of asset specificity.

Heide (1994) further refined the conceptualization of governance structure by providing a typology of market, unilateral/hierarchical, and bilateral governance forms accompanied with the distinguishing features in the imitation, maintenance, and termination phases of the exchange relationship. In a unilateral form of interorganizational governance, the exchange parties remain separate and one party is granted authority to develop rules and make decisions. Disputes are managed internal to the relationship and contracts are used to enforce compliance of the exchange. In bilateral interorganizational governance, exchange parties develop closer ties with overlapping roles and joint responsibilities, providing a framework for subsequent

adaptation through mutual adjustment (Macneil 1980), and agreements are enforced through the use of common interests and expectations of future continuance (Heide and Miner 1992).

Network Theory

A dyadic relationship between a buyer and a supplier does not exist in isolation impervious to unanticipated external events. An important factor influencing an organization's environment is the network in which it resides (Powell and Smith-Doerr 1994). The dyad exists as part of a larger network of buyers and suppliers. Conceptually, a network consists of large number of actors and the pattern of relationships that tie them together (Iacobucci and Hopkins 1992). For example, in the automotive industry, U.S. automakers use an extensive network of independent suppliers (Dyer 1996b), ranging from suppliers of standardized components to collaborative research and development (Sako and Helper 1998). Networks contain a multitude of individual dyads linking suppliers to other suppliers and buyers. When a supplier adds a new customer, the dyadic relationship between the supplier and the buyer is influenced by the change to the buyer's supplier network. The change in the network will introduce uncertainty and the potential for opportunistic behavior if nontrivial asset specificity is present in the dyadic relationship between a buyer and supplier (Antia and Frazier 2001; Wathne and Heide 2004). Accounting for the influence of the network moves transaction cost economics beyond the analysis of discrete exchanges and incorporates a perspective based on the position of other economic actors in a network and the structure of a network.

This section introduces concepts from network theory and the influence these dimensions have on the degree of uncertainty and the potential for opportunism experienced in a dyadic exchange relationship between a buyer and supplier. Specifically, the focus of this section will be on the structural constructs of centrality and density. Where centrality refers to the position an organization occupies in a network, and denotes the extent to which the organization occupies a strategic position in a network by virtue of being involved in many significant ties (Wasserman and Faust 1994). Density is the extent of interconnection among the actors of a network (Coleman 1988). An organization's position in a network (centrality) and structural characteristics of a network (density) affects the firm's ability to access information (Gnyawali and Madhavan 2001) and changes in the position of firms within a network introduces uncertainty to other members of the network (Gadde and Mattsson 1987). This section proceeds with a discussion on the use of network theory in the marketing literature, a definition of networks, the constructs of centrality and density of a network, and the application of network theory to the safeguarding and adaptation problems of transaction cost economics.

Network Definition. Originating in the field of sociology, network theory has been used extensively in organizational theory to investigate relationships between individuals and organizations (Parkhe et al. 2006). In the organizational theory literature, networks have been described as "network organization" (Miles and Snow 1986), "network forms of organization" (Powell 1990), "interfirm networks" (Uzzi 1997; Uzzi 1996) and "quasi-firms" (Eccles 1981). Network theory has grown in its use in the marketing literature (Achrol and Kotler 1999), and has been applied to the structure of

marketing organizations (Achrol 1991), dyadic business relationships (Anderson et al. 1994; Antia and Frazier 2001; Gadde and Mattsson 1987; Iacobucci and Hopkins 1992; Wathne and Heide 2004), and relationship marketing (Hakansson and Snehota 1995; Iacobucci 1996; Moller and Wilson 1995). In dyadic relationships between buyers and suppliers, networks provide a form of governance structure intermediate to pure market and hierarchical governance (Jones et al. 1997). Network structure influences the power and cooperation within dyads (Iacobucci and Hopkins 1992) and access to information in new product alliances (Rindfleisch and Moorman 2001). While the majority of research has focused on the relational or structural aspects of network theory for either coordinating or governing relationships, less research has been directed at the effect networks have in introducing or controlling uncertainty in dyadic relationships. Researchers have urged multi-level analysis of relationships at the firm and network levels to enhance the richness of theory development of dyadic interorganizational relationships (Achrol 1997; Achrol and Kotler 1999; Iacobucci and Hopkins 1992).

Researchers in the marketing literature have offered varying definitions of network organization (Anderson et al. 1994; Antia and Frazier 2001; Iacobucci and Hopkins 1992). Fundamentally, a definition of network organization includes the existence of two or more economic actors and the pattern of ties between the actors. Achrol and Kotler (1999) define a network organization as:

> An independent coalition of task- or skill-specialized economic entities (independent firms or autonomous organizational units) that operates without hierarchical control but is embedded, by dense lateral connections,

mutuality, and reciprocity, in a shared value system that defines "membership" roles and responsibilities.

The definition recognizes the important feature of embeddedness which differentiates it from other forms of organization (Granovetter 1985), and the dependence of organizations on other firms in the network connected by either direct or indirect ties (Cook and Emerson 1978).

Achrol and Kotler (1999) further distinguish between four types of network organizations: *vertical* networks, *internal* networks, *intermarket* networks, and *opportunity* networks. The function of each network and examples of research are presented in Table 2. Achrol and Kotler (1999) define a vertical network as:

> A group of resource firms specializing in the various products, technologies, or services that constitute the inputs of a particular industry, organized around a focal company (sometimes a "virtual" company) that focuses on monitoring and managing the critical contingencies faced by the network participants.

In this conceptualization, the network consists of suppliers and distributors organized around a focal firm (buyer). The focal firm performs few manufacturing functions and serves as an "integrator" to organize and coordinate the organizations in the network (Achrol and Kotler 1999). The ability of the buyer to organize the network allows the buyer to change membership of the network to meet the buyer's needs and sanction members for behavior contrary to the shared expectations of the network (Granovetter 1985; Rowley 1997).

A vertical network organized around a focal organization develops a group identity with shared routines, technology, and behavioral expectations (Dyer and Nobeoka 2000). Organizations within the vertical network share technology and develop procedures to transfer knowledge among the members to enhance innovation (Bell 2005; Zaheer and Bell 2005). The vertical network constitutes a resource to the focal organization and a source of competitive advantage in the marketplace (Achrol 1997; Achrol and Kotler 1999). Being a source of competitive advantage, the focal organization may react with a sense of trepidation when suppliers work with organizations outside the network. Suppliers working with organizations outside the network may provide information to their new customers that may erode the competitive advantage of the focal organization. The intrusion of a supplier's new customer into the network suggests that the focal organization may perceive an increased threat of opportunism and increased uncertainty about the intentions of the new customer. To reduce the threat of opportunism and uncertainty, the focal organization will need to adapt its dyadic relationships with suppliers engaging in sales to organizations new to the network.

Network Centrality. Network theory builds on the perspective that economic actions are influenced by the social context in which they are embedded and are influenced by the position of organizations in the network (Gulati 1998). Network theory focuses on informational and control advantages accorded organizations by virtue of their relational[1] and structural embeddedness within the network. The relational and structural embeddedness perspectives often overlap, since control advantage can arise from control

[1] Relational embeddedness is defined as the 'personal relationships people developed with each other through a history of interactions.'

of information (Burt 1992b). Relational embeddedness stresses the informational benefits of direct ties for gaining fine-grained information (Krackhardt 1992) where organizations possess common information and knowledge of each other and organizations develop a shared understanding of behavior that influence their actions (Coleman 1988). Structural embeddedness emphasizes the informational value of occupying a position in the network where information flows through not only the individual ties, but also through the network itself (Gulati 1999; Gulati 1995b).

Structural embeddedness is defined as the 'impersonal configuration of linkages between people or units' (Nahapiet and Ghoshal 1998). The informational benefits of structural embeddedness are dependent on the centrality and density of the network, as measured by the number of ties between organizations[2], where firms with a greater number of ties have access to greater amounts of information (Coleman 1988; Krackhardt 1992). The centrality of an organization and the density of the network capture the informational and control benefits of network position and structure (Coleman 1988; Krackhardt 1992). Table 3 presents empirical studies of network centrality and density.

Centrality has been measured as of degree of centrality, closeness, and betweenness (Freeman 1979; Krackhardt 1992; Wasserman and Faust 1994). Degree of centrality is the simplest measure of centrality and refers to the number of ties with other organizations in the network. Freeman (1979) conceptualized degree of centrality as a measure of activity. From an exchange perspective, the degree measure of centrality represents the number of alternatives available to an organization. Closeness is the

[2] Ties between organizations are categorized as either weak or strong ties. The difference in the ties rests on the magnitude and content of information accessed through the ties with other organizations, such as the frequency, intensity, and configuration.

organization's ability to access independently all other members of the network, and provides a measure of how quickly an organization can interact with other firms in receiving and communicating information (Freeman 1979). Closeness is interpreted as a measure of efficiency and the ability to avoid the control of others. Betweenness is the degree to which an organization lies between other organizations (Wasserman and Faust 1994). Betweenness measures the extent to which actors fall between pairs of other organizations on the shortest path connecting them (Freeman 1979) A central organization occupying a position between other organizations has the ability to mediate a communication between other organizations by withholding or distorting information (Burt 1992b).

Figure 3 presents a ten organization network (Cook et al. 1983). For closeness and betweenness measures of centrality, organization A occupies the most central location in the network followed by organizations B_1, B_2, and B_3 then organizations C_{1a}, C_{1b}, C_{2a}, C_{2b}, C_{3a}, and C_{3b}. Measuring the direct linkages only, the degree of centrality for organizations A and organizations B_1, B_2, and B_3 are equal but greater than organizations C_{1a}, C_{1b}, C_{2a}, C_{2b}, C_{3a}, and C_{3b}. By being situated between organizations B_1, B_2, and B_3, organization A is able to independently access and mediate information between each of the B_x organizations. Through each of the organizations (B_1, B_2, and B_3), organization A is also able to indirectly access each of the C_{xy} organizations. In this network, organization A has greater access to more sources of information and control of

information and is potentially more powerful than the other members of the network (Brass and Burkhardt 1992; Freeman 1979).

Centrality is associated with an organization's status within the network (Podolny 1993). The status of a central organization signals to other members of the network its reputation as a potential exchange partner (Raub and Weesie 1990). The ability to signal to other members of the network reduces uncertainty and search costs when developing relationships with central organizations (Gulati 1995b). Having greater access to information elevates the influence of an organization within the network (Boje and Whetten 1981). A central organization's influence stems from its position in the network and its ability to broker the flow of valued resources and mobilize resources controlled by others (Raub and Weesie 1990). By being situated between organizations, a central organization has access to unique information from multiple sources (Shan et al. 1994; Van de Ven 1986), thereby enhancing its ability to innovate (Powell et al. 1996) and attract other trustworthy prospective partners (Gulati 1995a).

Network Density. In addition to centrality, density influences an organization's ability to access and control information. Coleman (1988) argues networks that are densely embedded with many connections between organizations allow for robust and collective action, convey norms of exchange, and facilitate the accrual of obligations. In high density networks, information and resources spread quickly and efficiently because of the many interconnections and shared routines for information collection and distribution amongst the network's members (Coleman 1990; Rowley 1997; Valente 1995). As shown in Figure 4, in a dense vertical network, information can be shared between the Tier 1 suppliers and Tier 2 suppliers without having to involve the buyer. In

contrast, in a low density vertical network, information is not shared between the Tier 1 and Tier 2 suppliers and must flow through the buyer. Norms between the exchange partners form patterns of exchange and produce shared behavioral expectations and develop a perception of legitimacy (Galaskiewicz and Wasserman 1989). Dense networks enhance the ability to monitor actions of other firms, coordinate pressure to conform to expectations of other network members, and apply effective sanctions since they amplify the reputation effects of sanctions (Coleman 1990).

Safeguarding Problem in a Network Context. The safeguarding problem arises, according to transaction cost economics, due to the deployment of nontrivial specific assets and the possibility that a partner may act opportunistically to exploit those investments (Williamson 1985; 1975). Transaction cost economics proposes that increases in asset specificity lead to increases in the costs to safeguard these assets, and when these costs exceed the cost of purchasing the product in the market, organizations should vertically integrate to safeguard these assets against opportunism hazards (Williamson 1985; 1975). In addition to using vertical integration to govern the exchange, research has shown that relational governance can serve to safeguard transaction specific assets from opportunism in interorganizational relationships where vertical integration may not be possible (Dyer 1997; Heide and John 1992; Heide and John 1988; John 1984). In a vertical network, the history of transactions between firms leads to the emergence of shared values (Uzzi 1997) and trust between the organizations increases with greater interaction (Gulati 1995a). As shared values and trust between exchange partners develop, network governance can serve in place of vertical integration (Cannon et al. 2000).

Centrality of the organization and the density of the network reduce opportunism in network governance (Coleman 1988; Granovetter 1985). A firm occupying a central location within a network is less likely to act opportunistically due to detrimental effects to its reputation (Raub and Weesie 1990) and is more likely to detect opportunistic behavior due to greater access to information (Walker et al. 1997). Reputational concerns create self-enforcing safeguards and can substitute for contractual safeguards (Bradach and Eccles 1989; Powell 1990), where immediate short-term gains to an organization are offset by loss of reputation and future costs (Williamson 1991). A firm's reputation signals to other organizations its attractiveness as a potential supplier and its indirect ties serve as a system of referral to screen potential suppliers through other network members with past relationships with the potential supplier (Gimeno 2004; Gulati 1999). A centrally positioned firm can also influence the behavior of other firms within the network due to greater dependence of these organizations on the central firm in the network. In a study of Toyota's supplier network, Dyer and Nobeoka (2000) found that Toyota is able to influence its suppliers by building strong network identity and coordinating rules. Toyota not only enhances its reputation by managing the network, but also enhances the reputation of the other members in the network.

In dense networks where network members are interconnected, information about one member's opportunistic behavior diffuses rapidly through the network to other members (Granovetter 1985). Dense networks facilitate the emergence of norms (Adler and Kwon 2002) and common behavioral patterns (Coleman 1990). Violations of shared norms are more likely to be detected and sanctions for opportunistic behavior are more easily imposed in dense networks (Walker et al. 1997). Dense networks not only reduce

the risk of opportunistic behavior in the focal relationship, due to the threat of reputation loss, but also in relationships with other organizations (Gulati 1995a). In dense networks, common norms develop and improve mutual understanding among the members, lowering the possibility of opportunistic behavior and is key to safeguarding specific assets and substitutes for contractual safeguards (Bradach and Eccles 1989; Jones et al. 1997; Kale et al. 2000).

By reducing the likelihood of opportunistic behavior, centrality and network density lower the cost of transaction governance. Occupying a central location allows a firm to access more information efficiently and accords the firm a high status and reputation (Podolny 1993; Williamson 1991). Acts of opportunism in a dense network are transmitted quickly through the network, which diminishes the reputation of centrally located firms. The combination of the potential cost of tarnishing the firm's reputation and lower cost of obtaining information lower the cost of governance. In network governance, the lower governance cost supports a greater investment in transaction specific assets before the optimal cost of governance would require hierarchical governance (Williamson 1991).

Adaptation Problem in a Network Context. Transaction cost economics states that an adaptation problem is created when an organization's managers, due to bounded rationality, have difficulty in modifying contractual agreements when changes in the external environment occur (Williamson 1985; 1975). The adaptation problem is further complicated in the presence of nontrivial transaction specific asset investments by exchange partners. According to transaction cost economic logic, the solution in conditions of high environmental uncertainty is to vertically integrate to minimize the

transaction costs of adapting to the changes in the environment surrounding the exchange (Williamson 1985; 1975). Research has shown that relational governance can also serve to reduce environmental uncertainty and lower the transaction cost of adapting in buyer-supplier relationships (Noordewier et al. 1990). The ability to access information through a network reduces the environmental uncertainty facing the organization and decreases the cost of governing the relationship by decreasing the need to implement hierarchical governance (Gulati 1999).

The same attributes of centrality, access to information, influence, and reputation, in a network that limit opportunism, also influence the environmental uncertainty facing an organization. In a study examining the effect of unanticipated events on organizations, Madhavan, Koka, and Prescott (1998) found that centrality was a significant factor in ascertaining the uncertainty concerning the event, suggesting that occupying a central position in the network provides greater access to information. The status of occupying a central location signals to other organizations the firm's reputation as a potential partner (Podolny 1993). In the selection of partners for alliances, referrals and reputation provide self-selection criteria to limit potential partners for centrally located firms (Gulati 1995b). Having knowledge of prior relationships of a potential supplier's behavior with other firms reduces the uncertainty in forming a relationship with the firm, lowers search costs, and monitoring costs (Kogut et al. 1992; Powell et al. 1996).

A dense network reduces the cost to discover information and lowers search costs (Coleman 1988). Dense networks with many linkages between organizations reduce uncertainty and promote adaptation by increasing communication and information

sharing (Kraatz 1998). Organizations in dense networks have access to greater amounts of information than in sparse networks, due to greater interconnectedness between members of the network (Coleman 1988). Networks provide firms with flexibility to manage volatile environments and quickly adapt to changing market conditions by changing links between members in the network (Gulati 1999). Conversely, in sparse networks, information may be clustered in groups, each with divergent information, or the network may lack information, thereby increasing the environmental uncertainty of an organization.

Firms reduce their environmental uncertainty by being centrally located within a dense network. By being centrally located, firms have greater access to information and screen potential partners through referral from other partners and self-selection of perspective partners. Using a dense network, organizations can gather information efficiently by using the network to reduce environmental uncertainty. Reducing environmental uncertainty in the transaction, reduces the cost of governance in hybrid interorganizational exchanges, and lower cost of governance increases the investment in transaction specific assets the exchange can support before the optimal cost of governance would require hierarchical governance (Williamson 1991).

Summary

Transaction cost economics has provided a wealth of information concerning our understanding of the attributes of a transaction that lead to the interorganizational governance structure (David and Han 2004; Geyskens et al. 2006; Rindfleisch and Heide 1997; Shelanski and Klein 1995). However, a majority of the research has concentrated on the dyadic relationship as the unit of analysis neglecting factors influencing the focal

dyad based on where it resides within a network context. Researchers in marketing have begun to examine the influence of network factors on dyadic exchanges (Anderson et al. 1994; Antia and Frazier 2001; Gadde and Mattsson 1987; Iacobucci and Hopkins 1992; Wathne and Heide 2004), and research has shown that including network factors enhances the understanding of mechanisms influencing the outcomes of dyadic relationships. A source of environmental uncertainty in an interorganizational exchange is a change in the structure of the network in which the dyadic relationship resides. A change in the network causes the governance structure to shift to a state where it is no longer the most efficient form of governance, at which point the partners will seek to adapt the terms of the exchange to a new governance structure to curb the potential for opportunism and reduce maladaptation cost. In Chapter 3, a model of adaptation and safeguarding is developed based on the transaction cost economics paradigm with the inclusion of the constructs of centrality and density from network theory to explain the change in governance structure of a buyer-supplier interorganizational exchange.

CHAPTER THREE

THEORETICAL MODEL AND HYPOTHESES

This study investigates the adaptation of governance structure in buyer-seller relationships. The adaptation problem in transaction cost economics addresses how organizations manage ex post environmental uncertainty (Williamson 1985; 1975). Adaptation to change is a critical issue in the study of interorganizational governance (Williamson 1991). This study focuses on the governance of an exchange relationship where the buyer and the supplier are autonomous organizations in a vertical network (Achrol and Kotler 1999). Adaptation of the governance structure is required when an extraneous event causes imbalance in an existing dyadic governance structure introducing maladaption costs (Williamson 1985). A source of environmental uncertainty for the dyadic relationship can be caused by a change in the structure of the network in which the relationship resides. Specifically, for the purpose of this study, the event introducing environmental uncertainty in the dyadic relationship is the addition of a new customer by a supplier in the buyer's supplier network. The addition of a new customer by a supplier will necessitate that the governance structure between the buyer and the supplier adapt to accommodate the new customer in the buyer's supplier network. It is hypothesized that the structural characteristics, i.e., centrality of the new customer in the industry network and density of the buyer's supplier network, will moderate the attributes of the exchange, thereby leading to adaptation of the governance structure.

The addition of a new customer by a supplier to the network is analyzed from the perspective of the buyer. Figure 5 presents the model for the adaptation of the governance structure between the buyer and a supplier based on the buyer's asset

specificity, behavioral uncertainty, demand uncertainty, and technological uncertainty. It is hypothesized that centrality of the supplier's new customer will be positively associated with the buyer's demand and behavioral uncertainty and will moderate the relationship between buyer asset specificity and governance, and the density of the buyer's network moderates the relationships of buyer asset specificity, behavioral, demand, and technological uncertainty with governance. Since the buyer's supplier network is a source of information, the buyer's access to information will reduce the need for vertical coordination. If the density of the buyer's supplier network is high, then the buyer can access more information from the network than from a network with a low density, thereby reducing the uncertainty of the buyer.

The following section presents the formal hypotheses for buyer asset specificity, behavioral uncertainty, demand uncertainty, and technological uncertainty incorporating the effect of the centrality of the supplier's new customer in the industry network and the buyer's supplier network density. To provide nomological validity and internal consistency of the model, the transaction cost economic variables are incorporated in the model and later tested in the experimental design.

Hypothesis Development

Buyer Asset Specificity. Transaction cost economics postulates as a buyer's investments in transaction specific assets increase, the buyer should increase the degree of vertical coordination with a supplier (Williamson 1985; 1975). In a supplier network, vertical coordination involves the sharing of proprietary information, such as technical specifications, marketing plans, and product development, with a supplier. Sharing this information with an independent external party, the buyer loses a degree of control over

the information shared with the supplier. As the buyer's investments with the supplier increase, the buyer is at increasing risk of opportunistic behavior on behalf of the supplier and greater vertical coordination is required to protect these assets for expropriation. The information exchanged with the supplier may included the transfer of explicit as well as tacit information between the buyer and the supplier (Stremersch et al. 2003). Tacit information is particularly important for the buyer to protect from misuse, since it may involve skills and experience that may form a basis of the buyer's competitiveness (Simonin 1999). As suppliers expand their customer base, an indirect link to the buyer and access to information passed to the supplier is established. Having less control over the information passed to the supplier, than if the component were vertically integrated, the buyer faces an enhanced risk of expropriation by a supplier's new customer of assets and information shared with the supplier and a threat to the buyer's competitiveness (Williamson 1991).

To decrease the increased hazard of information leakage, the buyer will need to increase the degree of vertical coordination with the supplier and incur an increase in the cost of governing the relationship with the supplier (Williamson 1991). Direct costs to the buyer to curtail information leakage include the implementation of new procedures and policies with the supplier (Pilling et al. 1994), cost of renegotiating purchase agreements, and amending confidentiality agreements (Artz and Brush 2000). An indirect cost to the buyer is loss of future sales by actions taken by the supplier's new customer acting on the information supplied by the buyer to the supplier (Kim et al. 2006). Information leaking to the supplier's new customer may include strategies, competitive benchmarking, codified knowledge, and tacit knowledge in skills and

routines (Oxley and Sampson 2004; Polanyi 1966). Consider the situation where the supplier produces a highly customized component for the buyer. If the buyer is obligated to supply critical information, such as trade secrets, to the supplier for the engineering and production of the component, then the buyer may lose control over the information. The supplier may be able to expropriate a portion of the buyer's investment in servicing the new customer. The situation is of particular importance when the specific asset investment by the buyer is substantial.

When substantial assets are invested by the buyer, increased vertical coordination with an individual supplier is necessitated when managing a network of suppliers. The prevention of information leakage provided by a contract is limited ex ante (Grossman and Hart 1986) as contingencies not accounted for arise when a supplier adds new customers (Achrol and Gundlach 1999). To prevent potential information leakage to a supplier's new customer, greater coordination is required to offset ex post opportunism when nontrivial specific assets are invested in the exchange relationship. In buyer-seller exchange relationships, research has shown that organizations use pledges (Anderson and Weitz 1992), joint action (Heide and John 1990), relational norms (Cannon et al. 2000; Heide and John 1992), and vertical integration (Levy 1985; Masten 1984; Masten et al. 1991) to protect against ex post opportunism. This suggests that buyers will increase the degree of vertical coordination as investments in transaction specific assets increase to curtail opportunism, expropriation of these assets, and leakage of proprietary information by the supplier.

H_1: As buyer asset specificity increases, vertical coordination with the supplier increases.

Buyer Performance Ambiguity. As an independent entity, a supplier is not under the direct control of the buyer, as would be the case if production of the component were vertically integrated. The diminished degree of control over the supplier creates behavioral uncertainty for the buyer. Behavioral uncertainty arises with the supplier due to the potential of opportunistic inclinations on behalf of the supplier (Stinchombe 1985), and combined with the buyer's managers bounded rationality, creates a performance evaluation problem for the buyer (Williamson 1985; 1975). Having an alternative customer decreases the supplier's dependence on the buyer and increases the potential of opportunistic behavior by the supplier (Yamagishi et al. 1988). Bounded rationality of the buyer's managers limits the ability of the buyer to accurately assess the supplier's performance, creating performance ambiguity. Performance ambiguity is the difficulty of accurately measuring ex post the exchange partner's compliance with expected output (Williamson 1985; 1975). Ouchi (1980) argues that output-based measures be supplemented with control mechanisms to control behavioral uncertainty when performance ambiguity increases. To reduce performance ambiguity, the buyer must increase the monitoring of the supplier's performance to ensure the supplier conforms to the contractual agreement (Andersen and Buvik 2001; Heide and John 1990). Monitoring decreases the information asymmetry between the buyer and the supplier; however, as monitoring the supplier becomes more time consuming transaction costs increase for the buyer.

Managing a network of suppliers, it is particularly important for the buyer to monitor suppliers as suppliers add new customers to ensure the obligations to buyer are met by the supplier. The ability of monitoring to serve as a control mechanism is

dependent on the availability of information (Stump and Heide 1996), and performance ambiguity increases as the product delivered by the suppliers becomes increasing intangible and complex (Houston and Johnson 2000). For monitoring to be successful, the object of the monitoring needs to visible to the buyer. If the buyer cannot distinguish the performance level of the supplier, then the cost of monitoring increases. With increasing levels of complexity, the ability of the buyer to write complete contracts deteriorates (Grossman and Hart 1986) and performance ambiguity increases. Increased performance ambiguity will require the buyer to pursue active mechanisms of observation to ensure supplier compliance. Under such conditions, buyers have resorted to greater interfirm coordination (Andersen and Buvik 2001), joint venture formation (Houston and Johnson 2000), and vertical integration (Anderson 1985; Anderson and Schmittlein 1984) as forms of governance to reduce performance ambiguity. Increasing monitoring efforts reduces performance ambiguity and the incentive of the supplier to act opportunistically (Heide and John 1990). Increased monitoring of the supplier increases the buyer's ability to detect opportunistic behavior and decreases the incentive for the supplier to act opportunistically. This suggests that buyers managing a network of suppliers will increase vertical coordination with suppliers as the performance ambiguity increases.

H_2: As buyer performance ambiguity increases, vertical coordination with the supplier increases.

Buyer Demand Uncertainty. Demand uncertainty combined with bounded rationality creates an adaptation problem for the buyer (Williamson 1991; 1985; 1975). The demand uncertainty facing the buyer includes not only the volatility of the buyer's market, but also the buyer's share of the market. Bounded rationality limits the ability of

the buyer's managers to accurately forecast market demand. In a study of automotive manufacturing, Walker and Weber (1984) found that when demand is difficult to accurately forecast, the likelihood of implementing mechanisms of internal control increases. Vertical integration as a means to reduce demand uncertainty is supported in studies by Levy (1985) and Leiblein and Miller (2003). Similarly, in distribution channel research, the buyer's likelihood of using direct channels (John and Weitz 1988) and backward integration (Lieberman 1991) increases with demand uncertainty.

In a network context, the demand uncertainty in the exchange relationship facing the buyer increases with the addition of a new customer by a supplier in the buyer's supplier network. The addition of a new customer reflects a change in the capacity of the supplier base in the overall industry. The change in supplier base capacity, may signal changes in the demand for the end product and reduce the ability of the buyer to forecast future demand requirements. By adding the supplier, the new customer may be embarking on a strategy to increase its market share, thereby increasing the volatility of the market. Increases in demand uncertainty may cause fluctuations in the buyer's demand, and by relying on the supplier, the buyer may experience shortages or excess inventory. The buyer will need to negotiate an increased number of contingencies with the supplier ex post (John and Weitz 1988), and renegotiation increases the costs of the exchange by requiring adaptation of existing routines, procedures, and delivery schedules (Heide and John 1990). Failure to adjust the relationship to account for the change in demand uncertainty may result in maladaptation costs since the existing governance structure is no longer optimal (Williamson 1991). Greater fluctuations in future demand

will require increased vertical coordination to counter changes in demand uncertainty on behalf of the buyer with the supplier.

H_3: As buyer demand uncertainty increases, vertical coordination with the supplier increases.

Buyer Technological Uncertainty. Technological uncertainty is the inability to accurately forecast the technical requirements (Walker and Weber 1984). In industries where the pace of technological innovation is frequent, investments in specific assets having low salvage value, increase the capital loss in the event of technological obsolescence as innovation supersedes the existing technology (Balakrishnan and Wernerfelt 1986). In industries with high technological uncertainty, manufacturers cannot produce all the potential innovations internally. Integrating vertically insulates firms from the environment, making them slow to adapt to changes (Lawrence and Lorsch 1967; Robertson and Gatignon 1998). The potential for capital losses resulting from shifts in technology suggests that the benefits of reducing transaction costs by vertically integrating may be offset by retaining flexibility to adapt to changes in technology. In a study of alliance formation, Klein, Frazier and Roth (1990) found that organizations preferred the use of alliances in lieu of vertical integration in volatile technical environments.

An advantage of a network of suppliers is the buyer is freed from committing investments internally and being dependent on one technology. By purchasing components from a network of suppliers, the buyer has access to new technology offered by other suppliers. By using an intermediate form of governance, buyers are able to react to technological changes in a timely manner and achieve early mover advantages (Klein et al. 1990). This decreases the likelihood that the buyer will lose its competitive

advantage due to technological obsolescence. This suggests that in technological volatile environments, the buyer will desire the flexibility to use new technology and minimize agreements that tie the buyer to the supplier long-term leading to a decrease in vertical coordination.

H_4: As buyer technological uncertainty increases, vertical coordination with the supplier decreases.

Supplier New Customer Centrality. In the relationship with the current supplier, the performance ambiguity regarding the actions of the supplier is increased after the supplier adds a new customer. The degree of buyer performance ambiguity is dependent on the position the supplier's new customer occupies in the industry network. A centrally positioned new customer will increase the buyer performance ambiguity for the buyer due to enhanced reputation and status (Podolny 1993) conferred upon the supplier and decreased dependence of the supplier on the buyer (Cook et al. 1983; Yamagishi et al. 1988). By being centrally located, an organization's influence is elevated within the network (Boje and Whetten 1981). A central organization's influence stems from its ability to control the flow of valued resources and mobilize resources controlled by others (Raub and Weesie 1990). In research of the Japanese automotive industry, Dyer (1997) found that manufacturers exerted influence over their network of suppliers by extensive interfirm knowledge exchange, investments in specialized assets, and financial linkages. Being linked with a new customer of high status and reputation (Podolny 1993), derived from its central location in the industry network, increases the status of the supplier (Heide and John 1992). If the new customer has a reputation of high quality products, the supplier, by virtue of supplying the new customer, increases its status within the industry as a supplier of high quality components. The increased status, conferred on the supplier

by the new customer, can create a sense of obligation and reciprocity (Cook and Emerson 1978) to the new customer at the expense of the buyer. Changes in behavior could result in the supplier filling orders for the new customer before the buyer's orders, assigning greater resources to support the new customer, and decreasing responsiveness to the buyer.

In addition, having access to the new customer reduces the dependence of the supplier on the buyer (Cook et al. 1983; Yamagishi et al. 1988). The addition of the new customer creates a situation where the new customer and the buyer compete for the supplier's resources. By virtue of being between each customer, the supplier is in a position of mediating both relationships by withholding or distorting information given to each customer (Cook and Emerson 1978; Yamagishi et al. 1988). This gives the supplier leverage in negotiations with each customer by playing off each customer to gain favorable terms. Having a new customer increases the potential of the supplier failing to comply with the contract with the buyer. The enhanced reputation and status and decrease in dependence upon the buyer, suggests that the buyer performance ambiguity will be greater if the supplier's new customer occupies a central location within the industry network.

H_5: As the centrality of the supplier's new customer in the industry network increases, buyer performance ambiguity increases.

Organizations central in an industry network have more access to information, greater influence on other organizations (Freeman 1979; Gnyawali and Madhavan 2001), and are more innovative (Hansen 1999) than non-central organizations. When a supplier in a buyer's supplier network adds a centrally positioned new customer, future buyer

demand uncertainty is increased due to the potential of new innovative products being introduced to the market by the supplier's new customer. A supplier's new customer that is centrally located in the industry network will have a greater number of direct linkages and independent access to other organizations than less centrally located organizations (Rindfleisch and Moorman 2001). With a greater number of linkages, a centrally positioned new customer is more active in the industry network, forming multiple partnerships with suppliers and collaborative ventures (Baker 1990; Granovetter 1985). Direct linkages supply information that is reliable and timely from trustworthy partners (Becker 1970). Having a greater number of linkages with other organizations, a centrally located new customer is less likely to miss valuable information (Powell et al. 1996) and has access to new information earlier than non-central members of the network (Freeman 1979).

Having independent access to other organizations, a centrally located new customer can access information quickly and avoid the control of other organizations (Burt 1992b). Independent access provides the new customer with access to unique and novel information within the industry network (Ahuja 2000; Shan et al. 1994; Valente 1995; Van de Ven 1986). Having multiple information sources, provides multiple avenues for information, which allows a centrally positioned new customer to combine information from diverse sources to generate innovation (Powell et al. 1996). Research in the biotechnology industry found that central organizations had a greater number of collaborative ventures and grew at a greater rate than non-central organizations (Akerlof 1970). Greater independent access to information suggests a supplier's new customer

that is centrally located within an industry network will have an enhanced ability to innovate and introduce new products to the market.

With a greater potential to introduce new products to the market than non-central organizations, a centrally located new customer increases buyer demand uncertainty. The buyer will be unsure of the reasons for the new customer establishing a relationship with the supplier. By working with the supplier, the new customer may be signaling a change in its marketing strategy. The new customer may potentially be embarking on a campaign to increase its market share, leading to a potential decrease in the buyer's market share. On the other hand, the new customer may be switching suppliers to correct a quality problem with an existing supplier, suggesting a potential increase in market share for the buyer. In either case, the addition by the supplier of centrally positioned new customer diminishes the ability of the buyer to accurately forecast future demand greater than if the supplier's new customer is non-central in the industry network.

H_6: As the centrality of the supplier's new customer in the industry network increases, buyer demand uncertainty increases.

Supplier New Customer Centrality (Moderator). The addition of a new customer by the supplier creates competition for the supplier's resources between the new customer and the buyer (Cook and Emerson 1978; Yamagishi et al. 1988). The supplier is in a position to decide which resources to allot in supporting either the new customer or buyer. A centrally located new customer has an enhanced reputation and status within the industry network (Podolny 1993; Raub and Weesie 1990). To enhance its own status, the supplier may be inclined to increase collaboration with the new customer at the expense of the buyer (Burt 1992a). Sensing a change in commitment, the buyer may perceive a heightened potential of opportunistic behavior by the supplier. In addition, a

centrally located new customer has greater access to information and resources (Valente 1995) and is more innovative (Hansen 1999). Being able to access information through a network of organizations, a centrally positioned new customer will have developed mature routines and procedures for acquiring and disseminating information (Podolny 1994; Podolny 1993). The mature information processing routines of a central new customer suggests that it will be able to acquire a greater amount of information about the buyer through the supplier than a non-central new customer.

The addition of a centrally positioned new customer by the supplier increases the cost of safeguarding the transaction specific assets invested with the supplier. If the new customer is centrally positioned with mature routines for gathering information, then the threat of information passing to the new customer is heightened. To safeguard the assets invested with the supplier, the buyer has three options. First, the buyer may select market governance by bidding the contract to other suppliers capable of making the component. Second, the buyer may choose to continue purchasing from the current supplier and increase the level of vertical coordination with the supplier. Third, the buyer may select to vertically integrate the production of component. Williamson (1985; 1975) postulates that as transaction specific assets increase the cost of safeguarding these assets increases and the buyer would vertically integrate the production of the component. However, when a buyer has outsourced the production of components to a network of suppliers and views the network as an extension of the buyer's organization, vertical integration is less likely to be the first option considered when substantial assets have been invested with the supplier. By vertically integrating, the buyer must absorb the entire cost of producing the component, whereas switching suppliers allows the buyer to transfer the cost of

producing the component to a new supplier and reduces the cost of safeguarding the assets than if the buyer had remained with the current supplier. This suggests that buyers will switch suppliers to protect against the loss of information and expropriation of assets than continue purchasing from the current supplier when the new customer is central to the industry network.

H_{7a1}: Under high centrality of supplier's new customer in the industry network, buyer asset specificity (high/low) leads to a governance choice of market governance.

Alternatively, a new customer that is not central to the industry network is perceived as less of a threat to the buyer's competitive position. Non-central customers are less likely to have well developed procedures and routines for gathering and disseminating information as compared to central organizations. Thus, it is less likely that non-central customers will be able to gather information from the supplier and use the information to diminish the buyer's competitive position in the industry. Since the non-central new customer is less of threat to the buyer, the cost of implementing safeguarding procedures with the current customer are less than switching to a new supplier and incurring the cost of qualifying a new supplier, or vertically integrating the production of the component. Thus, when a non-central new customer is added by the current supplier, the buyer is more likely to choose to continue purchasing from the current supplier.

H_{7a2}: Under low centrality of supplier's new customer in the industry network, buyer asset specificity (high/low) leads to a governance choice of vertical coordination with the current supplier.

If the buyer chooses to continue purchasing from the current supplier after the addition of the new customer, then transaction cost economics would recommend the buyer increase the level of vertical coordination with the supplier to safeguard the assets invested. Centrally positioned new customers present a greater threat to the buyer due to enhanced information gathering and dissemination routines (Podolny 1994; Podolny 1993). Safeguarding against the increased potential of opportunistic behavior by the supplier and information leaking to the new customer, increases the likelihood that the buyer will implement greater forms of vertical coordination (Heide and John 1992; Kale et al. 2000).

H_{7b}: As the centrality of the supplier's new customer in the industry network increases, the relationship between buyer asset specificity and vertical coordination with the supplier increases.

Buyer Supplier Network Density. Density measures the relative number of ties in the network that link organizations together (Galaskiewicz and Wasserman 1989; Walker et al. 1997). Dense buyer-supplier networks facilitate efficient communication and development of shared behavioral expectations amongst members (Coleman 1990; Valente 1995), and can provide information to offset the increased uncertainty due to the addition of a new customer by the supplier. In sparse buyer supplier networks, the amount of information and shared behavioral expectations are lessened. The buyer can reduce the uncertainty with the current supplier by adjusting the governance with the supplier, and the buyer may choose to purchase the component from another supplier by choosing market governance when its supplier network is sparse. In sparse buyer supplier networks, the lack of information availability lessens the buyer's ability to detect opportunistic behavior, and the buyer can reduce the potential of opportunistic behavior

of the current supplier concerning transaction specific assets by switching to another supplier. This suggests that in sparse buyer supplier networks, the propensity of the buyer to opt for market governance will increase after the addition of a new customer by a supplier.

H_{8a1}: Under low buyer supplier network density, buyer asset specificity (high/low) leads to a governance choice of market governance.

Alternatively, in dense buyer supplier networks, shared behavioral expectations and information flowing through the network reduce the prospect of the supplier engaging in opportunistic behavior. Information obtained through a dense network comes at a minimal cost to the buyer, limiting the need of buyer to invest in monitoring of the supplier directly. The ability to access this information lowers the cost of continuing to purchase from the current supplier and diminishes the need to switch suppliers or vertically integrate the production of the component.

H_{8a2}: Under high buyer supplier network density, buyer asset specificity (high/low) leads to a governance choice of vertical coordination with the current supplier.

The combination of efficient communication of shared behavioral expectations in dense buyer supplier networks serves to provide the buyer with a mechanism to curtail opportunistic behavior. Since dense networks are efficient means of communicating, information about supplier opportunistic behavior diffuses rapidly through the network to the buyer (Williamson 1991), and the buyer can coordinate pressure on the supplier to conform to expectations (Burt 2000; Coleman 1988; Granovetter 1985) through the use of a coalition of other network members (Coleman 1988; Rowley et al. 2000; Walker et al. 1997). Sanctions carry the threat of reputation loss (Powell and Smith-Doerr 1994),

limiting the future prospect of supplying other organizations within the network. The density of the buyer's supplier network allows the buyer to monitor the actions of the supplier and the new customer efficiently and at a cost less than having to integrate the activity performed by the supplier to protect its investment in specific assets and prevent leakage of information to the supplier's new customer. Since a dense buyer supplier network decreases the cost of monitoring for the buyer, it is expected that the buyer's preference for vertical coordination with the supplier will be decreased.

H_{8b}: As buyer supplier network density decreases, the relationship between buyer asset specificity and vertical coordination with the supplier increases.

Dense buyer supplier networks also facilitate the diffusion of norms within the network, serving as a constraint on the supplier's behavior. Firms in the same network imitate one another's behavior in an attempt to be perceived as legitimate (Galaskiewicz and Wasserman 1989; Walker et al. 1997), and behaviors within the network become similar as shared behavioral expectations are established (Rowley 1997). In sparse buyer supplier networks norms are not well developed. Thus, behavioral expectations are lower and buyer performance ambiguity is increased. When a supplier adds a new customer in a sparse buyer supplier network, the difficulty of monitoring the supplier increases and the supplier conforming to expected behavior is diminished. This suggests that buyers will opt for market governance in sparse buyer supplier networks to offset the increased performance ambiguity after the supplier adds a new customer.

H_{9a1}: Under low buyer supplier network density, buyer performance ambiguity (high/low) leads to a governance choice of market governance.

Alternatively, in dense buyer supplier networks, the diffusion of norms serving as a constraint on the supplier's behavior decreases buyer performance ambiguity. Well developed norms within the buyer supplier network decrease buyer performance ambiguity due to conforming to expectations of behavior established within the network (Heide and John 1992). Failure to adhere to network norms may lead to diminished future opportunities from the buyer and other members of the network. In dense networks, the cost of monitoring a supplier is reduced and the buyer is more likely to continue purchasing from the current supplier instead of switching supplier or producing the component internally.

H_{9a2}: Under high buyer supplier network density, buyer performance ambiguity (high/low) leads to a governance choice of vertical coordination with the current supplier.

In a dense buyer supplier network, information on deviant behavior quickly disseminates to other network members and is sanctioned by other members of the network (Powell and Smith-Doerr 1994). The predictability of behavior in dense networks constrains the behavior of the supplier and promotes cooperation with the buyer. When the density of the buyer supplier network is low, the interconnectivity between suppliers is reduced and developing norms regarding cooperation are difficult to develop and information regarding the supplier's behavior travels more slowly through the network. Raub and Weesie (1990) demonstrate, using a Prisoner's Dilemma framework, that organizations in a dense network are constrained from deviant behavior and are more cooperative than organizations in networks where the density is low. Without access to information and the ability to sanction the supplier, the buyer must

resort to monitoring the supplier directly. Having access to information and the ability to sanction deviant behavior in a dense supplier network, suggests the buyer's costs to monitor the supplier are reduced and the need to increase vertical coordination is diminished.

H_{9b}: As buyer supplier network density decreases, the relationship between buyer performance ambiguity and vertical coordination with the supplier increases.

The density of a buyer's supplier network serves as a source of information to reduce uncertainty, both demand and technological, when a supplier adds a new customer. The availability of information is dependent on the density of the buyer supplier network (Coleman 1990; Valente 1995). In dense buyer supplier networks, information is quickly disseminated throughout the buyer's supplier network. By gathering information from a dense network of suppliers, the buyer can reduce the cost of governing the relationship with the supplier adding the new customer. In contrast, a sparse buyer supplier network fails to provide information necessary to reduce the governance cost of the managing the relationship with the supplier adding the new customer. If a buyer has a sparse network of suppliers, the cost of reducing uncertainty can be lower by opting for market governance and switching to a new supplier where the uncertainty in the new relationship is lower than with the current supplier. This suggests that in sparse buyer supplier networks, the lack of information availability will increase the buyer's preference for market governance and the buyer will switch to a new supplier to decrease demand and technological uncertainty when a supplier adds a new customer.

H_{10a1}: Under low buyer supplier network density, buyer demand uncertainty (high/low) leads to a governance choice of market governance.

H_{11a1}: Under low buyer supplier network density, buyer technological uncertainty (high/low) leads to a governance choice of market governance.

Alternatively, in dense buyer supplier networks, information is available from suppliers within the buyer's supplier network. By accessing this information, a buyer may reduce demand and technological uncertainty created when a supplier adds a new customer. The cost to access this information is minimal to the buyer and reduces the cost of managing the relationship with the current supplier. Having reduced demand uncertainty, the buyer will not need to coordinate changes in production as often. In addition, by accessing information through the network, the buyer will be aware of pending technological changes and can adjust its product offering to account for the changes in technology. This suggests that when buyers have dense supplier networks, they will be less likely to switch suppliers or vertically integrate the production of the component.

H_{10a2}: Under high buyer supplier network density, buyer demand uncertainty (high/low) leads to a governance choice of vertical coordination with the current supplier.

H_{11a2}: Under high buyer supplier network density, buyer technological uncertainty (high/low) leads to a governance choice of vertical coordination with the current supplier.

If the buyer chooses to continue working with a supplier after the supplier adds a new customer, the density of the buyer's supplier network influences the level of vertical coordination. As a source of information, the network the can reduce buyer demand uncertainty in its relationship with the supplier. Information supplied by the network is inexpensive, relative to formal governance mechanisms, and is from organizations that the buyer has worked with in the past. Information gathered from these close associates

tends to be more reliable and detailed (Granovetter 1985). Research supports the notion that organizations use networks to assess threats and opportunities within the market (Rowley et al. 2000; Walker et al. 1997). In the case of demand uncertainty, the buyer can determine from its network of suppliers if the new customer is adding capacity to embark on a market expansion campaign, thus threatening the buyer's future market share. On the other hand, the supplier's new customer may be adding the buyer's current supplier to address a quality issue with its supplier and the buyer may be able to capitalize on the opportunity to increase its market share. However, in sparse buyer supplier networks, information regarding the inclinations of the new customer is diminished. This suggests when buyers have a sparse network of suppliers, buyers will need to increase the level of vertical coordination with the supplier adding the new customer to offset demand uncertainty.

H_{10b}: As buyer supplier network density decreases, the relationship between buyer demand uncertainty and vertical coordination with the supplier increases.

Technological uncertainty reduces the ability of the buyer to accurately forecast technical requirements (Walker and Weber 1984). A dense network of suppliers reduces the degree of technological uncertainty confronting the buyer by providing information on technical advances (Valente 1995). The buyer can use this information from its supplier network to determine if the new customer is offering new technology and threatening the buyer's technology. Conversely, if the buyer supplier network density is low, the flow of information through the network is diminished and the buyer is at a greater threat of technological obsolescence. In sparse buyer supplier networks, the buyer will need to invest in a greater level of vertical coordination directly with the

supplier to reduce technological uncertainty. On the other hand, having access to a dense network of suppliers, the buyer can gather timely and reliable information without instituting increased levels of governance with the current supplier. It is expected that if the buyer has a dense network of suppliers, the buyer's preference for increasing vertical coordination with the supplier will be diminished.

H_{11b}: As buyer supplier network density decreases, the relationship between buyer technological uncertainty and vertical coordination with the supplier increases.

CHAPTER FOUR

RESEARCH METHOD

The research hypotheses presented in the preceding chapter are empirically tested by examining decisions of supply chain management professionals to adapt existing supplier relationships to accommodate the addition of a new customer by a current supplier in their supplier network. The research of adaptation of supplier relationships poses significant challenges in isolating the phenomenon. Relationships with suppliers typically incorporate a time horizon making immediate adaptation of the relationship difficult. Retrospective surveys require the informant to construct responses for two incidences in time: the time of the addition of the supplier's new customer and the response at a later date when the purchase agreement is amended. The difference in time between the events introduces confounding factors, limiting the validity of the results (Cook and Campbell 1979). To isolate the factors influencing the decision making process, an experimental scenario design is utilized (e.g., Achrol and Gundlach 1999; Dutta and John 1995; Joshi and Arnold 1997; Pilling et al. 1994).

The research for this dissertation is conducted in two phases. In the first phase, a qualitative analysis, literature review, and pre-test are conducted to gain a deeper understanding of the phenomenon. In the qualitative analysis adaptive responses are investigated by interviewing supply chain management professionals and performing a literature review to develop the experimental scenarios. This is followed by the pre-test of potential items to be used in the second phase of the research. The second phase uses role-playing scenarios in seven 2 × 2 mixed design experiments. The transaction cost economic variables (buyer asset specify, buyer performance ambiguity, buyer demand

uncertainty, and buyer technological uncertainty) are tested with between group treatments and the network variables (centrality and density) are tested with within group treatments.

Validation of Variable Measures and Pre-test

Validation of the variable measures and experimental scenarios to be used in this research necessitate a pre-test strategy to specify the domain, purify measures, and establish external validity of the experimental design. The pre-test portion of this research investigates the adaptive responses taken by supply chain management professionals and the validation of the experimental scenarios to be used in the study. The research follows an iterative process to increase the understanding of how the conceptual elements are perceived in industry and how scenarios developed are understood by professionals. The development of the variable measures and experimental scenarios uses a three-step process. The first step focuses on collecting adaptive responses from supply chain management professionals when confronted with the unanticipated addition of a new customer by a supplier. Second, a literature review to compile a list of adaptive responses and potential items for the constructs tested in the experimental design is undertaken. Finally, a pre-test is conducted with supply chain management professionals for each of the items to be used in the experiments. After each step in the process, wording of items and scenarios are altered as needed.

The first step entails collecting responses of adaptive behavior taken by supply chain management professionals upon learning of a supplier selling to a new customer using an open-ended question format. The event of learning of a supplier selling to a new customer is conceptualized as an unanticipated event that is new information to the

manager (Williamson 1991). A clinical professor of purchasing management assisted in the development of a sampling frame. Forty six supply chain management professionals were contacted by e-mail requesting their participation (Appendix 1) with an outline of the research (Appendix 2). A second e-mail was sent requesting their participation (Appendix 3). After two weeks, a third e-mail was sent as a reminder to non-respondents (Appendix 4). Twenty seven professionals agreed to participant, resulting in a 59% response rate.

The twenty seven supply chain professionals were interviewed over the phone using an open-ended question format (Appendix 5) to understand their reaction to supplier adding a new customer. Questions focused on how the subjects would structure relationships with suppliers concerning asset specificity, performance ambiguity, demand uncertainty, and technological uncertainty and how centrality of the supplier's new customer and the density of their supply network would influence their response concerning the supplier adding the new customer. These professionals stressed the need to reduce uncertainty regarding the relationship with the supplier and avoid any potential adverse effects regarding delivery performance, supplier production capacity, diversion of dedicated resources, and leakage of propriety information. Furthermore, if the supplier's new customer occupied a central position in the industry, then uncertainty of the relationship with the supplier increased. Professionals with greater experience in supply chain management stressed that the density of their supplier network factored into the decision making process of governing the relationship with individual suppliers. Dense networks served as a source of informal information that reduced the need for an

increase in vertical coordination with an individual supplier and reduced the likelihood of switching to a new supplier in the event of a customer being added.

The second step consists of conducting a review of the extant literature for measurement scales for vertical coordination and the independent variables. The results of the literature review are presented in Appendix 6. The literature review determined the construct definition (measure) and the items used to measure the construct in previous research. Vertical coordination has been defined as the extent parties carry out focal activities in a cooperative and coordinated way (Andersen and Buvik 2001; Buvik 2000), interfirm flows of activities, resources, and information in order to coordinate productive values and deal with the realignment of terms of trade (Buvik and Andersen 2002; Buvik and Gronhaug 2000), the regular pattern of similar or complementary actions and activities (Jap 2001), and the purposive organization of the flow of activities and information between the transacting parties (Buvik and John 2000). These definitions of vertical coordination focus on the need for transacting parties to engage in purposive and coordinated action in the exchange of information in pursuit of economic gain. Items used to measure vertical coordination include cooperation with the supplier in quality assurance (Andersen and Buvik 2001; Buvik 2000; Buvik and Andersen 2002; Buvik and Gronhaug 2000; Buvik and John 2000), resolution of conflicts (Buvik and Gronhaug 2000), price development and market conditions (Buvik and Gronhaug 2000; Buvik and John 2000), new product development (Andersen and Buvik 2001; Buvik and Andersen 2002; Buvik and Gronhaug 2000), production capacity (Andersen and Buvik 2001; Buvik and Andersen 2002), and goal setting and forecasting (Artz and Brush 2000).

Research focusing on transaction specific assets has defined transaction specific assets as investments made by the OEM/buyer with a particular supplier (Bensaou and Anderson 1999; Buvik 2000; Buvik and Andersen 2002; Buvik and Reve 2001; Heide 2003; Heide and John 1990; Heide and John 1992; Heide and Stump 1995; Rokkan et al. 2003; Stump 1995; Stump and Heide 1996) and assets invested in export channels (Klein 1989; Skarmeas et al. 2002). Definitions of transaction specific assets stress the idiosyncratic nature of the assets with a particular supplier and the loss of value if these assets are transferred to other uses. Items measuring transaction specific assets account for investments in tooling and equipment (Artz and Brush 2000; Buvik 2000; Buvik and Andersen 2002; Buvik and Reve 2001; Heide 2003; Heide and John 1990; Heide and John 1992; Heide and Stump 1995; Rokkan et al. 2003; Stump 1995; Stump and Heide 1996), tailoring of the buyer's production system (Buvik and John 2000; Heide 2003; Jap 2001), training of personnel (Rokkan et al. 2003; Skarmeas et al. 2002), and adaptation of technological standards (Buvik 2000; Buvik and Andersen 2002; Buvik and Reve 2001; Heide and John 1990; Heide and John 1992; Joshi and Stump 1999). These items address the spectrum of asset specificity to include site specificity, physical asset specificity, human asset specificity, and dedicated assets (Williamson 1985) with a particular supplier in an exchange relationship.

Previous research regarding performance ambiguity on part of the buyer has been adapted to the context of the research. For instance, in buyer-supplier relationships, performance ambiguity has been defined as the predictability/difficulty of the buyer in evaluating behavior/performance of the supplier (Heide and John 1990; Heide and Miner 1992; Heide and Stump 1995; Joshi and Stump 1999; Stump and Heide 1996). In a

franchisor/franchisee context, Antia and Frazier (2001) define performance ambiguity as the "extent of information available regarding agent performance," and in a manufacturer/distributor context, performance ambiguity is defined as the "ex ante difficulty faced by the manufacturer in evaluating the specific geographic area covered by the distributor" (Bergen et al. 1998). Items used to measure performance ambiguity in buyer-supplier relationships include ability to predict prices from the supplier (Heide and John 1990; Heide and Miner 1992; Joshi and Stump 1999), ability to predict delivery performance (Heide and Stump 1995; Joshi and Stump 1999), ability of supplier to adapt to changes in order specifications (Heide and Stump 1995; Joshi and Stump 1999), and monitoring of supplier (Heide and John 1990; Heide and Miner 1992).

Prior research has separated environmental uncertainty into demand uncertainty and technological uncertainty. Demand uncertainty has been defined as changing market conditions (Andersen and Buvik 2001; Buvik and Gronhaug 2000), price and volume uncertainty (Artz and Brush 2000), and inability to forecast volume requirements (Bensaou and Anderson 1999; Heide and John 1990; Heide and Stump 1995; Robertson and Gatignon 1998). Items used to measure demand uncertainty include demand for end product varies continually (Andersen and Buvik 2001; Artz and Brush 2000; Buvik and Gronhaug 2000; Buvik and John 2000), volume requirements for this component are predictable/reliable (Bensaou and Anderson 1999), demand is difficult to forecast (Robertson and Gatignon 1998), and predictability of industry sales volume for end product (Ganesan 1994; Heide and John 1990; Heide and Stump 1995). These items capture both the inability to predict the future demand for the end product and the

inability to provide the supplier with accurate volume predictions needed for production scheduling.

Technological uncertainty has been defined in prior research as technological dynamism (Andersen and Buvik 2001; Buvik and Gronhaug 2000), likelihood of major changes in a component, performance, and manufacturing processes (Bensaou and Anderson 1999), extent of technical innovation and rate of change of technology (Celly et al. 1999), inability to predict accurately technological changes in product and/or process technology (Robertson and Gatignon 1998; Stump 1995; Stump and Heide 1996), and inability to forecast accurately the technological requirements in a relationship (Heide and John 1990). Items used to measure technological uncertainty include product purchased has high innovation rates and short life cycles (Andersen and Buvik 2001; Buvik and Gronhaug 2000; Buvik and John 2000; Robertson and Gatignon 1998), predictability of technological changes in the end product (Stump and Heide 1996), and changes in product specifications (Heide and John 1990; Stump 1995; Walker and Weber 1984). These definitions and items conceptualize technological uncertainty as external to the focal buyer-supplier relationship that influence the predictability of technical changes to the end product or components purchased and the inability to forecast technical specifications for the supplier on behalf of the buyer.

Empirical research regarding the network variables centrality and density in supply chain literature is limited to research conduced by Antia and Frazier (2001). Centrality is defined as the strength of an individual agent's position in an agent network. Items to measure the agent's position are crucial cog in the franchisee network, maintain few relations in other franchisees, activity in franchise network, number of links with

other franchisees, and centrality in franchise system. Density is defined as the average strength of relations in a network. Items to measure the density of a network are franchisees share close ties amongst themselves, degree of interaction among franchisees, closeness of relations among franchisees, degree of communication and discussion of common problems among franchisees, and cohesiveness.

This research investigates the adaptation of governance in an existing buyer-supplier dyad when an unanticipated event occurs, specifically when the supplier adds a new customer. As the scales in the extant literature were meant for different contexts, the scales are adapted to the context and focus of this study where necessary, based on the responses of the supply chain management professionals interviewed in step one and input from academic experts familiar with transaction cost economics and network theory.

In the third step, a pre-test of the items used in each of the scenarios is conducted with eighteen professionals. The questionnaire e-mailed to each professional is presented in Appendix 7. In the pre-test, each of the items is tested individually for its effect on vertical coordination. Consistent with transaction cost economics, the high treatments for buyer asset specificity, performance ambiguity, demand uncertainty, and technological uncertainty led to increased vertical coordination with the supplier ($p < .001$). Testing of the control variables showed that market position had no effect on vertical coordination; however, having a single supplier ($p < .001$), few qualified suppliers in the market ($p < .001$), and purchasing frequency ($p < .01$) led to increased vertical coordination with the supplier. The results for the transaction cost and control variables are presented in Table 4. The results for buyer supplier network density and supplier new customer centrality

are presented in Table 5 and were not significantly different between the high and low treatments. However, all four treatments were significantly different than zero, indicating that the subjects were adapting the governance and increasing the degree of vertical coordination with the supplier due to the addition of the new customer.

After completing the survey, each participant was interviewed to assess how well each item was comprehended and measured the intended construct. Analysis of the results revealed that the manipulations were directionally correct and were well understood by the participants. Suggestions for improvement of the wording were incorporated in to the scenarios used in the seven role-playing experiments.

Experiment Method and Design

Sampling Frame. A key informant methodology is used to generate the data for this research. The sampling frame chosen for this research requires knowledgeable professionals as key informants (Campbell 1955; John and Reve 1982). Subjects for this research required supply chain management professionals that possess unique knowledge required in the adaptation of purchasing agreements and management of supplier relationships. Supply chain management professionals have responsibility for developing, negotiating, managing, and monitoring supplier contract performance (Cannon et al. 2000). The sampling frame consists of supply chain professionals who are members of the Institute for Supply Management (ISM)[3]. A subset of 4630 ISM supply chain management professionals from Standard Industry Codes (SIC) 350, 360, 370, and

[3] Formerly known as the National Association of Purchasing Management

380[4] were randomly selected. Members supplying a home address were removed and only professionals supplying a work address in the U.S. were included in the sample. A final sample of 2681 resulted. Phone numbers for the sample were obtained from whitepages.com and Verizon information.

Response Rate. For the seven role-playing experiments 867 supply chain management professionals were contacted, 504 agreed to participate and 363 either declined to participate (123), no longer worked for the firm (178), or the phone number was unavailable for the firm (62), leading to a response rate of 58%. Of the supply chain management professionals that agreed to participate, 336 are male and 168 are female, and 257 of the respondents are managers and 247 are non-managers. Of the supply chain management professionals that did not participate, 216 are male and 147 are female, and 160 of the respondents are managers and 187 are non-managers.

Sample Characteristics. The sample consists of 504 supply chain management professionals. The characteristics of the respondents are presented in Table 6. The sample comprises 336 males and 168 females. Segmented by industry, 190 respondents are from SIC 350, 118 respondents are from SIC 360, 107 respondents are from SIC 370, and 89 respondents are from SIC 380. Respondents from firms of less than 500 employees amounted to 153, and 351 respondents are from firms with greater than 500 employees. Segmented by job title, 253 of the respondents are managers and 251 are non-managers.

Unit of Analysis. Consistent with transaction cost economics, the unit of analysis for this research is the exchange relationship (Williamson 1985; 1975). This research

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[4] Corresponds to North American Industry Classification System (NAICS) codes 333, 334, 335, 336, and 339

focuses on the adaptation of the exchange relationship from the buyer's perspective. The focal exchange relationship for this research is the relationship between a buyer and its supplier established before the addition of a new customer by the supplier. The conceptualization of the need to adapt the exchange relationship arises from the addition of a new customer by the supplier. The addition of the new customer introduces an external disturbance to the relationship between the buyer and the supplier which needs to be accounted for to prevent maladaptation costs (Williamson 1991).

Design and Procedure. Seven individual role-playing scenarios using a 2 × 2 mixed design experiment were conducted to test the model. Subjects were presented a role-playing scenario where they were to imagine themselves in a given treatment condition. Role-playing scenarios provide controlled study of behavior where subjects enact the scenario described (Geller 1978) and can be an appropriate research method to capture the decision making process of subjects (Forward et al. 1976). The use of role-playing experiments has been shown to be an effective approach for operationalizing variables in a supply chain context (Achrol and Gundlach 1999; Dutta and John 1995; Jackson Jr. et al. 1984; Joshi and Arnold 1997; Pilling et al. 1994; Wuyts et al. 2004). In each experiment, the transaction cost variable (buyer asset specificity, buyer performance ambiguity, buyer demand uncertainty, and buyer technological uncertainty) is tested between groups, and the network variable (centrality and density) is tested within groups. Scenarios for each treatment are presented in Appendix 8 to 21. Each treatment consists of 36 randomly assigned subjects. To control for order effect, in each of the seven experiments, the subjects are divided into two groups of 18 subjects each. For one group, the high treatment for the within group variable (centrality or density) is presented first.

For second group, the low treatment for the within group variable (centrality or density) is presented first.

The scenario was developed for the subjects to role-play the position of a supply chain manager responsible for acquiring CD-ROM drives for a leading computer manufacturer. The choice of CD-ROM drives was made based on the subjects' familiarity of CD-ROMs drives, the need to exchange technical and marketing information to integrate the CD-ROM drive with the computer, and the market maturity for CD-ROM drives. The purchase of CD-ROM drives requires the subject to weigh the decision to continue working with the current supplier while retaining the option to switch to another supplier. Acquiring the CD-ROM drive requires the buyer to share sensitive technical and marketing information with the supplier, exposing the buyer to opportunistic behavior on behalf of the supplier (Williamson 1985; 1975). In contrast, the buyer may protect against opportunistic behavior by developing norms and familiarity with the supplier (Heide and John 1992; Noordewier et al. 1990) through repetitive purchases over a period of time and retaining the option to exit the relationship and purchase the CD-ROM drives from other suppliers in a mature market.

Each treatment was administered over the phone. Presentation of the scenario and collection of data took approximately five minutes for each treatment. For each scenario, each subject was instructed to assume a role-playing posture in which they assumed the position of supply chain manager responsible for buying CD-ROM drives for a leading computer manufacturer. For each subject, vertical coordination was defined followed by presentation of the assigned scenario. In the mixed design experiment, each subject was first presented their assigned treatment regarding the transaction cost economics variable

of interest and asked the degree of coordination they would recommend with the supplier on a 7-point scale (1 = very limited coordination, 7 = very extensive coordination). The subjects were then informed that the supplier had unexpectedly added a new customer that had previously not worked with any suppliers in their network. This was followed by administering a within subject treatment of the network variable (centrality or density). After each treatment, subjects were instructed to recommend one of three choices of action (find another supplier, produce internally, or continue purchasing from the current supplier). If a subject recommended to continue purchasing from the current supplier, then they were instructed to recommend the level of coordination they would have with the supplier after the addition of the new customer on a 11-point scale (-5 = extremely decrease, 0 = same level of coordination, 5 = extremely increase). Each scenario was concluded by gathering data on the subjects experience in supply chain management (number of years), position, supplier network size, industry, and firm size (number of employees).

Dependent Variable

Vertical Coordination. Vertical coordination is conceptualized as the purposive organization of the flow of activities and information between the buyer and the supplier (Andersen and Buvik 2001; Buvik and Andersen 2002; Buvik and Gronhaug 2000; Buvik and John 2000). Vertical coordination is operationalized as the degree of information exchanged between the buyer and the supplier. Information exchanged included production costs, market conditions for the end product, future market strategies, and joint efforts in product development and quality control (Andersen and Buvik 2001; Buvik and Andersen 2002; Buvik and Gronhaug 2000; Buvik and John 2000).

Independent Variables

Buyer Asset Specificity. Buyer asset specificity is conceptualized as the buyer's investments that are undertaken in support of a particular transaction, where the salvage value of the investments is much lower in best alternative uses or by alternative users should the original transaction be prematurely terminated (Williamson 1985; 1975). Buyer asset specificity describes the investments made by the buyer in physical assets, production processes, and knowledge that are specific to the supplier (Buvik and John 2000; Heide and John 1990; Joshi and Stump 1999). Buyer asset specificity is operationalized as the degree of investment by the buyer specifically with the current supplier. The treatment for buyer asset specificity contrasts the degree of investment by the buyer with the current supplier. Buyer asset specificity is manipulated as *"You have made significant investments specifically with this supplier"* (high buyer asset specificity) and *"You have made few investments specifically with this supplier"* (low buyer asset specificity).

Buyer Performance Ambiguity. Buyer performance ambiguity is conceptualized as the uncertainty of the buyer to accurately evaluate the supplier's ex post performance (Heide and John 1990). Buyer performance ambiguity is operationalized as the inability of the buyer to accurately predict supplier performance with regard to price and delivery (Joshi and Stump 1999). Buyer performance ambiguity is manipulated as *"You have been unable to accurately measure prices and delivery performance of this supplier easily* (high buyer performance ambiguity) and *"You have been able to accurately measure prices and delivery performance of this supplier easily* (low buyer performance ambiguity).

Buyer Demand Uncertainty. Demand uncertainty is conceptualized as the buyer's inability to accurately forecast the volume requirements (Walker and Weber 1984). Buyer demand uncertainty reflects the changing conditions of the markets that the organization is engaged (Buvik and John 2000), and the buyer's inability to forecast accurately the demand for the components from the supplier (Heide and John 1990). Buyer demand uncertainty is operationalized as the degree of demand uncertainty facing the buyer due to demand volatility and the ability to forecast production volumes for the supplier (Buvik and John 2000). Buyer demand uncertainty is manipulated as *"The demand for your computers varies continually and it is difficult to forecast production volumes for your supplier"* (high buyer demand uncertainty) and *"The demand for your computers is steady and it is easy to forecast production volumes for your supplier"* (low buyer demand uncertainty).

Buyer Technological Uncertainty. Buyer technological uncertainty is conceptualized as the buyer's inability to accurately forecast technical requirements (Walker and Weber 1984). Buyer technological uncertainty reflects the frequency of expected changes to the component and future technological improvements to the component (Andersen and Buvik 2001; Buvik and Gronhaug 2000; Buvik and John 2000). Buyer technological uncertainty is operationalized as the degree of technological uncertainty facing the buyer due to technological change and the ability to forecast requirements (Heide and John 1990). Buyer technological uncertainty is manipulated as *"Technology changes rapidly and it is difficult to forecast requirements"* (high buyer technological uncertainty) and *"Technology changes slowly and it is easy to forecast requirements"* (low buyer technological uncertainty).

Supplier New Customer Centrality. Centrality in a network is conceptualized as the organization's position in the network relative to others (Wasserman and Faust 1994). Network centrality measures the degree to which organizations occupy a position of influence and status within the network (Podolny 1993). Supplier new customer centrality is operationalized as the new customer's competitive position in the industry network and the number of ties with other organizations in the industry (Antia and Frazier 2001). Supplier new customer network centrality is manipulated as *"The supplier's new customer is a competitor and maintains many ties with other organizations within the industry"* (high supplier new customer network centrality) and *"The supplier's new customer is not a competitor and maintains few ties with other organizations within the industry"* (low supplier new customer network centrality).

Buyer Supplier Network Density. Buyer supplier network density is conceptualized as the interconnectiveness of organizations within a network (Coleman 1988). Buyer supplier network density reflects the relative number of links between organizations within the buyer's supplier network. Buyer supplier network density is operationalized as the cohesiveness of the buyer's supplier network and interaction amongst the suppliers (Antia and Frazier 2001). Buyer supplier network density is manipulated as *"Your network of suppliers is very cohesive with extensive interaction amongst the suppliers"* (high buyer supplier network density) and *"Your network of suppliers is not very cohesive with no interaction amongst suppliers"* (low buyer supplier network density).

Control Variables

Purchasing Frequency. Transaction cost economics assumes that purchasing frequency is associated with specialized assets in support of the transaction, and that increased asset specificity increases the exposure to opportunism (Williamson 1985; 1975). To control for purchase frequency, purchase frequency is held constant across the scenarios at a high level (*You have been frequently purchasing CD-ROM drives from a single supplier...*).

Relationship Duration. As the duration of the relationship increases between two firms, relational norms, trust, and personal relationships evolve between the supplier and buyer, reducing the threat of opportunism and decreasing ex post transaction costs (Bradach and Eccles 1989; Heide and John 1992). To control for relationship duration, relationship duration is held constant across the scenarios at two years (*...frequently purchasing CD-ROM drives from a single supplier for two years*).

Industry. The propensity to vertically integrate and supplier network configuration vary between industries (Balakrishnan and Wernerfelt 1986; Bell 2005). To control for differences between industries, the product purchased (CD-ROM drives) and the end product (computer) are held constant across scenarios. In addition, the industry for each subject was collected to investigate the consistency of responses from the subjects across the four industries comprising the sampling frame.

Firm Size. Firm size can influence the behavior of the firm (Cyert and March 1992). Research has shown that larger firms have access to greater resources and an ability to overcome the cost of changing the suppliers (Anderson 1985). Larger firms may have greater bargaining power and can negotiate for greater control in their

relationships with suppliers (Ganesan 1993). Firm size is controlled for by two methods. First, firm size is held constant between the scenarios by instructing subjects that they are purchasing components for a leading computer manufacturer (*Imagine you are a supply chain manager responsible for acquiring CD-ROM drives for a leading manufacturer of computers*). Second, post hoc, using data gathered from each subject, firm size (measured as number of employees) is used to investigate the consistency of responses from subjects for firms with less than 500 employees (coded as 0) and firms with greater than 500 employees (coded as 1)[5].

Gender. The gender of the subjects was collected and coded using a dummy variable. Male subjects are coded as 1, and female subjects are coded as 0.

[5] In the United States, the Small Business Administration has traditionally defined small businesses as less than 500 employees.

CHAPTER FIVE

RESULTS

The hypotheses are tested using seven role-playing mixed design experiments. The transaction cost economics variables, buyer asset specificity, buyer performance ambiguity, buyer demand uncertainty, and buyer technological uncertainty, are tested between groups. The network variables, supplier new customer centrality and buyer supplier network density, are tested within groups. Following accepted practice in the marketing discipline, significance of hypothesis testing is found at p-values of 0.05 and 0.1. For each of the experiments where hypotheses were tested in a mixed design, a Bonferroni correction factor is applied to account for the use of the same subjects in testing two hypotheses. A summary of the results is presented in Tables 7 and 8.

Transaction Cost Economics Prescriptions

Hypothesis One. Consistent with transaction cost economics, H_1 postulates when significant assets are invested by the buyer specifically with the supplier, the buyer will desire greater vertical coordination with the supplier. In support of H_1, buyer asset specificity has a significant impact on vertical coordination with the supplier ($p < 0.05$; Bonferroni Correction Factor $p < 0.1$), with the buyer desiring greater vertical coordination when the buyer has invested significant assets specifically with the supplier. The Levene statistic indicates that the two groups have homogenous variance ($p = 0.995$, NS). Analysis of the control variables for industry ($F = 0.443$, NS), firm size ($p = 0.285$,

NS), and, gender (p = 0.616, NS) indicate no significant effect on buyer asset specificity and vertical coordination.

Hypothesis Two. Hypothesis 2 postulates when buyer performance ambiguity increases, the buyer will desire greater vertical coordination with the supplier. In support of H_2, buyer performance ambiguity has a significant impact on vertical coordination with the supplier ($p < 0.05$; Bonferroni Correction Factor $p < 0.05$), with the buyer desiring greater vertical coordination when buyer performance ambiguity increases. The Levene statistic indicates that the two groups have homogenous variance (p = 0.053, NS). Analysis of the control variables for industry (F = 0.583, NS), firm size (p = 0.918, NS), and gender (p = 0.454, NS) indicate no significant effect on buyer performance ambiguity and vertical coordination.

Hypothesis Three. Hypothesis 3 postulates when buyer demand uncertainty increases, the buyer will desire greater vertical coordination with the supplier. In support of H_3, as buyer demand uncertainty increases, the buyer desires greater vertical coordination with the supplier ($p < 0.05$; Bonferroni Correction Factor $p < 0.05$). The Levene statistic indicates that the two groups do not have homogenous variance (p = 0.021), and analysis of this hypothesis does not assume equal variances between the two groups. Analysis of the control variables for industry (F = 0.861, NS), firm size (p = 0.878, NS), and gender (p = 0.540, NS) indicate no significant effect on buyer demand uncertainty and vertical coordination.

Hypothesis Four. Hypothesis 4 postulates when buyer technological uncertainty increases, the buyer will desire less vertical coordination with the supplier. The results indicate that there is not a significant difference between the low and high treatments of

technological uncertainty and the buyer's desire for vertical coordination ($p = 0.216$, NS). Therefore, H_4 is not supported. The Levene statistic indicates that the two groups have homogenous variance ($p = 0.735$, NS). Analysis of the control variables for industry ($F = 0.295$, NS), firm size ($p = 0.348$, NS), and gender ($p = 0.366$, NS) indicate no significant effect on buyer technological uncertainty and vertical coordination.

Supplier New Customer Centrality

Hypothesis Five. Hypothesis 5 predicts the centrality of the supplier's new customer in the industry network will be positively related to buyer performance ambiguity. The results indicate that for both high and low buyer performance ambiguity there s not a significant difference between the high and low treatments for centrality of the supplier's new customer. Therefore, H_5 is not supported.

The Levene statistic indicates that the groups for the centrality of the supplier's new customer for both the high buyer performance ambiguity ($p = 0.548$, NS) and low buyer performance ambiguity ($p = 0.801$, NS) treatments have homogenous variances. An order effect is present in the within group centrality treatment for the high buyer performance ambiguity treatment (Central customer presented first, $p = 0.01$; Non-central customer presented first, $p = 0.02$) and low buyer performance ambiguity treatment (Non-central customer presented first, $p = 0.035$). Analysis of the control variables for each buyer performance ambiguity treatment indicate industry ($F_{Low} = 0.433$, NS; $F_{High} = 0.307$, NS), firm size ($p_{Low} = 0.135$, NS; $p_{High} = 0.233$, NS), and gender ($p_{High} = 0.457$, NS) have no significant effect on centrality of the supplier's new customer and buyer performance ambiguity. However, the results for the low buyer performance ambiguity

treatment indicate a significant difference in responses due to gender ($p_{Low} = 0.035$), with females having greater performance ambiguity when a central customer is added by the supplier.

Hypothesis Six. Hypothesis 6 predicts the centrality of the supplier's new customer in the industry network will be positively related to buyer demand uncertainty. The centrality of the supplier's new customer increases the buyer demand uncertainty for the low treatment for buyer demand uncertainty ($p < 0.1$), but is not significant for the high treatment of buyer demand uncertainty, providing partial support for H_6.

The Levene statistic indicates that the groups for the centrality of the supplier's new customer for both the high ($p = 0.805$, NS) buyer demand uncertainty and low ($p = 0.249$, NS) buyer demand uncertainty treatments have homogenous variances. An order effect is present in the within group centrality treatment for the high buyer demand uncertainty treatment (Non-central customer presented first, $p= 0.014$), but is not present in the low demand uncertainty treatment within group centrality treatment. Analysis of the control variables for each buyer demand uncertainty treatment indicate industry ($F_{Low} = 0.624$, NS; $F_{High} = 0.049$, NS; Tukey test indicates no difference between industries), firm size ($p_{Low} = 0.876$, NS; $p_{High} = 0.235$, NS), and gender ($p_{Low} = 0.590$, NS) have no significant effect on centrality of the supplier's new customer. However, the results for the high buyer demand uncertainty treatment indicate a significant difference in responses due to gender ($p_{High} = 0.007$), with females having greater demand uncertainty when a central customer is added by the supplier.

Hypothesis Seven. Hypotheses 7a1, 7a2, and 7b test the moderating effect of the centrality of the supplier's new customer in the industry network on the buyer asset specificity/vertical coordination relationship. Hypothesis 7a1 predicts the buyer will prefer the market governance option and switch to a new supplier instead of producing the component internally or continuing to purchase from the current supplier when the supplier's new customer occupies a central position in the industry network. In support of H_{7a1}, when the supplier's new customer is central to the industry network, buyers significantly opted for market governance for both the high ($p < 0.05$) and low ($p < 0.05$) treatments of buyer asset specificity.

Hypothesis 7a2 predicts the buyer will continue purchasing from the current supplier when the supplier's new customer is not central to the industry network. In support of H_{7a2}, when the supplier's new customer is not central to the industry network, buyers significantly opted to continue purchasing from the current supplier for both the high ($p < 0.05$) and low ($p < 0.05$) treatments of buyer asset specificity.

If the buyer chose to continue purchasing from the current supplier after the addition of the new customer, then H_{7b} predicts the centrality of the supplier's new customer will positively moderate the relationship between buyer asset specificity and vertical coordination. The results indicate that the position the supplier's new customer in the industry network does not have a significant influence on the degree of vertical coordination desired by the buyer. Therefore, H_{7b} is not supported.

The Levene statistic indicates that the groups for the centrality of the supplier's new customer treatment for the high buyer asset specificity treatment have homogenous

variances (p = 0.250, NS). However, the Levene statistic indicates that the groups for the centrality of the supplier's new customer treatment for the low buyer asset specificity treatment do not have homogenous variances (p = 0.032), and analysis of the low buyer asset specificity treatment does not assume equal variances between the two groups. An order effect is not present for the within group centrality treatment for either the high buyer asset specificity or low buyer asset specificity treatments. Analysis of the control variables for each buyer asset specificity treatment indicate industry (F_{Low} = 0.067, NS; F_{High} = 0.773, NS), firm size (p_{Low} = 0.588, NS; p_{High} = 0.413, NS), and gender (p_{Low} = 0.779 NS) have no significant effect on the centrality of the supplier's new customer within group treatment. However, the results for the high buyer asset specificity treatment indicate a significant difference in responses due to gender (p_{High} = 0.003) with females desiring greater vertical coordination when a central customer is added by the supplier.

Buyer Supplier Network Density

Hypothesis Eight. Hypotheses 8a1, 8a2, and 8b test the moderating effect of buyer supplier network density on the buyer asset specificity/vertical coordination relationship. H_{8a1} predicts when the buyer's supplier network density is low, the buyer will prefer the market governance option and switch to a new supplier instead of producing the component internally or continuing to purchase from the current supplier. In support of H_{8a1}, when the buyer's supplier network density is low, buyers

significantly opted for market governance for both the high ($p < 0.05$) and low ($p < 0.05$) treatments of buyer asset specificity.

Hypothesis 8a2 predicts the buyer will continue purchasing from the current supplier when the buyer supplier network density is high. In support of H_{8a2}, when the buyer supplier network density is high, buyers significantly opted to continue purchasing form the current supplier for both the high ($p < 0.05$) and low ($p < 0.05$) treatments of buyer asset specificity.

If the buyer chose to continue purchasing from the current supplier after the addition of the new customer, then H_{8b} predicts the density of the buyer's supplier network will inversely moderate the relationship between buyer asset specificity and vertical coordination. For both treatments of buyer asset specificity, when the buyer has invested significant assets and when the buyer has invested few assets specifically with the supplier, the density of the buyer's supplier network does not significantly moderate the relationship between buyer asset specificity and vertical coordination. Therefore, H_{8b} is not supported.

The Levene statistic indicates that the groups for the buyer's supplier network density for both the high buyer asset specificity ($p = 0.271$, NS) and low buyer asset specificity ($p = 0.709$, NS) treatments have homogenous variances. An order effect is not present in the within group buyer's supplier network density treatment for either the high buyer asset specificity or low buyer asset specificity treatments. Analysis of the control variables indicate a difference in responses for the buyer's supplier network density due to industry ($F_{High} = 0.022$), where respondents from SIC 360 desire greater vertical

coordination than respondents from SIC 350. No differences in the buyer's supplier network density within group treatment are detected due to industry ($F_{Low} = 0.093$, NS), firm size ($p_{High} = 0.474$, NS; $p_{Low} = 0.347$, NS), and gender ($p_{High} = 0.308$, NS; $p_{Low} = 0.395$, NS).

Hypothesis Nine. Hypotheses 9a1, 9a2, and 9b test the moderating effect of buyer supplier network density on the buyer performance ambiguity/vertical coordination relationship. H_{9a1} predicts when the buyer's supplier network density is low, the buyer will prefer the market governance option and switch to a new supplier instead of producing the component internally or continuing to purchase from the current supplier. For both the high and low treatments of buyer performance ambiguity, the results indicate in low density buyer supplier networks, buyers did not significantly opt for market governance. Therefore, H_{9a1} is not supported.

Hypothesis 9a2 predicts when the buyer's supplier network density is high, the buyer will continue to purchase from the current supplier. For both the high and low treatments of buyer performance ambiguity, the results indicate buyers did not significantly choose to continue purchasing from the current supplier. Therefore, H_{9a2} is not supported.

If the buyer chose to continue purchasing from the current supplier after the addition of the new customer, then H_{9b} predicts the density of the buyer's supplier network will inversely moderate the relationship between buyer performance ambiguity and vertical coordination. For both treatments of buyer performance ambiguity, the

density of the buyer's supplier network does not significantly moderate the relationship between buyer performance ambiguity and vertical coordination. Therefore, H_{9b} is not supported.

The Levene statistic indicates that the groups for buyer's supplier network density for the high buyer performance ambiguity ($p = 0.603$, NS) treatment have homogenous variances. The Levene statistic ($p = 0.015$) indicated that the groups for the low buyer performance ambiguity treatment did not have homogenous variances, and the analysis is conducted assuming not equal variances. An order effect is not present in the buyer's supplier network density within group treatment for either the high buyer performance ambiguity or low buyer performance ambiguity treatments. Analysis of the control variables for industry ($F_{High} = 0.137$, NS; $F_{Low} = 0.264$, NS), firm size ($p_{High} = 0.257$, NS; $p_{Low} = 0.865$, NS), and gender ($p_{High} = 0.968$, NS; $p_{Low} = 0.261$, NS) indicate no significant effect on the buyer's supplier network density within group treatment.

Hypothesis Ten. Hypotheses 10a1, 10a2, and 10b test the moderating effect of buyer supplier network density on the buyer demand uncertainty/vertical coordination relationship. H_{10a1} predicts when the buyer's supplier network density is low, the buyer will prefer the market governance option and switch to a new supplier instead of producing the component internally or continuing to purchase from the current supplier. In support of H_{10a1}, when the buyer's supplier network density is low, buyers significantly opted for market governance for both the high ($p < 0.05$) and low ($p < 0.05$) treatments of buyer demand uncertainty.

Hypothesis 10a2 predicts the buyer will continue purchasing from the current supplier when the buyer supplier network density is high. In support of H_{10a2}, when the buyer supplier network density is high, buyers significantly opted to continue purchasing form the current supplier for both the high ($p < 0.05$) and low ($p < 0.05$) treatments of buyer demand uncertainty.

If the buyer chose to continue purchasing from the current supplier after the addition of the new customer, then H_{10b} predicts that the density of the buyer's supplier network will inversely moderate the relationship between buyer demand uncertainty and vertical coordination. The density of the buyer's supplier network does not moderate the degree of vertical coordination for the high buyer demand uncertainty treatment; however, the density of the buyer's supplier network significantly moderates the low buyer demand uncertainty treatment ($p < 0.05$; Bonferroni Correction Factor $p < 0.1$), with the buyer desiring greater vertical coordination when buyer supplier network density is low. Therefore, H_{10b} is partially supported.

The Levene statistic indicates that the groups for the buyer's supplier network density for both the high buyer demand uncertainty ($p = 0.500$, NS) and low buyer demand uncertainty ($p = 0.118$, NS) treatments have homogenous variances. An order effect is present in the buyer's supplier network density within group treatment for the high buyer demand uncertainty treatment (Central customer presented first, $p = 0.024$), but is not present in the buyer's supplier network density within group treatment for the low demand uncertainty treatment. Analysis of the control variables for industry ($F_{High} = 0.414$, NS; $F_{Low} = 0.677$, NS), firm size ($p_{Low} = 0.475$, NS), and gender ($p_{High} =$

0.766, NS; p_{Low}=0.190, NS) indicate no significant effect on the buyer's supplier network density within group treatment. However, for the high buyer demand uncertainty treatment, firm size (p_{High} = 0.039) indicated a difference in responses between small (< 500 employees) and large (> 500 employees) firms, with smaller firms desiring greater vertical coordination.

Hypothesis Eleven. Hypotheses 11a1, 11a2 and 11b test the moderating effect of buyer supplier network density on the buyer technological uncertainty/vertical coordination relationship. H_{11a1} predicts when the buyer's supplier network density is low, the buyer will prefer the market governance option and switch to a new supplier instead of producing the component internally or continuing to purchase from the current supplier. In support of H_{11a1}, when the buyer's supplier network density is low, buyers significantly opted for market governance for both the high ($p < 0.05$) and low ($p < 0.05$) treatments of buyer technological uncertainty.

Hypothesis 11a2 predicts the buyer will continue purchasing from the current supplier when the buyer supplier network density is high. In support of H_{11a2}, when the buyer supplier network density is high, buyers significantly opted to continue purchasing form the current supplier for both the high ($p < 0.05$) and low ($p < 0.05$) treatments of buyer technological uncertainty.

If the buyer chose to continue purchasing from the current supplier after the addition of the new customer, then H_{11b} predicts that the density of the buyer's supplier network will inversely moderate the relationship between buyer technological uncertainty

and vertical coordination. The buyer's supplier network density significantly increases the degree of vertical coordination when buyer technological uncertainty is high ($p < 0.1$; Bonferroni Correction Factor, NS); however, when buyer technological uncertainty is low the density of the buyer's supplier network does not significantly moderate the relationship. Therefore, H_{11b} is partially supported.

The Levene statistic indicates that the groups for the buyer's supplier network density for both the high buyer technological uncertainty ($p = 0.317$, NS) and low buyer technological uncertainty ($p = 0.729$, NS) treatments have homogenous variances. An order effect is not present in the within group density treatment for either the high buyer technological uncertainty or low buyer technological uncertainty treatments. Analysis of the control variables for industry ($F_{High} = 0.565$, NS; $F_{Low} = 0.480$, NS), firm size ($p_{High} = 0.346$, NS; $p_{Low} = 0.453$, NS) gender ($p_{High} = 0.130$, NS; $p_{Low} = 0.183$, NS) indicate no significant effect on the buyer's supplier network density within group treatment.

CHAPTER SIX

THEORETICAL AND MANAGERIAL CONTRIBUTIONS OF THE STUDY

The objective of this dissertation was to integrate a network perspective with transaction cost economics. Specifically, this research addressed how a buyer adapts its relationship with a supplier due to structural changes occurring within a network of suppliers. A limitation of transaction cost economics is a failure to account for "interdependencies among a series of related contracts" (Williamson 1985, p. 393) when examining a relationship between a buyer and supplier. Scholars have recently suggested that to fully understand dyadic relationships, a network perspective needs to be incorporated (Antia and Frazier 2001; Geyskens et al. 2006; Wathne and Heide 2004). Using established transaction cost economics logic, this research integrated the structural dimensions of centrality and density from network theory to address the governance of a buyer with a current supplier that has added a new customer. The addition of the new customer introduces uncertainty in the existing dyadic relationship between the buyer and the current supplier due to the change in the surrounding network. As such, this research focuses on the buyer's adaptation of the dyadic governance and addresses the following two research questions. First, does the centrality in the industry network of the supplier's new customer influence the governance in an existing relationship? Second, does the density of the buyer's supplier network moderate the governance with the current supplier when a new relationship is added to the network? The results of this research provide evidence that dyadic relationships are influenced by the network in which they exist, and a deeper understanding of adaptive governance is gained when a network perspective is integrated with transaction cost economics logic.

Theoretical Contributions

Four conclusions are drawn from the results of this research. First, the transaction cost economics prescriptions of increased transaction asset specificity, behavioral uncertainty, and demand uncertainty in a buyer-supplier dyadic relationship lead to increased vertical coordination with a supplier are supported[6], providing nomological support and internal consistency of the model. Second, the centrality in the industry network of supplier's new customer increases the future buyer demand uncertainty when demand uncertainty is initially low and moderates the dyadic governance concerning buyer asset specificity. Third, the buyer's supplier network density moderates vertical coordination with the supplier when buyer demand uncertainty is initially low and buyer technological uncertainty initially high. Finally, buyer supplier network density has a significant influence on governance choice. In low density buyer supplier networks, buyers opted for market governance, and in high density buyer supplier networks, buyers choose to continue purchasing form the current supplier when a new customer is added by the supplier.

Transaction Cost Economics Prescriptions. Transaction cost economics prescribes three forms of governance (market, hybrid, and vertical integration) in managing marketing channels (Heide 1994; Williamson 1985; 1975). Manufacturing firms purchase components from a network of suppliers engage in a form of hybrid governance, where the cost to manage the relationship is greater than market governance and lower than producing the component internally (Williamson 1991), where the cost of governance is driven by the degree of asset specificity, behavioral uncertainty, and

[6] Increased technological uncertainty leading to greater vertical coordination with the supplier was not supported.

environmental (demand and technological) uncertainty. In hybrid governance, as these dimensions increase, vertical coordination between the buyer and a supplier escalates (Andersen and Buvik 2001; Buvik and Gronhaug 2000; Combs and Ketchen 1999) and the level of joint action increases (Heide and John 1990; Joshi and Stump 1999). Consistent with transaction cost economics, the results of this research provide empirical evidence in support of increased vertical coordination in hybrid governance when significant investments are made by a buyer specifically with the current supplier and when the levels of behavioral and demand uncertainty are elevated (Geyskens et al. 2006; Rindfleisch and Heide 1997; Williamson 1985; 1975).

Hybrid governance requires greater information sharing between the buyer and the supplier (Celly et al. 1999), placing the buyer in a potentially adverse situation concerning the safeguarding of information and assets invested and evaluation of the supplier's performance in complying with the contract. The buyer may be required to share proprietary product and process information. Sharing such information, exposes the buyer to potential opportunistic behavior on behalf the supplier (Provan and Skinner 1989), requiring safeguarding measures. In hybrid governance, as buyer asset specificity increases, the buyer increases the level of vertical coordination with the supplier to reduce the threat of opportunistic behavior and safeguard the assets by greater contract formalization (Buvik 1998; Cannon et al. 2000) and monitoring (Pilling et al. 1994). In relationships where it is difficult for the buyer to measure price and delivery performance, Heide and John (1990) showed that buyers increased vertical coordination with the supplier by increasing monitoring and verification efforts. Houston and Johnson (2000) found that performance ambiguity led to increased vertical coordination between a

buyer and supplier in the formation of a joint venture. Strong forms of hybrid governance, such as joint ventures and alliances, allow buyers to protect their proprietary assets and monitor the supplier's performance through joint ownership and risk sharing (Heide 1994).

Consistent with prior research (Andersen and Buvik 2001; Buvik and Gronhaug 2000; Combs and Ketchen 1999; Heide and John 1990; Joshi and Stump 1999), the results of this research indicate that buyers utilizing hybrid governance adapt the governance with their current supplier by increasing vertical coordination, in the form of contract adjustments and increased monitoring and verification efforts, with the supplier to protect assets invested with the supplier and reduce behavioral uncertainty when the structure of the network changes. Increased vertical coordination allows the buyer to protect the assets invested through increased interaction with the supplier to reduce potential ex post opportunistic behavior and the misuse of proprietary assets and leakage of information to the new customer (Wathne and Heide 2000). Increased vertical coordination can also occur in the form of increased monitoring of the supplier and verification efforts (Heide and John 1990). Monitoring and verification reduce the buyer's behavioral uncertainty and increase the likelihood of the supplier meeting cost, quality, and delivery targets preventing disruption of assembly and excess inventory carrying costs.

Environmental uncertainty also influences the level of vertical coordination between the buyer and supplier (Williamson 1985; 1975). Prior research has studied environmental uncertainty as demand and technological uncertainty (Geyskens et al. 2006; Rindfleisch and Heide 1997). Fluctuations in demand require the buyer to adapt

the transaction with the supplier to account for scheduling changes in component production. Research has shown that demand uncertainty leads to greater vertical integration (Leiblein et al. 2002; Levy 1985) and increased negotiation costs (Artz and Brush 2000). As demand uncertainty increases the buyer must communicate the changes in future demand of the end product to the supplier so the supplier can adjust the production schedule to prevent component shortages and excess inventory. This research provides further evidence of increased vertical coordination between the buyer and the supplier to reduce demand uncertainty and is consistent with transaction cost economic logic. The consistency of these results with the prescriptions of transaction cost economics provide nomological validity, internal consistency, and validates the model incorporating the network variables centrality and density presented in this research.

Network Centrality. Centrality of the supplier's new customer in the industry influences the governance decision of the existing relationship between the buyer and the current supplier. The buyer can protect itself from opportunistic behavior by switching suppliers (market governance), increase vertical coordination with the supplier, or vertically integrate the component and produce it internally. This research indicates that vertical integration is the least likely option considered when the supplier adds a new customer. To counter opportunistic behavior, buyers are more likely to switch to a new supplier if the current supplier's new customer is centrally positioned within the industry network. By choosing market governance to address a change in the network structure, the buyer can reduce the threat of expropriation of assets and leakage of proprietary information to the supplier's new customer. Central organizations in a network have greater prestige and influence than non-central organizations (Raub and Weesie 1990),

and will have greater influence over the supplier, possibly causing the supplier to divert resources in support of a central organization. By switching suppliers, the current buyer eliminates the threat of potential opportunistic behavior on behalf of the supplier, thereby alleviating the potential of supply disruptions and loss of competitive information from the supplier to the new customer. Interestingly, if the buyer chooses to stay with the supplier, the position of the supplier's new customer does not differentiate the degree of vertical coordination with the current supplier. This suggests that buyers are relying on contracts and ex ante confidentially agreements to protect against potential ex post opportunistic behavior and the buyers do not perceive the need to increase vertical coordination upon learning of the supplier's new customer and may not adapt the relationship with the current supplier until the commission of opportunistic behavior.

The addition of a centrally positioned new customer by the supplier increases the buyer's demand uncertainty when demand uncertainty is initially low. In low buyer demand uncertainty, supply chains are stable and a change in suppliers has a greater impact than in high buyer demand uncertainty environments where supply chains are adjusting to changes in demand. Adding a centrally positioned customer by a supplier signals to the buyer of a pending change in the demand. The buyer's demand may decrease, if the supplier's new customer is embarking on a market expansion strategy, or may increase, if the supplier's new customer is changing suppliers to address a quality issue with its current supplier. Centrally positioned supplier new customers pose a greater threat to a buyer's future demand due to their ability to in innovate and introduce new products to the market (Powell et al. 1996). This ability allows central new customers to capture market share from the buyer by the introduction of new technology

and possibly rendering the buyer's technology obsolete. This research suggests as buyers become aware of changes in a competitor's supply chain, buyers adapt the governance with the supplier to account for the increased uncertainty in future demand of the buyer's products. In supplier networks, the focal dyad is not isolated from the network it which it resides. As this research shows, a change in the network structure surrounding the focal dyad increases the potential of opportunistic behavior and demand uncertainty that require adaptation of the governance to prevent maladaption costs (Williamson 1991). Even though the addition of the new customer added by the supplier is one position away in the buyer's supplier network, the position occupied within the industry network has a direct influence on the governance of the dyadic relationship between the buyer and supplier.

Network Density. The buyer's supplier network density influences the governance decision. In sparse buyer supplier networks, relational norms are low (Heide and John 1992; Noordewier et al. 1990) and the propensity for buyers to switch to a new supplier is greater. In markets where there are many qualified suppliers, buyers may switch to a new supplier after the current supplier adds a new customer to protect against the loss of propriety information and reduce uncertainty external to the current supplier. When the buyer's supplier network density is sparse, buyers switch suppliers more often than when the supplier network is dense to counter demand uncertainty and elevated technological uncertainty. This suggests that buyers switch suppliers when the norms, shared expectations within the network, and communication amongst the suppliers are low. In the absence of norms and communication amongst network members, the buyer is in a position to opportunistically search the market for a new supplier without the

current supplier discovering the buyer potentially switching to a new supplier. In situations where the norms governing the network are not established to due low network density and technological uncertainty is high, buyers search the market for new technology and will switch suppliers with greater frequency than in dense networks. This suggests that when the buyer's supplier network density is high, the buyer will work closer with suppliers to develop technologies within the network.

If the buyer chooses to continue purchasing from the supplier, the density of the buyer's supplier network influences the degree of vertical coordination with the supplier. The density of a network influences the availability and flow of information between its members (Coleman 1990; Valente 1995) and can reduce the buyer's uncertainty when changes occur in the structure of the buyer's supplier network. This research indicates that the density of the buyer's supplier network influences the level of coordination with the supplier concerning environmental uncertainty but not concerning issues regarding the supplier directly, such as investments with the supplier and behavioral uncertainty. In low demand uncertainty environments, the addition of a new customer by a supplier in the buyer's supplier network has a stronger signaling effect than in high demand uncertainty environments. Low demand uncertainty environments are characterized by stable market share for organizations competing in the market and established supply channels. The addition of a new customer by one of the buyer's suppliers increases the future demand uncertainty of the buyer. Two sources of information are available to the buyer to offset the increase in demand uncertainty. The buyer may gather information from other suppliers in its supplier network, or the buyer may contact the supplier adding the new customer directly. In sparse networks, the results indicate that buyer's increase

information sharing with the supplier to reduce the increase in demand uncertainty created by the addition of the new customer. This suggests that in sparse networks, the ability to gather information from the buyer's network of suppliers is diminished, requiring greater coordination with the individual supplier.

Similarly, the density of the buyer's supplier network influences the level of vertical coordination with the supplier adding the new customer in high technological uncertainty environments. High technological uncertainty environments are characterized by short product life cycles where technology obsolescence contributes to the rapid decline in market share of organizations where their technology is superseded by the competition. In high technological uncertainty environments, the addition of the new customer has a greater signaling effect to the buyer regarding the potential of future technology changes. In a dense network, the buyer can access information concerning impending technology changes through its supplier network and reduce technological uncertainty. However, in sparse networks, the lack of information in the network causes the buyer to increase the vertical coordination with the supplier adding the new customer to reduce the increased technological uncertainty. Thus, in sparse supplier networks, the buyer must adapt the governance of the relationship with the supplier to account for the increase in technological uncertainty in high technological uncertainty environments. In contrast, dense supplier networks allow the buyer to gather information from its supplier network negating the need to adapt the governance with the supplier adding the new customer.

By considering the influence of the network density in which the dyad resides, a greater understanding of how buyers adapt their relationships with suppliers extends the

prescriptions from transaction cost economics and the management of supplier networks. The buyer's supplier network density does not elevate the safeguarding and performance evaluation problems. Buyers address safeguarding of assets and supplier performance directly with the supplier in dense or sparse buyer supplier networks. This suggests that buyers do not gather information from the network to counter opportunistic behavior of the supplier or increase their bounded rationally to reduce behavioral uncertainty. However, in low demand uncertainty and high technological uncertainty environments, the density of the buyer's supplier network influences the adaptation of the relationship with the supplier. In these environments, maladaptation costs occur when a new customer is added by a supplier in the buyer's supplier network. In sparse supplier networks, buyers adapt the governance of the relationship by increasing the vertical coordination with the supplier. The increase in vertical coordination suggests that the cost of managing the relationship is increased. In dense supplier networks, the need to adapt the governance is decreased due to the availability of information from the network of supplier, thereby reducing the cost of managing the relationship with the supplier after the addition of the new customer. These results indicate that the structure of the network that the dyad resides influences the governance decision concerning the adaptation of the relationship to account for changes in environmental uncertainty.

An additional benefit proposed for dense networks is the ability to sanction and prevent opportunistic behavior by applying pressure to conform to expectations and shared norms of the network (Burt 2000; Coleman 1988; Granovetter 1985). This research suggests that buyers do not use their supplier network to coordinate with other suppliers in their network to sanction the supplier adding a new customer. The lack of

this phenomenon may be due to ethical considerations, the buyer's reputation with other suppliers in its supplier network, and advantage accorded to the buyer by the addition of the supplier's new customer. Coordinating suppliers to sanction the opportunistic behavior of one supplier acting opportunistically may violate anti-trust and collusion statues regarding the management of suppliers. Buyers engaging in sanctioning behavior risk the loss reputation and trust with other suppliers in their supplier network if the buyer is viewed as manipulating suppliers for its own interests. Other suppliers will then be less likely to trust the buyer in future transactions. Finally, the buyer is in a position to capitalize on the supplier's improved financial and technology position. The addition of a new customer by a supplier reduces the cost of the components produced by the supplier which can lead to price reductions for the buyer in future negotiations. Also, the new customer may introduce new technology with the supplier that may improve future products purchased by the current buyer.

Managerial Contributions

In recent years, there has been considerable interest in the management of supplier networks (Achrol and Kotler 1999; Wathne et al. 2001; Wathne and Heide 2004). Managing a network of suppliers requires managers to expand beyond the management of individual relationships and manage the network as a complete entity to develop synergy and create a competitive advantage. This research illustrates the need to account for the position of organizations within the industry network and the density of a manufacturer's supplier network structure in developing a competitive advantage through supply chain management. This research has two key implications for managers. First, the addition of an organization central in the industry network as a new customer by a

supplier increases the buyer's uncertainty in its relationship with the supplier and needs to be managed ex ante to lower future adaptation costs with the supplier. Second, a dense network of suppliers is a source of information that reduces the environmental uncertainty confronting the buyer and lowers the cost of managing the overall supplier network.

As organizations have outsourced activities to a network of suppliers, organizations lose a degree of control over the use of proprietary information and decisions by suppliers that add new customers. In contrast to vertically integrated organizations, manufacturers need to be aware of the potential risks regarding the safeguarding of information in anticipation of suppliers developing new business relationships. Manufacturers need to develop contracts to explicitly state the expectations of suppliers and confidentially agreements to prevent the loss of proprietary information with the expectation of structural changes in the buyer's supplier network, such as when a supplier adds a new customer. Anticipating the addition of customers by suppliers, manufacturers should structure contracts with provisions to prevent the expropriation of assets by the supplier's new customer. Contracts with such provisions prevents excessive restructuring of relationships with current suppliers and avoids maladaption costs incurred when the supplier network structure changes.

However, changes to the structure of the supplier network can be a benefit and manufacturers should be in a position to negotiate with suppliers to strengthen their competitive position. The addition of a new customer, either a central or non-central to the industry network, by a supplier increases economies of scale for the supplier. Manufacturers benefit by being able to negotiate future price reductions for the

components purchased. If the manufacturer has designated the supplier as a supplier of choice in advance of the addition of the new customer, then the manufacturer is in a position to negotiate the lowest price from this supplier, thereby enhancing its competitive position and profit margin. Intuitively, manufacturers regard the addition of a competitor central to the industry network as a potential threat. However, with forethought in structuring contractual agreements to protect proprietary information shared with the supplier, manufacturers may benefit and at times should encourage suppliers to work with centrally positioned customers. By virtue of its central position in the industry, the new customer confers a degree of prestige to the supplier and enhances the supplier's position in the industry. Indirectly, a manufacturer may benefit from access to new product and process technology available to its supplier, enhancing its own reputation within the industry.

In contrast, managers may offset the uncertainty created by the addition of a new customer by one of its suppliers by constructing and maintaining a dense network of suppliers where information moves throughout the network and norms are developed to constrain opportunistic behavior. In dense networks, buyers have access to information flowing between the suppliers which can offset the environmental uncertainty in the focal dyadic relationship with an individual supplier. By being able to reduce the uncertainty in the relationship with the supplier adding the customer, the need to increase the vertical coordination directly with the supplier is diminished. Not only do dense suppliers networks reduce the need for vertical coordination with an individual supplier, but also can be applied across the entire supply chain network to reduce the cost of managing the entire network. By managing each supplier individually, buyers may neglect information

available from outside the dyad to reduce uncertainty within the dyad. By accessing the information available in a dense supplier network, the degree of vertical coordination can be reduced with all the suppliers, thereby decreasing the overall cost of managing the supplier network.

In addition, dense supplier networks promote the development of norms and shared expectations and reduce the potential of the buyer switching suppliers to offset the uncertainty and opportunistic behavior when new customers are added by suppliers (Heide and John 1992; Noordewier et al. 1990). Transaction cost economics argues that purchasing components through market transitions is the least costly option. Viewing each transaction as an individual transaction, this proposition may indeed be true. However, when suppliers are arranged in a network, interconnections between multiple suppliers increase the cost of switching suppliers. Switching suppliers incurs costs to reestablish interconnections between the new supplier and the existing supplier network. From a buyer's perspective, replacing a supplier may not necessarily be the least costly option. The cost of qualification and adaptation of a new supplier to the norms and expectations of the manufacturer's supply chain may far exceed the cost of additional coordination with the current supplier. It may be in the manufacturer's best interest to continue the relationship with the current supplier and develop a dense network of suppliers with efficient means of communication and norms of behavior for the entire network to restrain opportunistic behavior on the part of both the supplier and the manufacturer. Thus, the viewing and managing the entire supplier network as a whole may in the long-term be more efficient than managing each supplier as an individual entity.

Limitations and Future Research Directions

The results and implications drawn from this research should be interpreted in light of the research method used and normative prescriptions proposed by transaction cost economics. While several tests of the hypotheses are consistent with the model, the results should be viewed by considering the following limitations. First, this research was restricted to supply chain management professionals from the manufacturing (machinery, electrical, transportation, and measurement) industry to provide a homogenous sampling frame. The results and implications may differ for service organizations (Erramilli and Rao 1993). In a network consisting of service organizations, the level of vertical coordination between buyers and suppliers may be greater due to the tacit nature of information included in the service purchased. In addition, the simultaneous consumption and purchase of the service may necessitate a deeper understanding of the supplier's production processes and greater protection of proprietary information. This may lead to greater coordination with suppliers and denser networks than in the manufacturing industry due to greater co-production of the deliverable service. Service buyers may also limit suppliers in their networks from working with competitors to a greater degree due to the competitive advantage of sharing information with the supplier and the diminished ability to protect tacit information. Future research could examination the governance response of service organizations.

Second, the research did not limit the influence of interactions between variables in the experiments. It is possible that variables such as the duration of the relationship and the use of transaction specific assets influenced the results of tests concerning other variables in the research. Buyer-supplier relationships that have existed for an extended

period of time allow for the development of norms and trust between the buyer and supplier (Noordewier et al. 1990). Increasing the norms and trust between the buyer and supplier will diminish the need for coordination and limit the likelihood that the buyer will switch suppliers when the supplier adds a new customer. Transaction cost economics also postulates interactions between uncertainty and asset specificity. While asset specificity was controlled for in experiments concerning uncertainty at a low level, alternative explanations regarding the influence of asset specificity this research cannot be ruled out. An extension of this research could include interactions resulting from the duration of the relationship and specific assets invested by the buyer.

Third, this research was limited to buyer-supplier dyads in the U.S. Extending this research to international suppliers increases the uncertainty in the dyad and may lead to greater costs of coordination. International suppliers add another dimension of complexly in managing a network of suppliers (Buvik and Andersen 2002). Differing cultures and legal systems require the buyer to protect against counterfeiting by the supplier and loss of proprietary information. Where enforcement of contracts is minimal, the buyer may have no recourse in preventing supplier opportunistic behavior. Extending this research into an international environment will provide interesting insight into global supply chain management.

Fourth, this research focused on the network structural dimensions, and an extension of this research would be to include relational network dimensions. Networks provide governance of relationships due to the content of the information shared between organizations and the development of norms and shared expectations. The establishment of norms provides an implicit form of governance within the network, thus offsetting the

need for explicit forms of governance. Organizations reframe from acting opportunistically due to the ability of the network to sanction their actions and remove them from the network. In dense networks where norms are high and organizations derive a sense of prestige from membership, the need for coordination and the propensity of the buyer to switch suppliers is diminished. Investigating relational network dimensions would be a fruitful area for future research.

APPENDICES

Appendix 1

E-mail from Clinical Professor in Supply Management

Soliciting Supply Chain Professionals Participation in Research

Best and Brightest,

As you know, one of our research streams at MSU is around supplier relationships / governance. Wesley Pollitte, a doctoral student at MSU, is initiating a study in this area – see attached. The purpose of this email is to request your early stage support of Wes' research by responding to his call for a short interview. Wes will use the findings from these initial interviews to develop and test the research described on the attached.

Because of your SM expertise along with your firm's reputation as a leader in SM, we'd like your help. Wes will contact you within the next several days to determine your interest and availability. Thanks in advance for your support.

XXX

Appendix 2

Executive Summary Sent to Supply Chain Professionals Soliciting Participation in Research

The Effects of Vertical Networks on Channel Governance Adaptation: A Transaction Cost Economics Approach

Wesley A. Pollitte – July, 2007

This research investigates the management of a supplier network from the perspective of the buyer concerning the adaptation of governance between a supplier and the buyer as network membership changes. Specifically, this study focuses on changes in governance between a supplier and a buyer in a vertical network when the supplier adds a new customer. The model is examined using a two-stage role-playing experiment with supply management professionals as key informants to capture the degree of vertical coordination before and after the addition of the supplier's new customer.

The experimental design is conducted in two phases; a concept validation and pre-test phase followed by the actual administering of the experiment in phase two. The first phase involves an iterative process to understand how the conceptual elements of the adaptive responses and construct items to be tested in the experimental design are perceived by Supply Management professionals. Upon establishing the conceptual domain, feedback will be solicited from supply management professionals on the wording and presentation of the scenarios (seven total scenarios) used in the experiment. Upon completion of the scenarios, a pre-test will be conducted using supply management professionals though phone interviews to examine the comprehension and recall of the key components of each scenario.

The second phase of the experiment consists of a two-step experiment. Each informant is presented with a treatment that addresses a condition prior to the addition of a new customer by a supplier and a condition after the addition of a new customer by a supplier. In the first step, the informant is to select the preferred level of vertical coordination based on the conditions presented in the scenario. In the second step, after the new customer is added, an additional variable is added to the scenario and the informant is to address the level of vertical coordination required. The hypothesized outcome of this research is to show that characteristics of the network influence the level of vertical coordination in the focal relationship between the buyer and the supplier.

Appendix 3

Initial E-mail Soliciting Supply Chain Professionals Participation in Research

XXX

I hope this message finds you well.

Hello, my name is Wesley Pollitte, and I am a doctoral student at Michigan State University. Currently I'm initiating my research for my dissertation on buyer-supplier relationships in a network context. As a supply management professional, you are in a unique position to supply valuable insights and information in the early phases of this research and your participation in this research would be greatly appreciated. It is anticipated that the results of this research will provide guidance in efficiently structuring buyer-supplier relationships by including the influence of network factors in governance decision-making.

Recently you were contacted by Joseph Sandor regarding participation in research here at Michigan State University in support of my dissertation described in the attached. My research focuses on changes in governance between a buyer and a supplier when the supplier adds a new customer. Specifically, my research addresses how do buyers adapt their relationships with suppliers when membership of a network changes.

This phase of the research concerns developing a greater understanding of how organizations adapt supplier relationships. Your participation will require answering a

few short questions regarding how you would adapt your relationship with a supplier. Answering the questions should take approximately 15 to 30 minutes. Of course all of your responses will be confidential and only used by me in support of this research.

I would like to schedule a phone interview with you at your convenience between August 8th and 22nd. Please let me know when you would be available and a phone number where I can reach you. I can be reached by e-mail at pollitte@msu.edu or by phone at (517) 432-6454. If you are willing to participate in this research, I can provide you a summary of the findings upon its completion.

Again, thank you for consideration in participating in this research. I look forward to hearing from you in the near future.

Wesley Pollitte

Michigan State University

Appendix 4

Follow-up E-mail to Soliciting Supply Chain Professionals Participation in Research

XXX

This message is a follow-up to an invitation for research support at Michigan State University. Previously you received an e-mail from Joseph Sandor on July 16th and me on July 27th. To date, you have not responded to the opportunity to participate in this research, and as a supply chain management professional, your input in highly valued in support of this research.

If you would like to participate in this research, please e-mail me at pollitte@msu.edu or call me at (517) 432-6454.

I look forward to hearing from you.

Wesley Pollitte

Michigan State University

Appendix 5

Research Questionnaire of Adaptive Responses Used in Interviews With Supply Chain Professionals

Demographic information collected included the professional's name, position, years of experience in supply chain management, product responsibility, company name, and company size (number of employees).

Vertical Coordination Definition:

This research studies vertical coordination between you as a buyer and your supplier as part of a network of suppliers. Vertical coordination is the degree of information exchanged between you and your supplier. This information may include: production costs, market conditions for the end product, future market strategies, and joint efforts in product development and quality control.

1. When you structure relationships with suppliers, how does the amount of assets committed to support a particular supplier influence the level of vertical coordination with the supplier? (information exchanged, production costs, etc)

2. When you structure relationships with suppliers, how does your ability to forecast your product demand influence the level of vertical coordination with the supplier?

3. When you structure relationships with suppliers, how does your ability to forecast technological changes influence the level of vertical coordination with the supplier?

4. When you structure relationships with suppliers, how does your ability to predict prices and delivery performance of that supplier influence the level of vertical coordination with the supplier?

5. If one of your current suppliers adds a new customer, what are the types of responses, if any; you would take in regard to this supplier?

    5a. Would you do anything differently now?

    5b. If yes, what?

6. If that supplier's new customer *maintains many* relations with other organizations in the industry and is *very active* in the industry network, how might this affect your response to that supplier?

    6a. Would you do anything differently now?

    6b. If yes, what?

7. Would your response differ if the supplier's new customer *maintains few* relations with other organizations in the industry and is *not very active* in the industry network?

7a. Would you do anything differently now?

7b. If yes, what?

8. How do you use your network of suppliers to gather information regarding the supplier and the new customer?

8a. Does this influence the level of vertical coordination you have with the supplier?

This concludes this questionnaire. Is there anything you would like to add?

Also, the information from this interview will be used to generate is seven scenarios to be used in a role-playing experiment. Would you be willing to critique 2 or 3 scenarios in the near future?

Thank you for your participation.

Appendix 6

Measures-Literature Review

Vertical Coordination

Buvik and Andersen (2002)

Measure: The extent of interfirm flows of activities, resources, and information in order to coordinate productive values and deal with the realignment of terms of trade.

Items: Development and testing of new materials and components.
Improvement of products and services delivered to our firm.
Exchange of information about production and costs figures.
Improvement of the quality assurance processes.
Selection of materials and components.

Andersen and Buvik (2001)

Measure: The extent that parties carrying out the focal activities in a co-operative and co-ordinated way.

Items: We are regularly in contact with this supplier as regards to the development and testing of new materials and components.
We co-operate closely with our supplier in order to improve products and services delivered to our firm.
We co-operate closely with this supplier in order to co-ordinate the production capacity planning of our firm.
Our firm co-operates closely with this supplier to improve the quality assurance processes in its company.

Jap (2001)

Measure: The regular pattern of similar or complementary actions and activities.

Items: They work on joint projects tailored to their needs.
They work together to exploit unique opportunities.
Both companies are always looking for synergistic ways to do business together.

Artz and Brush (2000)

Measure: Willingness of the OEM and supplier to work together to create a positive exchange relationship.

Items: We share proprietary information with this supplier.
We participate in joint goal setting and forecasting with this supplier.
This supplier does not seek our advice or counsel.

Buvik (2000)

Measure: The intensity of inter-firm co-ordination and the exchange of information between the transacting parties.

Items: We cooperate closely with our supplier about quality assurance processes within its company.

Our firms make regular joint efforts to improve the quality of the products we order.

Our firm cooperates closely with this supplier in the following up of orders.

We cooperate closely with this supplier to improve the quality control of products and services delivered to our firm.

Buvik and Gronhaug (2000)

Measure: The extent of interfirm flows of activities, resources, and information in order to coordinate productive values and deal upon terms of trade.

Items: Our firms co-operate smoothly to meet complaints and solve conflicts.

Our firm co-operate closely with this supplier in the following up of order.

Our firms regularly exchange information about price development and market conditions.

We co-operate closely with this supplier in the quality control of products delivered to us.

We co-operate regularly with this supplier as regards testing of new materials and components.

Buvik and John (2000)

Measure: The purposive organization of the flow of activities and information between the transacting parties.

Items: We regularly exchange information about production costs with this supplier.

We regularly consult with this supplier about its selection or raw materials and components incorporated in the product(s) we order.

We regularly exchange information about price development and market conditions with this supplier.

Our firms make regular joint efforts to improve the quality of the products we order from this supplier.

We cooperate closely with this supplier on quality control of product delivered to our company.

Specific Assets

Heide (2003)

Measure: Investments made by OEM in physical assets, procedures, and people that are tailored to relationship with a particular supplier.

Items:
- We have made significant investments in tooling and equipment dedicated to our relationship with this supplier.
- Our production system has been tailored to meet the requirements of dealing with this supplier.
- Our production system has been tailored to use the particular components bought from this supplier.
- Gearing up to deal with this supplier requires highly specialized tools and equipment.
- This supplier has some unusual technological norms and standards, which have required adaptation on our part.
- Training and qualifying this supplier as involved substantial commitments of time and money.

Rokkan, Heide, and Wathne (2003)

Measure: Investments made by the buyer dedicated to the relationship with a particular supplier.

Items:
- We have made significant investments in equipment dedicated to our relationship with this supplier.
- We have made extensive internal adjustments in order to deal effectively with this supplier.
- Training our people to deal with this supplier has involved substantial commitments of time and money.
- Our logistics systems have been tailored to meet the requirements of dealing with this supplier.

Buvik and Andersen (2002)

Measure: The investments made by the buyer in physical assets, production facilities, tools and knowledge tailored to the specific purchasing relationship.

Items:
- Investments in production equipment.
- Specific insight and knowledge about technological standards.
- Specific resources dedicated to quality assurance programs.
- Special equipment and routines for product control.
- Resources tailored to restructure production.
- Specific investments in information technology.

Skarmeas, Katsikeas, and Schlegelmilch (2002)

Measure: Importer's investments that are specific to the focal relationship, including personnel, training programs, efforts and facilities.

Items:
- We have made substantial investment in personnel dedicated to this supplier's product line.
- We give extensive training to our customers on how to use the supplier's product line.
- We have invested a great deal in building up this supplier's business.
- We have made substantial investments in facilities dedicated to this supplier's product line.

Antia and Frazier (2001)

Measure: Extent investments that cannot be redeployed from existing uses and users except at a significant loss of productive value.

Items:
- If this relationship were to terminate, it would be difficult for us to recoup investments made in this franchisee.
- Training and qualifying this franchisee has involved considerable commitments of time and money.
- We have invested a great deal in building up this franchisee's business.
- If we were to terminate this franchisee, we would lose a lot of our investment in him/her.

Buvik and Reve (2001)

Measure: The investments and/or adaptations made by the buyer in physical assets, production facilities, tools and knowledge tailored to the relationship.

Items:
- We have committed a lot of time to training of personnel for this supplier.
- Our firm has committed a lot of time and resources to learn and adapt to the technical standards of this supplier's products.
- We have made comprehensive investments in transportation equipment dedicated to deal effectively with this supplier.
- We have committed a lot of time and resources to develop specific equipment and routines for product control of deliveries from this supplier.
- Our firm has made comprehensive investments to restructure and integrate our production facilities with this supplier's production.
- Our firm has made significant investments in information technology dedicated to the interaction with this supplier.

Jap (2001)

Measure: Non-fungible investments that uniquely support the buyer-supplier relationship.

Items: If this relationship were to end, they would be wasting a lot of knowledge that's tailored to their relationship.

If either company were to switch to a competitive buyer or vendor, they would lose a lot of the investments made in the present relationship.

They have invested a great deal in building up their joint business.

Artz and Brush (2000)

Measure: The OEM's physical, human, temporal specificity.

Items: We have made significant investments in tooling and equipment dedicated to this supplier.

Qualifying this supplier has involved substantial commitments of time and money.

The supplier's product requires technical skills that are unique to this supplier.

Buvik (2000)

Measure: The investments and/or adaptations made by the buyer in physical assets, production facilities, tools and knowledge tailored to the relationship.

Items: Our firm has committed a lot of time and resources to adapt to technical standards of this supplier's products.

Our firm has made comprehensive investments in storage and transportation equipment dedicated to deal effectively with deliveries from this supplier.

Our firm has committed a lot of time and resources to develop and acceptable quality assurance system at this supplier.

Our firm has committed a lot of time and resources to develop special equipment and routines for product control of deliveries from this supplier.

Our firm has made comprehensive investments to restructure our production to achieve higher efficiency in further processing or products and materials bought from this supplier.

Buvik and John (2000)

Measure: Investments made by OEM in physical assets, production processes, tools, and knowledge tailored to the focal supplier.

Items: Our firm has committed a lot of time and resources to develop specific equipment and routines for control of deliveries from this supplier.

Our firm has made comprehensive investments to restructure and integrate our production facilities with this supplier's production facilities.

Our firm as invested extensively in production equipment specifically adapted to with the products we buy from this supplier

Our firm has committed a lot of time and resources to developing an acceptable quality assurance program at this supplier's plant.

Bensaou and Anderson (1999)

Measure: The investments specific to a relationship, which are difficult or expensive to transfer to another relationship without losing their value.

Items: Extent to which you believe your firm has made major investments specifically for its relationship with this supplier:

In tooling.

On tailoring its products to using this supplier's component.

In time and effort to learn this supplier's business practices.

In time and effort to develop the relationship with this supplier.

Joshi and Stump (1999)

Measure: Specific asset investments in resources, procedures, and people made by the OEM in its relationship with the focal supplier.

Items: We made significant investments in resources dedicated to our relationship with this supplier.

Our operating process has been tailored to meet the requirements of dealing with this supplier.

Training and qualifying this supplier has involved substantial commitments of time and money.

This supplier has some unusual technological norms and standards that have required extensive adaptation on our part.

Stump and Heide (1996)

Measure: The buyer's initial investments made as part of the purchasing agreement with a particular supplier.

Items: Our production system that incorporates this item has been tailored to meet the requirements of dealing with this supplier.

We have spent significant resources to ensure that our specifications for this item fit well with this supplier's production capabilities.

Gearing up to deal with this supplier on this item required highly specialized tools and equipment on our part.

The procedures and routines we have developed to obtain this item are tailored to the particular situation of this supplier.

This supplier has some unusual technological norms and standards for the item, which have required extensive adaptations on our part.

Heide and Stump (1995)

Measure: Buyer's investment in specialized assets and procedures that are idiosyncratic to a particular supplier relationship.

Items: We have made significant investments in tooling and equipment dedicated to our relationship with this supplier.

Our production system has been tailored to use the particular components bought from this supplier.

Stump (1995)

Measure: The extent to which durable investments tailored to the focal supplier have been made to support a particular transaction.

Items: Our production system that incorporates this item has been tailored to meet the requirements of dealing with this supplier.

Gearing up to deal with this supplier on this item required highly specialized tools and equipment on our part.

Heide and John (1992)

Measure: Buyer's investment in specialized physical assets, organizational procedures, and training that are idiosyncratic to a particular supplier relationship.

Items: We have made significant investments in tooling and equipment dedicated to our relationship with this supplier.

This supplier has some unusual technological norms and standards, which have required adaptation on our part.

Training and qualifying this supplier as involved substantial commitments of time and money.

Our production system has been tailored to use the particular components bought from this supplier.

Gearing up to deal with this supplier requires highly specialized tools and equipment.

Heide and John (1990)

Measure: Investments made by OEM in physical assets, procedures, and people that are tailored to relationship with a particular supplier.

Items: We have made significant investments in tooling and equipment dedicated to our relationship with this supplier.

Our production system has been tailored to using the particular items bought from this supplier.

Klein, Frazier, and Roth (1990)

Measure: The degree to which durable, transaction-specific assets were found in the export channel.

Items: It is difficult for an outsider to learn our ways of doing things.

To be effective, a salesperson has to take a lot of time to get to know the customers.

It takes a long time for a salesperson to learn about this product thoroughly.

A salesperson's inside information on our procedures would be very helpful to our competition.

Specialized facilities are needed to market this product.

A large investment in equipment and facilities is needed to market this product.

Klein (1989)

Measure: The degree to which durable, transaction-specific assets were found in the export channel.

Items: It is difficult for an outsider to learn our ways of doing things.

To be effective, a salesperson has to take a lot of time to get to know the customers.

It takes a long time for a salesperson to learn about this product thoroughly.

A salesperson's inside information on our procedures would be very helpful to our competition.

Specialized facilities are needed to market this product.

A large investment in equipment and facilities is needed to market this product.

Performance Ambiguity

Antia and Frazier (2001)

Measure: Extent of information available regarding agent performance.

Items: Not possible to supervise closely--Easy to supervise closely.

Difficult to evaluate level of franchisee effort--Easy to evaluate level of franchisee effort.

Our evaluation is based on very "fuzzy" information--Our evaluation is based on very accurate information.

Joshi and Stump (1999)

Measure: The degree of predictability of supplier behavior for the OEM.

Items: We can accurately predict the prices for the input component that will be charged by this supplier in our next procurement cycle.

We can accurately predict the delivery performance (% of on-time deliveries) of this supplier for our next procurement cycle.

We know that this supplier will adapt quickly, should we have to change our order specifications at short notice.

Bergen, Heide, and Dutta (1998)

Measure: The *ex ante* difficulty faced by the manufacturer in evaluating the specific geographic area covered by the distributor.

Items: There would be significant costs associated with monitoring the activities of this distributor.

At a given time, it would be difficult to evaluate which sales this distributor covers.

Determining this distributor's specific sales would require us to make frequent on-site inspections.

It would be difficult for us to evaluate exactly who this distributor is selling to.

Stump and Heide (1996)

Measure: The inherent difficulty faced by the buyer in accurately evaluating the supplier's performance.

Items: Precise standards by which to assess this supplier's performance are not readily available.

Evaluating this supplier's performance is a highly subjective process.

This supplier is performing so many different tasks that it is difficult to determine whether a good job is being done.

It is difficult to determine whether agreed upon quality standards and specifications are adhered to.

Heide and Stump (1995)

Measure: Buyer's evaluation of the given supplier relationship.

Items: Adherence to specifications.
Delivery performance.

Heide and Miner (1992)

Measure: Assessments of the level of effort a buyer must put forth to assess the quality of the product produced by a supplier.

Items: It is inadequate to evaluate this supplier based only on component prices.
Evaluating the performance of this supplier requires extensive incoming inspection.
In order to obtain satisfactory assessment of this supplier's performance, we need to conduct on-site inspection at the supplier's plant.
Conducting performance evaluations of this supplier requires making sure the follow the approved production and quality control procedures.

Heide and John (1990)

Measure: The difficulty faced by the buyer (OEM) in evaluating the supplier's performance *ex post* by inspection or other such means.

Items: It is inadequate to evaluate this supplier based only on component prices.
Conducting performance evaluations of this supplier requires making sure the follow the approved production and quality control procedures.

Demand Uncertainty

Andersen and Buvik (2001)

Measure: Changing market conditions.

Items: The demand for our end products varies significantly over time.
The market conditions for the products we buy from this supplier is very unstable.

Artz and Brush (2000)

Measure: The price and volume uncertainty.

Items: Price estimates for this supplier's product are difficult to predict.
The market for the end product that uses this supplier's component is highly volatile.
It is difficult to estimate the expected volumes for the supplier's component.

Buvik and Gronhaug (2000)

Measure: The changing economic demand conditions.

Items: The demand for our end products varies continually.
The market condition of our supplier is very unstable.

Buvik and John (2000)

Measure: The unpredictability of the task environment.

Items: The demand for our end products varies continually.
The demand conditions for our supplier's product are very irregular.

Bensaou and Anderson (1999)

Measure: The inability to forecast accurately the volume requirements in the relationship.

Items: Extent to which volume requirements for this component are predictable.
Extent to which your firm's estimates for this component are reliable.

Robertson and Gatignon (1998)

Measure: The difficulty of predicting demand.

Items: Demand is difficult to forecast.
Markets are uncertain.

Heide and Stump (1995)

Measure: Inability to forecast in an accurate fashion the demand for components in question.

Items: Industry sales volume for end product. "unpredictable/predictable"
Your company's sales volume for end product. "unpredictable/predictable"

Ganesan (1994)

Measure: Extent to which market and demand changes are rapid.

Items: Unpredictable demand--Predictable demand.
Sales forecasts are accurate--Sales forecasts are inaccurate.
Stable market shares--Volatile market shares.

Heide and John (1990)

Measure: Inability to forecast accurately the demand for components in question.

Items: Industry sales volume for end product. "unpredictable/predictable"
Your company's sales volume for end product.
"unpredictable/predictable"

Walker and Weber (1984)

Measure: The assessment of fluctuations in the demand for a component and the confidence placed in estimates of the demand.

Items: The extent to which significant fluctuations are expected in the daily or monthly volume requirement for the component.
The extent to which volume estimates for the component are expected to be uncertain.

Technological Uncertainty

Andersen and Buvik (2001)

Measure: Technological dynamism.

Items: The product we purchase from this supplier has very high innovation rates and short life cycles.

Our most important competitors are regularly carrying out significant product adjustments and development of new products.

Antia and Frazier (2001)

Measure: Extent to which the rate of change in the external environment is rapid and unpredictable.

Items: In our business, customer tastes change rapidly.

Production/service technology changes are few and far between in our business.

New developments evolve very rapidly in our industry.

Buvik and Gronhaug (2000)

Measure: Technological dynamism.

Items: Our most important competitors are regularly carrying out product adjustments and development of new products.

The products we buy from this supplier have a high innovation speed and short life cycle.

Buvik and John (2000)

Measure: The unpredictability of the task environment.

Items: Our most important competitors are regularly carrying out product adjustments and development of new products.

The products we purchase from our supplier have very high innovation rates and short life cycles.

Bensaou and Anderson (1999)

Measure: The likelihood of major changes in a component, its performance, and its manufacturing processes.

Items: How likely will major changes occur in the component in four areas (i.e., functionally improvements, major product innovations, major manufacturing innovations, price/performance ratio improvements) during the next five years.

Celly, Spekman, and Kamauff (1999)

Measure: The product complexity and engineering content, as well as the extent of technical innovation and rate of change in technology.

Items: Complex products--Simple products.
High technical innovations--Low technical innovations.
Mature process technology--Evolving process technology.
Low engineering content--High engineering content.
Fast changing technology--Slowly changing technology.

Robertson and Gatignon (1998)

Measure: The change in technology in the product category.

Items: The technology is stable.
Life cycles are short.
The technology is moving very fast.
Technology is on a constant plateau.
Technological pressure is intense.
The technology moves rapidly from generation to generation.

Stump and Heide (1996)

Measure: The inability to predict accurately the technological changes in the product purchased and its underlying manufacturing processes.

Items: Technological changes in end product. "predictable/unpredictable"
General technological developments in the supply market for the identified item. "predictable/unpredictable"
Your firm's changes in specifications for the identified item. "predictable/unpredictable"
This supplier's changes in specifications for the identified item. "predictable/unpredictable"

Stump (1995)

Measure: The unpredictability of changes in product and/or process technology.

Items: Technological changes in end product. "predictable/unpredictable"
General technological developments in the supply market for the identified item. "predictable/unpredictable"

Heide and John (1990)

Measure: Inability to forecast accurately the technological requirements in the relationship.

Items: Technological changes in the end product. "unpredictable/predictable"
General technological developments in the supply market for the components bought. "unpredictable/predictable"

Walker and Weber (1984)

Measure: The uncertainty in terms of change in component specifications.

Items: The frequency of expected changes in specifications for the component.
The probability of future technological improvements of the component.

Network Density

Antia and Frazier (2001)

Measure: Reflects the average strength of relations in a network.

Items: Franchisees of our system share close ties amongst themselves.
There is very little interaction among our franchisees.
Relations among our franchisees are very close.
Share frequent communications--Rarely communicate with each other.
Frequently discuss common problems--Rarely discuss common problems.
Extremely close ties--Not very cohesive.

Network Centrality

Antia and Frazier (2001)

Measure: The strength of an individual agent's position in an agent network.

Items: This franchisee is a crucial cog in the franchisee network.
The franchisee maintains few relations with other franchisees.
Not at all active in franchise network--Very active in franchise network.
Has few links with other franchisees--Has extensive links with other franchisees.
Not at all central to our system--Very central to our franchise system.

Appendix 7

Pre-test Questionnaire Sent to Supply Chain Professionals

Imagine you are a supply chain manager responsible for purchasing CD-ROMs from a supplier for a manufacturer of computers. Please answer the following questions regarding the level of coordination you would have in regards to this supplier.

Part 1

How much coordination would you recommend based on the following statements:

	(Please **Bold** Choice)						
	Limited Coordination						Extensive Coordination
If you have made significant investments specifically with this supplier, where these investments have little value in alternative uses.	1	2	3	4	5	6	7
If you are able to accurately measure prices and delivery performance of this supplier easily.	1	2	3	4	5	6	7
If technology within the industry changes slowly and it is easy to forecast technological requirements.	1	2	3	4	5	6	7
If demand for your computers is steady and is easy to forecast.	1	2	3	4	5	6	7
If you have made few investments specifically with this supplier, where these investments have little value in alternative uses.	1	2	3	4	5	6	7
If you are unable to accurately measure prices and delivery performance of this supplier easily.	1	2	3	4	5	6	7
If demand for your computers varies continually and is difficult to forecast.	1	2	3	4	5	6	7
If technology within the industry changes rapidly and it is difficult to forecast technological requirements.	1	2	3	4	5	6	7

Part 2

How much coordination would you recommend based on the following statements:

	(Please **Bold** Choice) Limited Coordination 1 2 3 4 5 6 7 Extensive Coordination
If you are a market leader for computers.	1 2 3 4 5 6 7
If you purchase the CD-ROMs from a single supplier.	1 2 3 4 5 6 7
If there are multiple qualified suppliers of CD-ROMs.	1 2 3 4 5 6 7
If you purchase the CD-ROMs from the supplier frequently.	1 2 3 4 5 6 7
If your deliveries come frequently from your supplier.	1 2 3 4 5 6 7
If you are not a market leader for computers.	1 2 3 4 5 6 7
If you purchase the CD-ROMs from multiple suppliers.	1 2 3 4 5 6 7
If there are few qualified suppliers of CD-ROMs.	1 2 3 4 5 6 7
If you purchase CD-ROMs from the supplier infrequently.	1 2 3 4 5 6 7
If your deliveries come infrequently from your supplier.	1 2 3 4 5 6 7

Part 3: Your customer's new supplier

If your supplier of CD-ROMs unexpectedly begins to supply a new customer, what response would you recommend based on your supplier's new customer characteristics?

1. The supplier's new customer maintains few ties with other organizations in the industry and is not active in the network.

   (Please place "X" on line of 1of the 3 options)

   Find another supplier of CD-ROMs? ___ (Please go to question 2)

   Produce the CD-ROMs internally? ___ (Please go to question 2)

   Continue to purchase CD-ROMs from this supplier? ___ (Please go to question 1a)

   1a. Having chosen to continue purchasing from this supplier, what level of coordination would you now recommend for this supplier?

   -3 -2 -1 0 +1 +2 +3
   Decrease Coordination | Same Coordination | Increase Coordination
   (Please **Bold** Choice)

2. The supplier's new customer maintains many ties with other organizations in the industry and is very active in the network.

   (Please place "X" on line of 1 of the 3 options)

   Find another supplier of CD-ROMs? ___

   Produce the CD-ROMs internally? ___

   Continue to purchase CD-ROMs from this supplier? ___ (Please go to question 2a)

   2a. Having chosen to continue purchasing from this supplier, what level of coordination would you now recommend for this supplier?

   -3 -2 -1 0 +1 +2 +3
   Decrease Coordination | Same Coordination | Increase Coordination
   (Please **Bold** Choice)

Part 4: Your supplier network

If the supplier of CD-ROMs unexpectedly begins to supply CD-ROMs to a new customer, what response would you recommend based on your supplier network characteristics?

3. You and your suppliers have extensive ties with each other and communicate frequently.

(Please place "X" on line of 1 of the 3 options)

Find another supplier of CD-ROMs? ___ (Please go to question 4)

Produce the CD-ROMs internally? ___ (Please go to question 4)

Continue to purchase CD-ROMs from this supplier? ___ (Please go to question 3a)

3a. Having chosen to continue purchasing from this supplier, what level of coordination would you now recommend for this supplier?

-3 -2 -1 0 +1 +2 +3
Decrease Coordination | Same Coordination | Increase Coordination
(Please **Bold** Choice)

4. You and your suppliers have limited ties with each other and communicate infrequently.

(Please place "X" on line of 1 of the 3 options)

Find another supplier of CD-ROMs? ___

Produce the CD-ROMs internally? ___

Continue to purchase CD-ROMs from this supplier? ___ (Please go to question 4a)

4a. Having chosen to continue purchasing from this supplier, what level of coordination would you now recommend for this supplier?

-3 -2 -1 0 +1 +2 +3
Decrease Coordination | Same Coordination | Increase Coordination
(Please **Bold** Choice)

Appendix 8

Script for Buyer Asset Specificity High and Density (Within Subjects) Treatment

Hello, Mr. /Ms. _____, my name is Wes Pollitte. I am a doctoral student at Michigan State University.

I am conducting research for my dissertation on buyer-supplier relationships and I am contacting supply chain professionals like yourself, and I was wondering if you would you be willing to spend 5 minutes to answer some questions?

I will read a scenario where you will assume the position of a supply chain manager for a computer manufacturer with responsibility for the management of a network of suppliers and recommending the level of coordination with your suppliers.

Coordination is defined as the degree of information exchanged between you and your supplier, and may include information on production costs, market conditions for the end product, future market strategies, and joint efforts in product development and quality control.

Keep in mind, all your responses are confidential and you may refuse to answer any questions.

Here is the scenario:

> Imagine you are a supply chain manager responsible for acquiring CD-ROM drives for a leading manufacturer of computers.
>
> While there are multiple qualified suppliers of CD-ROM drives in the market,

You have been frequently purchasing CD-ROM drives from a single supplier for two years.

You have been able to accurately measure prices and delivery performance of this supplier easily.

The technology changes slowly and it is easy to forecast requirements.

The demand for your computers is steady and it is easy to forecast production volumes for your supplier.

And, you have made significant investments specifically with this supplier.

Based on these conditions, on a scale of 1 to 7, where 1 is very limited coordination and 7 is very extensive coordination, how much coordination would you recommend with this supplier?

Keeping these conditions in mind, in this next section, I will read two statements regarding the level of coordination you would recommend with your CD-ROM drive supplier after the supplier unexpectedly adds a new customer that has previously not worked with any suppliers in your network. For each of the two statements please recommend one of the following three actions.

a- Find another supplier of CD-ROM drives.

b- Produce the CD-ROM drives internally.

c- Continue to purchase CD-ROM drives from this supplier.

Your network of suppliers is *very* cohesive with *extensive* interaction amongst the suppliers.

Of the three actions, which would you recommend?

If continue to purchase CD-ROM drives from this supplier is chosen:

Since you are going to continue purchasing from this supplier, on a scale of negative 5 to positive 5, where 0 is recommend the same level of coordination, negative 5 is extremely decrease, and positive 5 is extremely increase the level of coordination with the supplier, what level of coordination would you recommend for the CD-ROM drive supplier?

Your network of suppliers is *not* very cohesive with *no* interaction amongst suppliers. Of the three actions, which would you recommend?

If continue to purchase CD-ROM drives from this supplier is chosen:

Since you are going to continue purchasing from this supplier, on a scale of negative 5 to positive 5, where 0 is recommend the same level of coordination, negative 5 is extremely decrease, and positive 5 is extremely increase the level of coordination with the supplier, what level of coordination would you recommend for the CD-ROM drive supplier?

That concludes the scenario. I just need some background information.

Background Information

Company name

What is your position?

How many years have you worked in supply chain management?

How many suppliers do you work with?

What is the principle product that you manufacture?

How many people are employed by your company?

Appendix 9

Script for Buyer Asset Specificity Low and Density (Within Subjects) Treatment

Hello, Mr. /Ms. _____, my name is Wes Pollitte. I am a doctoral student at Michigan State University.

I am conducting research for my dissertation on buyer-supplier relationships and I am contacting supply chain professionals like yourself, and I was wondering if you would you be willing to spend 5 minutes to answer some questions?

I will read a scenario where you will assume the position of a supply chain manager for a computer manufacturer with responsibility for the management of a network of suppliers and recommending the level of coordination with your suppliers.

Coordination is defined as the degree of information exchanged between you and your supplier, and may include information on production costs, market conditions for the end product, future market strategies, and joint efforts in product development and quality control.

Keep in mind, all your responses are confidential and you may refuse to answer any questions.

Here is the scenario.

> Imagine you are a supply chain manager responsible for acquiring CD-ROM drives for a leading manufacturer of computers.
>
> While there are multiple qualified suppliers of CD-ROM drives in the market,

You have been frequently purchasing CD-ROM drives from a single supplier for two years.

You have been able to accurately measure prices and delivery performance of this supplier easily.

The technology changes slowly and it is easy to forecast requirements.

The demand for your computers is steady and it is easy to forecast production volumes for your supplier.

And, you have made few investments specifically with this supplier.

Based on these conditions, on a scale of 1 to 7, where 1 is very limited coordination and 7 is very extensive coordination, how much coordination would you recommend with this supplier?

Keeping these conditions in mind, in this next section, I will read two statements regarding the level of coordination you would recommend with your CD-ROM drive supplier after the supplier unexpectedly adds a new customer that has previously not worked with any suppliers in your network. For each of the two statements please recommend one of the following three actions.

a- Find another supplier of CD-ROM drives.

b- Produce the CD-ROM drives internally.

c- Continue to purchase CD-ROM drives from this supplier.

Your network of suppliers is *very* cohesive with *extensive* interaction amongst the suppliers.

Of the three actions, which would you recommend?

If continue to purchase CD-ROM drives from this supplier is chosen:

Since you are going to continue purchasing from this supplier, on a scale of negative 5 to positive 5, where 0 is recommend the same level of coordination, negative 5 is extremely decrease, and positive 5 is extremely increase the level of coordination with the supplier, what level of coordination would you recommend for the CD-ROM drive supplier?

Your network of suppliers is *not* very cohesive with *no* interaction amongst suppliers. Of the three actions, which would you recommend?

If continue to purchase CD-ROM drives from this supplier is chosen:

Since you are going to continue purchasing from this supplier, on a scale of negative 5 to positive 5, where 0 is recommend the same level of coordination, negative 5 is extremely decrease, and positive 5 is extremely increase the level of coordination with the supplier, what level of coordination would you recommend for the CD-ROM drive supplier?

That concludes the scenario. I just need some background information.

Background Information

Company name

What is your position?

How many years have you worked in supply chain management?

How many suppliers do you work with?

What is the principle product that you manufacture?

How many people are employed by your company?

Appendix 10

Script for Buyer Asset Specificity High and Centrality (Within Subjects) Treatment

Hello, Mr. /Ms. _____, my name is Wes Pollitte. I am a doctoral student at Michigan State University.

I am conducting research for my dissertation on buyer-supplier relationships and I am contacting supply chain professionals like yourself, and I was wondering if you would you be willing to spend 5 minutes to answer some questions?

I will read a scenario where you will assume the position of a supply chain manager for a computer manufacturer with responsibility for the management of a network of suppliers and recommending the level of coordination with your suppliers.

Coordination is defined as the degree of information exchanged between you and your supplier, and may include information on production costs, market conditions for the end product, future market strategies, and joint efforts in product development and quality control.

Keep in mind, all your responses are confidential and you may refuse to answer any questions.

Here is the scenario.

> Imagine you are a supply chain manager responsible for acquiring CD-ROM drives for a leading manufacturer of computers.
>
> While there are multiple qualified suppliers of CD-ROM drives in the market,

You have been frequently purchasing CD-ROM drives from a single supplier for two years.

You have been able to accurately measure prices and delivery performance of this supplier easily.

The technology changes slowly and it is easy to forecast requirements.

The demand for your computers is steady and it is easy to forecast production volumes for your supplier.

And, you have made significant investments specifically with this supplier.

Based on these conditions, on a scale of 1 to 7, where 1 is very limited coordination and 7 is very extensive coordination, how much coordination would you recommend with this supplier?

Keeping these conditions in mind, in this next section, I will read two statements regarding the level of coordination you would recommend with your CD-ROM drive supplier after the supplier unexpectedly adds a new customer that has previously not worked with any suppliers in your network. For each of the two statements please recommend one of the following three actions.

a- Find another supplier of CD-ROM drives.

b- Produce the CD-ROM drives internally.

c- Continue to purchase CD-ROM drives from this supplier.

The supplier's new customer is a *competitor and maintains many ties* with other organizations within the industry.

Of the three actions, which would you recommend?

If continue to purchase CD-ROM drives from this supplier is chosen:

Since you are going to continue purchasing from this supplier, on a scale of negative 5 to positive 5, where 0 is recommend the same level of coordination, negative 5 is extremely decrease, and positive 5 is extremely increase the level of coordination with the supplier, what level of coordination would you recommend for the CD-ROM drive supplier?

The supplier's new customer *is not a competitor and maintains few ties* with other organizations within the industry.

Of the three actions, which would you recommend?

If continue to purchase CD-ROM drives from this supplier is chosen:

Since you are going to continue purchasing from this supplier, on a scale of negative 5 to positive 5, where 0 is recommend the same level of coordination, negative 5 is extremely decrease, and positive 5 is extremely increase the level of coordination with the supplier, what level of coordination would you recommend for the CD-ROM drive supplier?

That concludes the scenario. I just need some background information.

Background Information

Company name

What is your position?

How many years have you worked in supply chain management?

How many suppliers do you work with?

What is the principle product that you manufacture?

How many people are employed by your company?

Appendix 11

Script for Buyer Asset Specificity Low and Centrality (Within Subjects) Treatment

Hello, Mr. /Ms. _____, my name is Wes Pollitte. I am a doctoral student at Michigan State University.

I am conducting research for my dissertation on buyer-supplier relationships and I am contacting supply chain professionals like yourself, and I was wondering if you would you be willing to spend 5 minutes to answer some questions?

I will read a scenario where you will assume the position of a supply chain manager for a computer manufacturer with responsibility for the management of a network of suppliers and recommending the level of coordination with your suppliers.

Coordination is defined as the degree of information exchanged between you and your supplier, and may include information on production costs, market conditions for the end product, future market strategies, and joint efforts in product development and quality control.

Keep in mind, all your responses are confidential and you may refuse to answer any questions.

Here is the scenario:

> Imagine you are a supply chain manager responsible for acquiring CD-ROM drives for a leading manufacturer of computers.
>
> While there are multiple qualified suppliers of CD-ROM drives in the market,

You have been frequently purchasing CD-ROM drives from a single supplier for two years.

You have been able to accurately measure prices and delivery performance of this supplier easily.

The technology changes slowly and it is easy to forecast requirements.

The demand for your computers is steady and it is easy to forecast production volumes for your supplier.

And, you have made few investments specifically with this supplier.

Based on these conditions, on a scale of 1 to 7, where 1 is very limited coordination and 7 is very extensive coordination, how much coordination would you recommend with this supplier?

Keeping these conditions in mind, in this next section, I will read two statements regarding the level of coordination you would recommend with your CD-ROM drive supplier after the supplier unexpectedly adds a new customer that has previously not worked with any suppliers in your network. For each of the two statements please recommend one of the following three actions.

a- Find another supplier of CD-ROM drives.

b- Produce the CD-ROM drives internally.

c- Continue to purchase CD-ROM drives from this supplier.

The supplier's new customer is a *competitor and maintains many ties* with other organizations within the industry.

Of the three actions, which would you recommend?

If continue to purchase CD-ROM drives from this supplier is chosen:

Since you are going to continue purchasing from this supplier, on a scale of negative 5 to positive 5, where 0 is recommend the same level of coordination, negative 5 is extremely decrease, and positive 5 is extremely increase the level of coordination with the supplier, what level of coordination would you recommend for the CD-ROM drive supplier?

The supplier's new customer *is not a competitor and maintains few ties* with other organizations within the industry.

Of the three actions, which would you recommend?

If continue to purchase CD-ROM drives from this supplier is chosen:

Since you are going to continue purchasing from this supplier, on a scale of negative 5 to positive 5, where 0 is recommend the same level of coordination, negative 5 is extremely decrease, and positive 5 is extremely increase the level of coordination with the supplier, what level of coordination would you recommend for the CD-ROM drive supplier?

That concludes the scenario. I just need some background information.

Background Information

Company name

What is your position?

How many years have you worked in supply chain management?

How many suppliers do you work with?

What is the principle product that you manufacture?

How many people are employed by your company?

Appendix 12

Script for Buyer Behavioral Uncertainty High and Density (Within Subjects) Treatment

Hello, Mr. /Ms. _____, my name is Wes Pollitte. I am a doctoral student at Michigan State University.

I am conducting research for my dissertation on buyer-supplier relationships and I am contacting supply chain professionals like yourself, and I was wondering if you would you be willing to spend 5 minutes to answer some questions?

I will read a scenario where you will assume the position of a supply chain manager for a computer manufacturer with responsibility for the management of a network of suppliers and recommending the level of coordination with your suppliers.

Coordination is defined as the degree of information exchanged between you and your supplier, and may include information on production costs, market conditions for the end product, future market strategies, and joint efforts in product development and quality control.

Keep in mind, all your responses are confidential and you may refuse to answer any questions.

Here is the scenario:

> Imagine you are a supply chain manager responsible for acquiring CD-ROM drives for a leading manufacturer of computers.
>
> While there are multiple qualified suppliers of CD-ROM drives in the market,

You have been frequently purchasing CD-ROM drives from a single supplier for two years.

The technology changes slowly and it is easy to forecast requirements.

The demand for your computers is steady and it is easy to forecast production volumes for your supplier.

You have made few investments specifically with this supplier.

And, you have been unable to accurately measure prices and delivery performance of this supplier easily.

Based on these conditions, on a scale of 1 to 7, where 1 is very limited coordination and 7 is very extensive coordination, how much coordination would you recommend with this supplier?

Keeping these conditions in mind, in this next section, I will read two statements regarding the level of coordination you would recommend with your CD-ROM drive supplier after the supplier unexpectedly adds a new customer that has previously not worked with any suppliers in your network. For each of the two statements please recommend one of the following three actions.

a- Find another supplier of CD-ROM drives.

b- Produce the CD-ROM drives internally.

c- Continue to purchase CD-ROM drives from this supplier.

Your network of suppliers is *very* cohesive with *extensive* interaction amongst the suppliers.

Of the three actions, which would you recommend?

If continue to purchase CD-ROM drives from this supplier is chosen:

Since you are going to continue purchasing from this supplier, on a scale of negative 5 to positive 5, where 0 is recommend the same level of coordination, negative 5 is extremely decrease, and positive 5 is extremely increase the level of coordination with the supplier, what level of coordination would you recommend for the CD-ROM drive supplier?

Your network of suppliers is *not* very cohesive with *no* interaction amongst suppliers.

Of the three actions, which would you recommend?

If continue to purchase CD-ROM drives from this supplier is chosen:

Since you are going to continue purchasing from this supplier, on a scale of negative 5 to positive 5, where 0 is recommend the same level of coordination, negative 5 is extremely decrease, and positive 5 is extremely increase the level of coordination with the supplier, what level of coordination would you recommend for the CD-ROM drive supplier?

That concludes the scenario. I just need some background information.

Background Information

Company name

What is your position?

How many years have you worked in supply chain management?

How many suppliers do you work with?

What is the principle product that you manufacture?

How many people are employed by your company?

Appendix 13

Script for Buyer Behavioral Uncertainty Low and Density (Within Subjects) Treatment

Hello, Mr. /Ms. _____, my name is Wes Pollitte. I am a doctoral student at Michigan State University.

I am conducting research for my dissertation on buyer-supplier relationships and I am contacting supply chain professionals like yourself, and I was wondering if you would you be willing to spend 5 minutes to answer some questions?

I will read a scenario where you will assume the position of a supply chain manager for a computer manufacturer with responsibility for the management of a network of suppliers and recommending the level of coordination with your suppliers.

Coordination is defined as the degree of information exchanged between you and your supplier, and may include information on production costs, market conditions for the end product, future market strategies, and joint efforts in product development and quality control.

Keep in mind, all your responses are confidential and you may refuse to answer any questions.

Here is the scenario:

> Imagine you are a supply chain manager responsible for acquiring CD-ROM drives for a leading manufacturer of computers.
>
> While there are multiple qualified suppliers of CD-ROM drives in the market,

You have been frequently purchasing CD-ROM drives from a single supplier for two years.

The technology changes slowly and it is easy to forecast requirements.

The demand for your computers is steady and it is easy to forecast production volumes for your supplier.

You have made few investments specifically with this supplier.

And, you have been able to accurately measure prices and delivery performance of this supplier easily.

Based on these conditions, on a scale of 1 to 7, where 1 is very limited coordination and 7 is very extensive coordination, how much coordination would you recommend with this supplier?

Keeping these conditions in mind, in this next section, I will read two statements regarding the level of coordination you would recommend with your CD-ROM drive supplier after the supplier unexpectedly adds a new customer that has previously not worked with any suppliers in your network. For each of the two statements please recommend one of the following three actions.

a- Find another supplier of CD-ROM drives.

b- Produce the CD-ROM drives internally.

c- Continue to purchase CD-ROM drives from this supplier.

Your network of suppliers is *very* cohesive with *extensive* interaction amongst the suppliers.

Of the three actions, which would you recommend?

If continue to purchase CD-ROM drives from this supplier is chosen:

Since you are going to continue purchasing from this supplier, on a scale of negative 5 to positive 5, where 0 is recommend the same level of coordination, negative 5 is extremely decrease, and positive 5 is extremely increase the level of coordination with the supplier, what level of coordination would you recommend for the CD-ROM drive supplier?

Your network of suppliers is *not* very cohesive with *no* interaction amongst suppliers.

Of the three actions, which would you recommend?

If continue to purchase CD-ROM drives from this supplier is chosen:

Since you are going to continue purchasing from this supplier, on a scale of negative 5 to positive 5, where 0 is recommend the same level of coordination, negative 5 is extremely decrease, and positive 5 is extremely increase the level of coordination with the supplier, what level of coordination would you recommend for the CD-ROM drive supplier?

That concludes the scenario. I just need some background information.

Background Information

Company name

What is your position?

How many years have you worked in supply chain management?

How many suppliers do you work with?

What is the principle product that you manufacture?

How many people are employed by your company?

Appendix 14

Script for Buyer Demand Uncertainty High and Density (Within Subjects) Treatment

Hello, Mr. /Ms. _____, my name is Wes Pollitte. I am a doctoral student at Michigan State University.

I am conducting research for my dissertation on buyer-supplier relationships and I am contacting supply chain professionals like yourself, and I was wondering if you would you be willing to spend 5 minutes to answer some questions?

I will read a scenario where you will assume the position of a supply chain manager for a computer manufacturer with responsibility for the management of a network of suppliers and recommending the level of coordination with your suppliers.

Coordination is defined as the degree of information exchanged between you and your supplier, and may include information on production costs, market conditions for the end product, future market strategies, and joint efforts in product development and quality control.

Keep in mind, all your responses are confidential and you may refuse to answer any questions.

Here is the scenario:

> Imagine you are a supply chain manager responsible for acquiring CD-ROM drives for a leading manufacturer of computers.
>
> While there are multiple qualified suppliers of CD-ROM drives in the market,

You have been frequently purchasing CD-ROM drives from a single supplier for two years.

You have been able to accurately measure prices and delivery performance of this supplier easily.

The technology changes slowly and it is easy to forecast requirements.

You have made few investments specifically with this supplier.

And, the demand for your computers varies continually and it is difficult to forecast production volumes for your supplier.

Based on these conditions, on a scale of 1 to 7, where 1 is very limited coordination and 7 is very extensive coordination, how much coordination would you recommend with this supplier?

Keeping these conditions in mind, in this next section, I will read two statements regarding the level of coordination you would recommend with your CD-ROM drive supplier after the supplier unexpectedly adds a new customer that has previously not worked with any suppliers in your network. For each of the two statements please recommend one of the following three actions

a- Find another supplier of CD-ROM drives.

b- Produce the CD-ROM drives internally.

c- Continue to purchase CD-ROM drives from this supplier.

Your network of suppliers is *very* cohesive with *extensive* interaction amongst the suppliers.

Of the three actions, which would you recommend?

If continue to purchase CD-ROM drives from this supplier is chosen:

Since you are going to continue purchasing from this supplier, on a scale of negative 5 to positive 5, where 0 is recommend the same level of coordination, negative 5 is extremely decrease, and positive 5 is extremely increase the level of coordination with the supplier, what level of coordination would you recommend for the CD-ROM drive supplier?

Your network of suppliers is *not* very cohesive with *no* interaction amongst suppliers.

Of the three actions, which would you recommend?

If continue to purchase CD-ROM drives from this supplier is chosen:

Since you are going to continue purchasing from this supplier, on a scale of negative 5 to positive 5, where 0 is recommend the same level of coordination, negative 5 is extremely decrease, and positive 5 is extremely increase the level of coordination with the supplier, what level of coordination would you recommend for the CD-ROM drive supplier?

That concludes the scenario. I just need some background information.

Background Information

Company name

What is your position?

How many years have you worked in supply chain management?

How many suppliers do you work with?

What is the principle product that you manufacture?

How many people are employed by your company?

Appendix 15

Script for Buyer Demand Uncertainty Low and Density (Within Subjects) Treatment

Hello, Mr. /Ms. _____, my name is Wes Pollitte. I am a doctoral student at Michigan State University.

I am conducting research for my dissertation on buyer-supplier relationships and I am contacting supply chain professionals like yourself, and I was wondering if you would you be willing to spend 5 minutes to answer some questions?

I will read a scenario where you will assume the position of a supply chain manager for a computer manufacturer with responsibility for the management of a network of suppliers and recommending the level of coordination with your suppliers.

Coordination is defined as the degree of information exchanged between you and your supplier, and may include information on production costs, market conditions for the end product, future market strategies, and joint efforts in product development and quality control.

Keep in mind, all your responses are confidential and you may refuse to answer any questions.

Here is the scenario:

> Imagine you are a supply chain manager responsible for acquiring CD-ROM drives for a leading manufacturer of computers.
>
> While there are multiple qualified suppliers of CD-ROM drives in the market,

You have been frequently purchasing CD-ROM drives from a single supplier for two years.

You have been able to accurately measure prices and delivery performance of this supplier easily.

The technology changes slowly and it is easy to forecast requirements.

You have made few investments specifically with this supplier.

And, the demand for your computers is steady and it is easy to forecast production volumes for your supplier.

Based on these conditions, on a scale of 1 to 7, where 1 is very limited coordination and 7 is very extensive coordination, how much coordination would you recommend with this supplier?

Keeping these conditions in mind, in this next section, I will read two statements regarding the level of coordination you would recommend with your CD-ROM drive supplier after the supplier unexpectedly adds a new customer that has previously not worked with any suppliers in your network. For each of the two statements please recommend one of the following three actions.

a- Find another supplier of CD-ROM drives.

b- Produce the CD-ROM drives internally.

c- Continue to purchase CD-ROM drives from this supplier.

Your network of suppliers is *very* cohesive with *extensive* interaction amongst the suppliers.

Of the three actions, which would you recommend?

If continue to purchase CD-ROM drives from this supplier is chosen:

Since you are going to continue purchasing from this supplier, on a scale of negative 5 to positive 5, where 0 is recommend the same level of coordination, negative 5 is extremely decrease, and positive 5 is extremely increase the level of coordination with the supplier, what level of coordination would you recommend for the CD-ROM drive supplier?

Your network of suppliers is *not* very cohesive with *no* interaction amongst suppliers.

Of the three actions, which would you recommend?

If continue to purchase CD-ROM drives from this supplier is chosen:

Since you are going to continue purchasing from this supplier, on a scale of negative 5 to positive 5, where 0 is recommend the same level of coordination, negative 5 is extremely decrease, and positive 5 is extremely increase the level of coordination with the supplier, what level of coordination would you recommend for the CD-ROM drive supplier?

That concludes the scenario. I just need some background information.

Background Information

Company name

What is your position?

How many years have you worked in supply chain management?

How many suppliers do you work with?

What is the principle product that you manufacture?

How many people are employed by your company?

Appendix 16

Script for Buyer Technological Uncertainty High and Density (Within Subjects) Treatment

Hello, Mr. /Ms. _____, my name is Wes Pollitte. I am a doctoral student at Michigan State University.

I am conducting research for my dissertation on buyer-supplier relationships and I am contacting supply chain professionals like yourself, and I was wondering if you would you be willing to spend 5 minutes to answer some questions?

I will read a scenario where you will assume the position of a supply chain manager for a computer manufacturer with responsibility for the management of a network of suppliers and recommending the level of coordination with your suppliers.

Coordination is defined as the degree of information exchanged between you and your supplier, and may include information on production costs, market conditions for the end product, future market strategies, and joint efforts in product development and quality control.

Keep in mind, all your responses are confidential and you may refuse to answer any questions.

Here is the scenario:

> Imagine you are a supply chain manager responsible for acquiring CD-ROM drives for a leading manufacturer of computers.
>
> While there are multiple qualified suppliers of CD-ROM drives in the market,

You have been frequently purchasing CD-ROM drives from a single supplier for two years.

You have been able to accurately measure prices and delivery performance of this supplier easily.

The demand for your computers is steady and it is easy to forecast production volumes for your supplier.

You have made few investments specifically with this supplier.

And, technology changes rapidly and it is difficult to forecast requirements.

Based on these conditions, on a scale of 1 to 7, where 1 is very limited coordination and 7 is very extensive coordination, how much coordination would you recommend with this supplier?

Keeping these conditions in mind, in this next section, I will read two statements regarding the level of coordination you would recommend with your CD-ROM drive supplier after the supplier unexpectedly adds a new customer that has previously not worked with any suppliers in your network. For each of the two statements please recommend one of the following three actions.

a- Find another supplier of CD-ROM drives.

b- Produce the CD-ROM drives internally.

c- Continue to purchase CD-ROM drives from this supplier.

Your network of suppliers is *very* cohesive with *extensive* interaction amongst the suppliers.

Of the three actions, which would you recommend?

If continue to purchase CD-ROM drives from this supplier is chosen:

> Since you are going to continue purchasing from this supplier, on a scale of negative 5 to positive 5, where 0 is recommend the same level of coordination, negative 5 is extremely decrease, and positive 5 is extremely increase the level of coordination with the supplier, what level of coordination would you recommend for the CD-ROM drive supplier?

Your network of suppliers is *not* very cohesive with *no* interaction amongst suppliers.

Of the three actions, which would you recommend?

If continue to purchase CD-ROM drives from this supplier is chosen:

> Since you are going to continue purchasing from this supplier, on a scale of negative 5 to positive 5, where 0 is recommend the same level of coordination, negative 5 is extremely decrease, and positive 5 is extremely increase the level of coordination with the supplier, what level of coordination would you recommend for the CD-ROM drive supplier?

That concludes the scenario. I just need some background information.

Background Information

Company name

What is your position?

How many years have you worked in supply chain management?

How many suppliers do you work with?

What is the principle product that you manufacture?

How many people are employed by your company?

Appendix 17

Script for Buyer Technological Uncertainty Low and Density (Within Subjects) Treatment

Hello, Mr. /Ms. _____, my name is Wes Pollitte. I am a doctoral student at Michigan State University.

I am conducting research for my dissertation on buyer-supplier relationships and I am contacting supply chain professionals like yourself, and I was wondering if you would you be willing to spend 5 minutes to answer some questions?

I will read a scenario where you will assume the position of a supply chain manager for a computer manufacturer with responsibility for the management of a network of suppliers and recommending the level of coordination with your suppliers.

Coordination is defined as the degree of information exchanged between you and your supplier, and may include information on production costs, market conditions for the end product, future market strategies, and joint efforts in product development and quality control.

Keep in mind, all your responses are confidential and you may refuse to answer any questions.

Here is the scenario:

> Imagine you are a supply chain manager responsible for acquiring CD-ROM drives for a leading manufacturer of computers.
>
> While there are multiple qualified suppliers of CD-ROM drives in the market,

You have been frequently purchasing CD-ROM drives from a single supplier for two years.

You have been able to accurately measure prices and delivery performance of this supplier easily.

The demand for your computers is steady and it is easy to forecast production volumes for your supplier.

You have made few investments specifically with this supplier.

And, technology changes slowly and it is easy to forecast requirements.

Based on these conditions, on a scale of 1 to 7, where 1 is very limited coordination and 7 is very extensive coordination, how much coordination would you recommend with this supplier?

Keeping these conditions in mind, in this next section, I will read two statements regarding the level of coordination you would recommend with your CD-ROM drive supplier after the supplier unexpectedly adds a new customer that has previously not worked with any suppliers in your network. For each of the two statements please recommend one of the following three actions.

a- Find another supplier of CD-ROM drives.

b- Produce the CD-ROM drives internally.

c- Continue to purchase CD-ROM drives from this supplier.

Your network of suppliers is *very* cohesive with *extensive* interaction amongst the suppliers.

Of the three actions, which would you recommend?

If continue to purchase CD-ROM drives from this supplier is chosen:

Since you are going to continue purchasing from this supplier, on a scale of negative 5 to positive 5, where 0 is recommend the same level of coordination, negative 5 is extremely decrease, and positive 5 is extremely increase the level of coordination with the supplier, what level of coordination would you recommend for the CD-ROM drive supplier?

Your network of suppliers is *not* very cohesive with *no* interaction amongst suppliers.

Of the three actions, which would you recommend?

If continue to purchase CD-ROM drives from this supplier is chosen:

Since you are going to continue purchasing from this supplier, on a scale of negative 5 to positive 5, where 0 is recommend the same level of coordination, negative 5 is extremely decrease, and positive 5 is extremely increase the level of coordination with the supplier, what level of coordination would you recommend for the CD-ROM drive supplier?

That concludes the scenario. I just need some background information.

Background Information

Company name

What is your position?

How many years have you worked in supply chain management?

How many suppliers do you work with?

What is the principle product that you manufacture?

How many people are employed by your company?

Appendix 18

Script for Buyer Behavioral Uncertainty High and Centrality (Within Subjects) Treatment

Hello, Mr. /Ms. _____, my name is Wes Pollitte. I am a doctoral student at Michigan State University.

I am conducting research for my dissertation on buyer-supplier relationships and I am contacting supply chain professionals like yourself, and I was wondering if you would you be willing to spend 5 minutes to answer some questions?

I will read a scenario where you will assume the position of a supply chain manager for a computer manufacturer with responsibility for the management of a network of suppliers. Keep in mind, all your responses are confidential and you may refuse to answer any questions.

Here is the scenario:

> Imagine you are a supply chain manager responsible for acquiring CD-ROM drives for a leading manufacturer of computers.
>
> While there are multiple qualified suppliers of CD-ROM drives in the market,
>
> You have been frequently purchasing CD-ROM drives from a single supplier for two years.
>
> The technology changes slowly and it is easy to forecast requirements.
>
> The demand for your computers is steady and it is easy to forecast production volumes for your supplier.
>
> You have made few investments specifically with this supplier.

And, you are unable to accurately measure prices and delivery performance of this supplier easily.

Based on these conditions, on a scale of 1 to 7, where 1 is very uncertain and 7 is very certain, what is your certainty in the supplier complying with the purchase agreement? Keeping these conditions in mind, in this next section, I will read you two statements regarding your certainty in the CD-ROM drive supplier complying with the purchase agreement after the supplier unexpectedly adds a new customer that has previously not worked with any suppliers in your network.

The supplier's new customer is a *competitor and maintains many ties* with other organizations within the industry.

On a scale of negative 5 to positive 5, where 0 is neither deceases or increases your certainty in the supplier complying with the purchase agreement, negative 5 is very likely decreases, and positive 5 is very likely increases your certainty in the supplier complying with the purchase agreement, what is your certainty in the supplier complying with the purchase agreement?

The supplier's new customer *is not a competitor and maintains few ties* with other organizations within the industry.

On a scale of negative 5 to positive 5, where 0 is neither deceases or increases your certainty in the supplier complying with the purchase agreement, negative 5 is very likely decreases, and positive 5 is very likely increases your certainty in the supplier complying with the purchase

agreement, what is your certainty in the supplier complying with the purchase agreement?

That concludes the scenario. I just need some background information.

Background Information

Company name

What is your position?

How many years have you worked in supply chain management?

How many suppliers do you work with?

What is the principle product that you manufacture?

How many people are employed by your company?

Appendix 19

Script for Buyer Behavioral Uncertainty Low and Centrality (Within Subjects) Treatment

Hello, Mr. /Ms. _____, my name is Wes Pollitte. I am a doctoral student at Michigan State University.

I am conducting research for my dissertation on buyer-supplier relationships and I am contacting supply chain professionals like yourself, and I was wondering if you would you be willing to spend 5 minutes to answer some questions?

I will read a scenario where you will assume the position of a supply chain manager for a computer manufacturer with responsibility for the management of a network of suppliers. Keep in mind, all your responses are confidential and you may refuse to answer any questions.

Here is the scenario:

> Imagine you are a supply chain manager responsible for acquiring CD-ROM drives for a leading manufacturer of computers.
>
> While there are multiple qualified suppliers of CD-ROM drives in the market,
>
> You have been frequently purchasing CD-ROM drives from a single supplier for two years.
>
> The technology changes slowly and it is easy to forecast requirements.
>
> The demand for your computers is steady and it is easy to forecast production volumes for your supplier.
>
> You have made few investments specifically with this supplier.

And, you are able to accurately measure prices and delivery performance of this supplier easily.

Based on these conditions, on a scale of 1 to 7, where 1 is very uncertain and 7 is very certain, what is your certainty in the supplier complying with the purchase agreement? Keeping these conditions in mind, in this next section, I will read you two statements regarding your certainty in the CD-ROM drive supplier complying with the purchase agreement after the supplier unexpectedly adds a new customer that has previously not worked with any suppliers in your network.

The supplier's new customer is a *competitor and maintains many ties* with other organizations within the industry.

On a scale of negative 5 to positive 5, where 0 is neither deceases or increases your certainty in the supplier complying with the purchase agreement, negative 5 is very likely decreases, and positive 5 is very likely increases your certainty in the supplier complying with the purchase agreement, what is your certainty in the supplier complying with the purchase agreement?

The supplier's new customer *is not a competitor and maintains few ties* with other organizations within the industry.

On a scale of negative 5 to positive 5, where 0 is neither deceases or increases your certainty in the supplier complying with the purchase agreement, negative 5 is very likely decreases, and positive 5 is very likely increases your certainty in the supplier complying with the purchase

agreement, what is your certainty in the supplier complying with the purchase agreement?

That concludes the scenario. I just need some background information.

Background Information

Company name

What is your position?

How many years have you worked in supply chain management?

How many suppliers do you work with?

What is the principle product that you manufacture?

How many people are employed by your company?

Appendix 20

Script for Buyer Demand Uncertainty High and Centrality (Within Subjects) Treatment

Hello, Mr. /Ms. _____, my name is Wes Pollitte. I am a doctoral student at Michigan State University.

I am conducting research for my dissertation on buyer-supplier relationships and I am contacting supply chain professionals like yourself, and I was wondering if you would you be willing to spend 5 minutes to answer some questions?

I will read a scenario where you will assume the position of a supply chain manager for a computer manufacturer with responsibility for the management of a network of suppliers. Keep in mind, all your responses are confidential and you may refuse to answer any questions.

Here is the scenario:

> Imagine you are a supply chain manager responsible for acquiring CD-ROM drives for a leading manufacturer of computers.
>
> While there are multiple qualified suppliers of CD-ROM drives in the market,
>
> You have been frequently purchasing CD-ROM drives from a single supplier for two years.
>
> You are able to accurately measure prices and delivery performance of this supplier easily.
>
> Technology changes slowly and it is easy to forecast requirements.
>
> You have made few investments specifically with this supplier.

And, the demand for your computers varies continually and it is difficult to forecast production volumes for your supplier.

Based on these conditions, on a scale of 1 to 7, where 1 is very uncertain and 7 is very certain, what is your certainty in predicting future demand for your computers?

Keeping these conditions in mind, in this next section, I will read you two statements regarding your certainty in predicting future demand for your computers after the CD-ROM drive supplier unexpectedly adds a new customer that has previously not worked with any suppliers in your network.

The supplier's new customer is a *competitor and maintains many ties* with other organizations within the industry.

On a scale of negative 5 to positive 5, where 0 is neither deceases or increases your certainty in predicting future demand for your computers, negative 5 is very likely decreases, and positive 5 is very likely increases your certainty in predicting future demand for your computers, what is your certainty in predicting future demand for your computers?

The supplier's new customer *is not a competitor and maintains few ties* with other organizations within the industry.

On a scale of negative 5 to positive 5, where 0 is neither deceases or increases your certainty in predicting future demand for your computers, negative 5 is very likely decreases, and positive 5 is very likely increases your certainty in predicting future demand for your computers, what is your certainty in predicting future demand for your computers?

That concludes the scenario. I just need some background information.

Background Information

Company name

What is your position?

How many years have you worked in supply chain management?

How many suppliers do you work with?

What is the principle product that you manufacture?

How many people are employed by your company?

Appendix 21

Script for Buyer Demand Uncertainty Low and Centrality (Within Subjects) Treatment

Hello, Mr. /Ms. _____, my name is Wes Pollitte. I am a doctoral student at Michigan State University.

I am conducting research for my dissertation on buyer-supplier relationships and I am contacting supply chain professionals like yourself, and I was wondering if you would you be willing to spend 5 minutes to answer some questions?

I will read a scenario where you will assume the position of a supply chain manager for a computer manufacturer with responsibility for the management of a network of suppliers. Keep in mind, all your responses are confidential and you may refuse to answer any questions.

Here is the scenario:

> Imagine you are a supply chain manager responsible for acquiring CD-ROM drives for a leading manufacturer of computers.
>
> While there are multiple qualified suppliers of CD-ROM drives in the market,
>
> You have been frequently purchasing CD-ROM drives from a single supplier for two years.
>
> You are able to accurately measure prices and delivery performance of this supplier easily.
>
> Technology changes slowly and it is easy to forecast requirements.
>
> You have made few investments specifically with this supplier.

And, the demand for your computers is steady and it is easy to forecast production volumes for your supplier.

Based on these conditions, on a scale of 1 to 7, where 1 is very uncertain and 7 is very certain, what is your certainty in predicting future demand for your computers?

Keeping these conditions in mind, in this next section, I will read you two statements regarding your certainty in predicting future demand for your computers after the CD-ROM drive supplier unexpectedly adds a new customer that has previously not worked with any suppliers in your network.

The supplier's new customer is a *competitor and maintains many ties* with other organizations within the industry.

On a scale of negative 5 to positive 5, where 0 is neither deceases or increases your certainty in predicting future demand for your computers, negative 5 is very likely decreases, and positive 5 is very likely increases your certainty in predicting future demand for your computers, what is your certainty in predicting future demand for your computers?

The supplier's new customer *is not a competitor and maintains few ties* with other organizations within the industry.

On a scale of negative 5 to positive 5, where 0 is neither deceases or increases your certainty in predicting future demand for your computers, negative 5 is very likely decreases, and positive 5 is very likely increases your certainty in predicting future demand for your computers, what is your certainty in predicting future demand for your computers?

That concludes the scenario. I just need some background information.

Background Information

Company name

What is your position?

How many years have you worked in supply chain management?

How many suppliers do you work with?

What is the principle product that you manufacture?

How many people are employed by your company?

Figure 1

Interconnection of Supplier in Buyer Network with Supplier New Customer Network

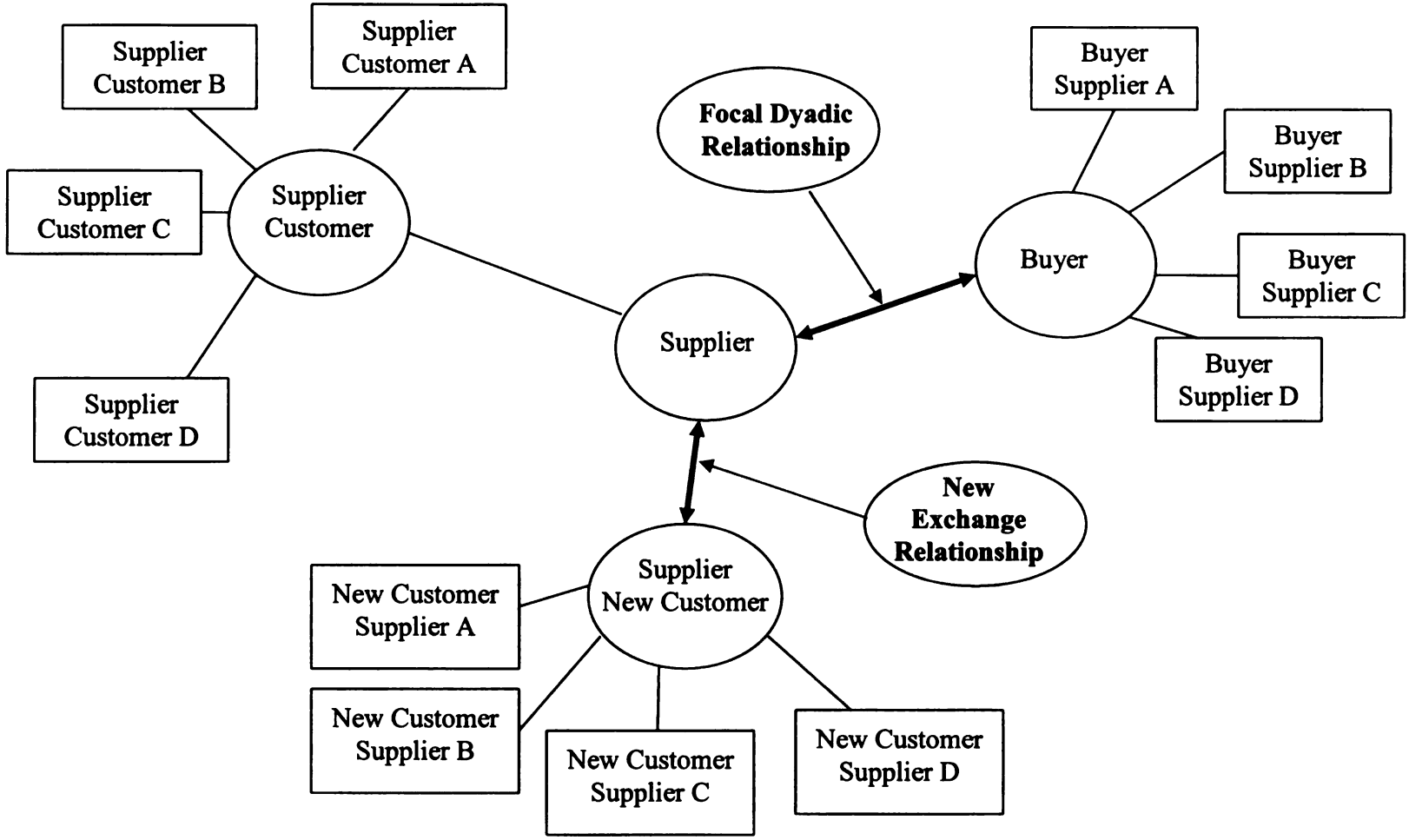
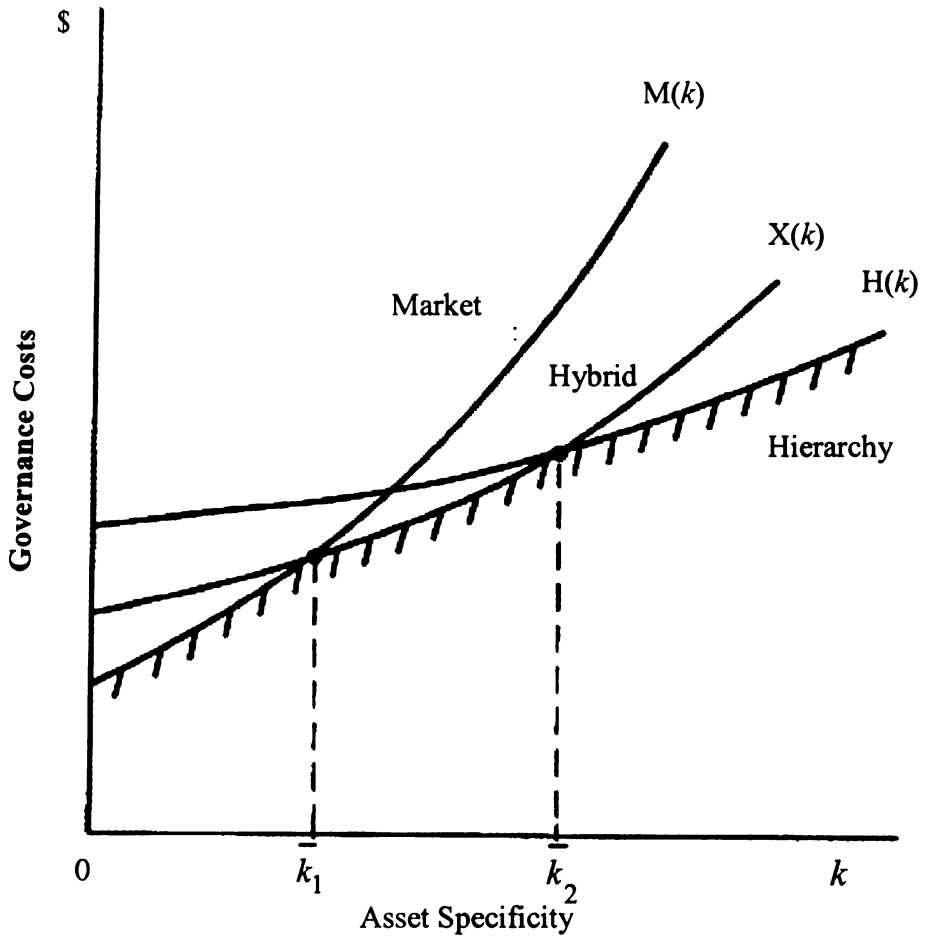


Figure 2

Governance Costs as a Function of Asset Specificity*



*From Williamson, Oliver E. (1991), "Comparative Economic Organization: The Analysis of Discrete Structural Alternatives," Administrative Science Quarterly, 36 (2), 269-296.

Figure 3

Centrality in a Network

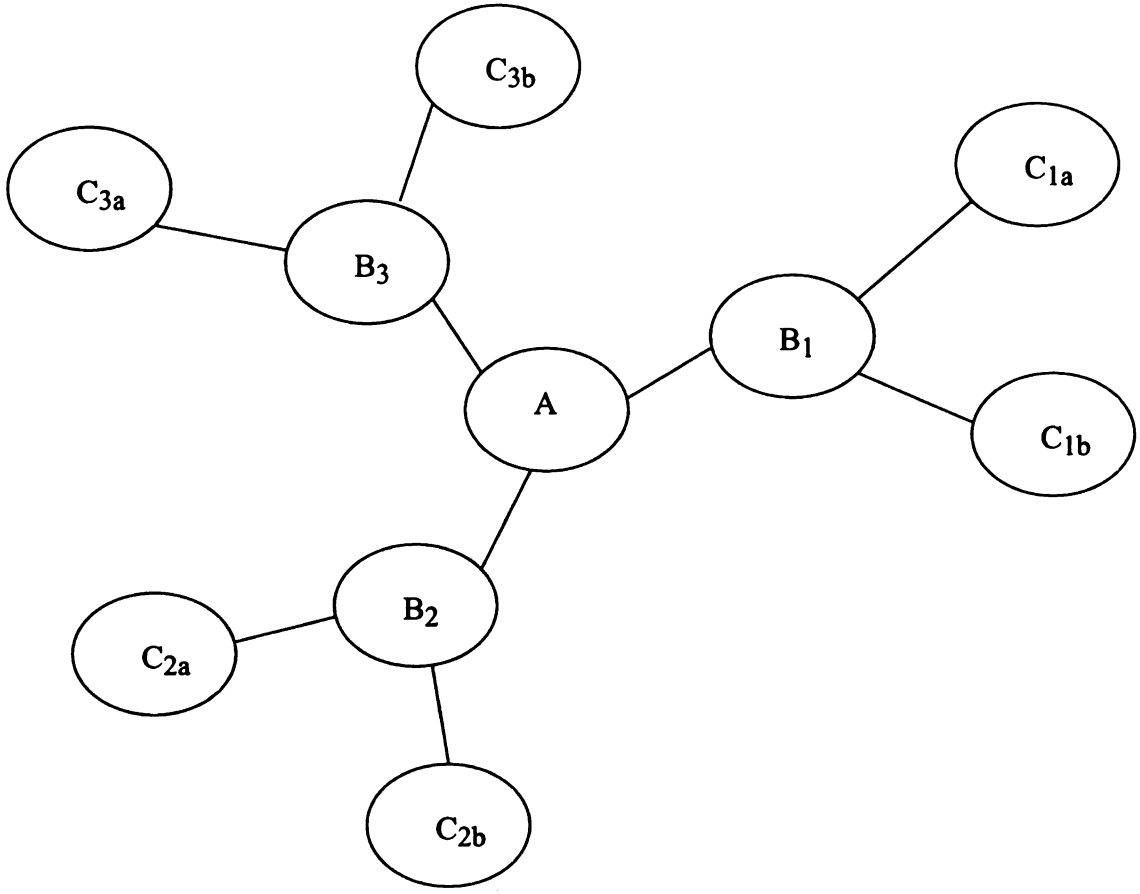


Figure 4

Vertical Network Density

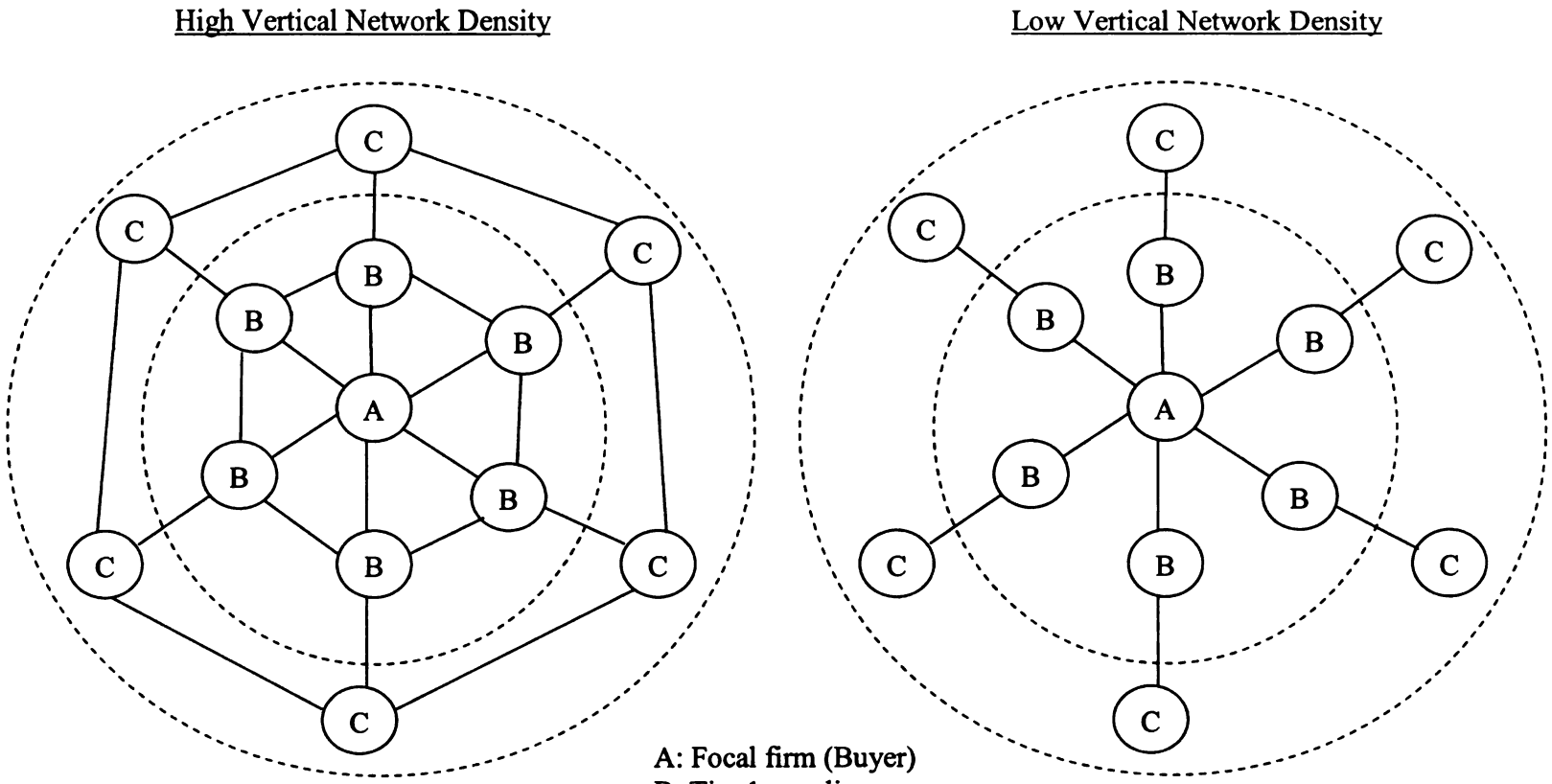


Figure 5

Theoretical Model

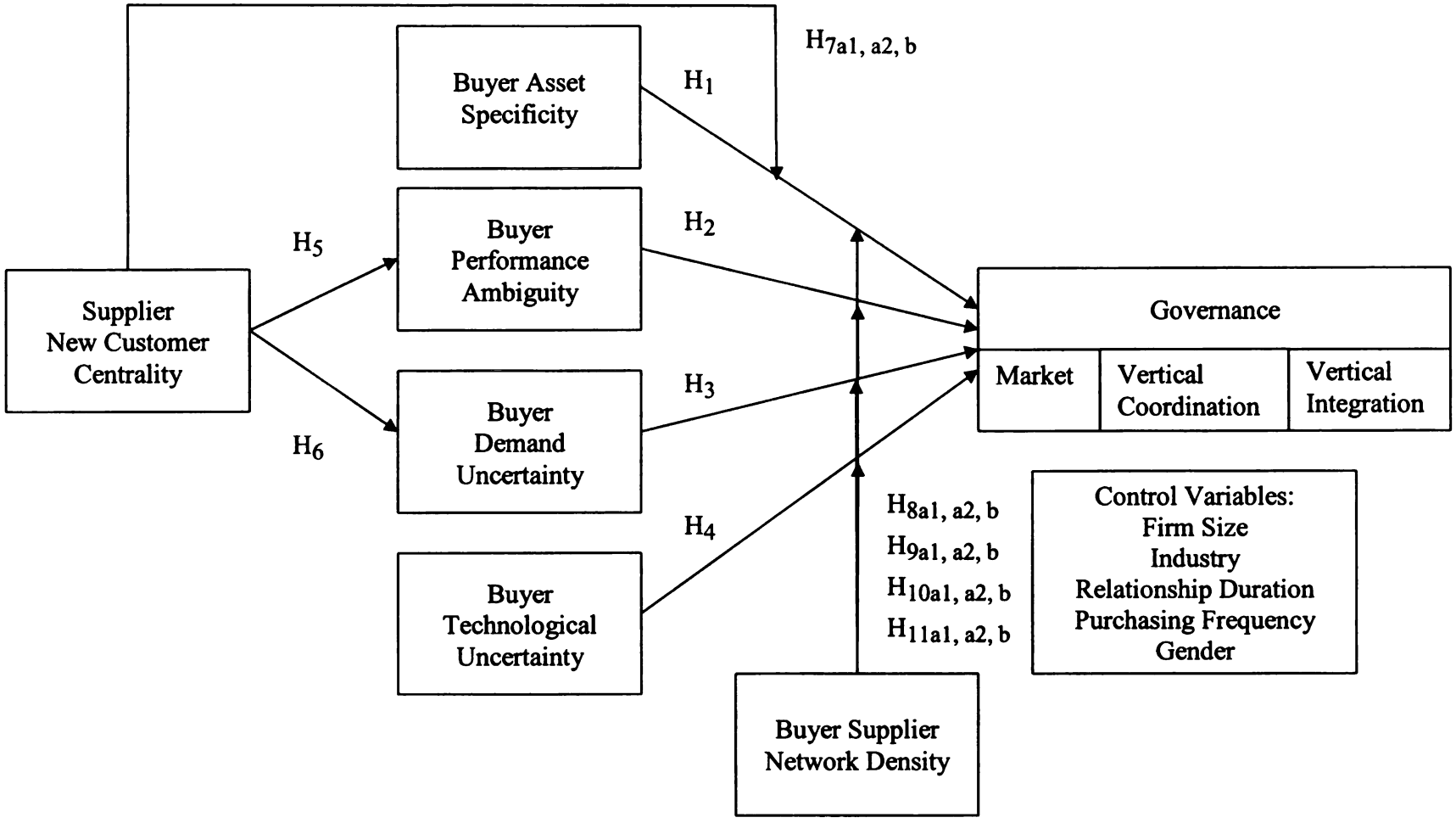


Table 1

Transaction Cost Economics Empirical Studies

Author(s)	Context	Independent Variable(s)	Dependent Variable(s)	Key Findings
Achrol & Gundlach (1999)	Legal and social governance in controlling opportunism (n=101)	Comparative commitment; Contract; Relational norms; Contract x relational norms; Comparative commitment x contract; Comparative commitment x relational norms; Comparative commitment x contract x relational norms	Opportunism	Asymmetric commitment of resources by one party creates an incentive for opportunistic behavior by the other party Contracts are largely ineffective in mitigating opportunism brought about by asymmetric commitments Relational norms provide a better mechanism for safeguarding against opportunism in situations for asymmetric commitment
Adler, Scherer, Baron & Katerberg (1998)	Contracts in buyer-seller exchange (n=181)	Asset specificity; Uncertainty; Contract incompleteness	Type of contract	Transaction cost variables are effective at predicting contract type

Table 1 (cont'd)

Author(s)	Context	Independent Variable(s)	Dependent Variable(s)	Key Findings
Andersen & Buvik (2001)	International and domestic interfirm buyer-seller relationships (n=180)	Asset specificity; Environmental uncertainty; Asset specificity x behavioral uncertainty; Behavioral uncertainty x environmental uncertainty	Interfirm coordination	Asset specificity is positively related to interfirm coordination Behavioral uncertainty in conjunction with higher asset specificity leads to greater interfirm coordination in international relationships Interaction of behavioral uncertainty and environmental uncertainty leads to greater interfirm coordination in international relationships
Anderson (1985)	Use of integrated salesforce versus manufacturers' representatives (n=159)	Asset specificity; Behavioral uncertainty; Asset specificity x environmental uncertainty; Environmental uncertainty; Transaction frequency	Integrated salesforce versus manufacturers' representatives	Behavioral uncertainty is greater than asset specificity in explaining the integration of personnel selling Environmental uncertainty in combination with asset specificity increases integration of salesforce

Table 1 (cont'd)

Author(s)	Context	Independent Variable(s)	Dependent Variable(s)	Key Findings
Anderson (1988)	Use of integrated salesforce versus manufacturers' representatives (n=169)	Asset specificity; Environmental uncertainty; Behavioral uncertainty	Opportunism	Asset specificity is positively related to opportunism
				Behavioral uncertainty is positively related to opportunism
				Direct salesforces display less opportunism than manufacturers" representatives
			Goal congruence	Opportunism is negatively related to degree of goal congruence
Anderson & Coughlan (1987)	Use of integrated channel versus independent intermediaries in international market entry (n=94)	Asset specificity; Product differentiation; Existing distribution arrangement; Region of entry	Integrated channel versus independent channel	Entrants use integrated channels for products that entail asset specificity

Table 1 (cont'd)

Author(s)	Context	Independent Variable(s)	Dependent Variable(s)	Key Findings
Anderson & Schittlein (1984)	Use of integrated salesforce versus manufacturers' representatives (n=172)	Asset specificity; Environmental uncertainty; Behavioral uncertainty; Transaction frequency; Asset specificity x environmental uncertainty; Asset specificity x behavioral uncertainty	Integrated salesforce versus manufacturers' representatives	Behavioral uncertainty followed by asset specificity positively related to salesforce integration Interactions of asset specificity and uncertainty not found Transaction frequency has no impact
Anderson & Weitz (1992)	Commitment of manufacturers and distributors in channel relationships (n=378)	Asset specificity; Perception of asset specificity; Exclusivity; Perception of exclusivity; Perception of two-way communication; Perception of history of conflict; Perception of reputation for fairness	Manufacturer's commitment to the relationship	Asset specificity pledges by one party increase the perceptions of commitment of the other party
			Distributor's commitment to the relationship	Asset specificity pledges by distributors or manufacturers in the other party is associated with stronger commitment to the relationship

Table 1 (cont'd)

Author(s)	Context	Independent Variable(s)	Dependent Variable(s)	Key Findings
Antia, Bergen, Dutta & Fisher (2006)	Manufacturer-distributor relationships (n=104)	Enforcement severity; Enforcement speed; Detection ability; Price differential; Product scarcity; Premium positioning; Customer heterogeneity; Enforcement severity x detection ability; Enforcement severity x enforcement speed; Enforcement speed x detection ability; Enforcement severity x enforcement speed x detection ability	Incidence	Interaction of severity, detection ability, and enforcement speed deter gray market violations
Antia & Frazier (2001)	Buyer-seller relationships (n=213)	Asset specificity; Environmental uncertainty; Asset specificity x environmental uncertainty; Network density; Network centrality; Obligation criticality; Network Density x obligation criticality; Network centrality x obligation criticality; Interdependence magnitude; Interdependence asymmetry; Relationalism; Asset specificity x relationalism	Contract enforcement	Enforcement is influenced by channel system, network, and dyadic levels of analysis

Table 1 (cont'd)

Author(s)	Context	Independent Variable(s)	Dependent Variable(s)	Key Findings
Antia & Frazier (2001) (cont'd)				Asset specificity positively related to contract enforcement
				Environmental uncertainty not related to contract enforcement
				Network dimensions dampen contract enforcement
				Dyadic level response is shaped by need to protect the strength and value of the relationship
				Asset specificity tempers the effect of relationalism on contract enforcement
Artz & Brush (2000)	Buyer-seller relationships (n=393)	Asset specificity, Environmental uncertainty; Asset specificity x flexibility x coordination	Negotiation costs	Asset specificity is positively related to negotiation costs
				Environmental uncertainty is positively related to negotiation costs
				Relational norms moderate the relationship between asset specificity and negotiation costs

Table 1 (cont'd)

Author(s)	Context	Independent Variable(s)	Dependent Variable(s)	Key Findings
Aulakh & Kotabe (1997)	Channel integration in foreign markets (n=108)	Asset specificity; Country risk; International experience; Firm size; Market Position strategy; Global integration strategy; Differentiation strategy	Channel integration	As asset specificity increases firms are more likely to use a market option Environmental uncertainty (country risk) is negatively related to channel integration
Balakrishnan & Wernerfelt (1986)	Make or buy decision in B2B relationships (n=93 industries)	Environmental uncertainty	Vertical integration	Integration is affected negatively by technological uncertainty especially if the degree of competition is high
Barney, Edwards & Ringleb (1992)	Legal liability and vertical integration (n=105)	Technological uncertainty; Industry concentration; Demand uncertainty; Legal liability; Past vertical integration	Vertical integration	Flexibility advantages associated with less vertical integration outweigh the transaction cost advantages of more vertical integration Technological uncertainty is positively related to vertical integration Demand uncertainty is negatively related to vertical integration
Bello & Gilliland (1997)	Export channel performance (n=160)	Human investments; Market volatility	Flexibility	Human investments positively related to flexibility

Table 1 (cont'd)

Author(s)	Context	Independent Variable(s)	Dependent Variable(s)	Key Findings
Bello & Lohtia (1995)	Export channel performance (n=269)	Asset Specificity; Environmental uncertainty	Use of agent	Product and human asset specificity is related to agency use Environmental uncertainty is related to distributor use
Bensaou & Anderson (1999)	Antecedents of specific asset investment in buyer-seller relationships (n=447)	Architectural interdependence; Task complexity; Supplier size; Supplier market share; Demand uncertainty; Upstream market concentration; Standard resources required to produce component; Scope of the relationship; Age of the relationship; Supplier reputation; Institutional context	Buyer's specific investments	Task complexity, technological uncertainty, and scope of the relationship are positively related to asset specificity Supplier size, supplier market share, standardization, and supplier reputation are negatively related to asset specificity
Bergen, Heide & Dutta (1998)	Manufacturer tolerance of distributor gray market activity (n=147)	Performance ambiguity, Dual distribution; Exclusive dealing; Distributor services; Product maturity	Tolerance of opportunism	Distributor services is negatively related to tolerance of opportunism Performance ambiguity is positively related to tolerance of opportunism

Table 1 (cont'd)

Author(s)	Context	Independent Variable(s)	Dependent Variable(s)	Key Findings
Bergen, Heide & Dutta (1998) (cont'd)				Dual channels is negatively related to tolerance of opportunism Exclusive dealing is positively related to tolerance of opportunism Product maturity is positively related to tolerance of opportunism
Bergh & Lawless (1998)	Governance choice due to uncertainty (n=164)	Environmental uncertainty	Portfolio restructuring	Increases in environmental uncertainty over time lead to divestiture and decreases in environmental uncertainty lead to acquisition is tentatively supported
Brouthers (2002)	Entry mode choice (n=218)	Asset specificity	Entry mode	Higher perceived transaction costs is positively related to wholly owned modes of entry
Brouthers, Brouthers & Werner (2003)	Entry mode choice (n=213)	Asset specificity; Economic uncertainty; Behavioral uncertainty, Economic uncertainty x asset specificity	Entry mode	Asset specificity and economic uncertainty are positively related to entry mode choice
			Performance	Firms that used TCE have better performance than firms that do not

Table 1 (cont'd)

Author(s)	Context	Independent Variable(s)	Dependent Variable(s)	Key Findings
Brown, Dev & Lee (2000)	Efficacy of ownership, investment in transaction specific assets, and development of relational norms in managing opportunism (n=395)	Ownership; Asset specificity; Relational norms; Ownership x asset specificity; Ownership x relational norms; Asset specificity x relational norms; Ownership x asset specificity x relational norms	Opportunism	Asset specificity increases opportunism when used alone Relational norms by itself and in combination with other governance mechanisms limits opportunism
Bucklin & Sengupta (1993)	Organization of co-marketing alliances (n=98)	Contractual governance; Asset specificity; Environmental uncertainty; Contractual governance x asset specificity; Transaction frequency	Power imbalance	Asset specificity and transaction frequency are positively related to power imbalance Contractual governance is effective in reducing power imbalance when asset specificity is high
Buvik (1998)	Technological and economic dependence in purchasing relationships (n=172)	Environmental uncertainty; Asset specificity; Environmental uncertainty x asset specificity; Transaction frequency	Level of formalized purchasing contract	When supplier asset specificity is low and environmental uncertainty is high, then formalization of purchase contracting diminishes When supplier asset specificity is high and environmental uncertainty is high, then formalization of purchase contract is increased

Table 1 (cont'd)

Author(s)	Context	Independent Variable(s)	Dependent Variable(s)	Key Findings
Buvik (2000)	Buyer-seller relationships (n=171)	Asset specificity; Environmental uncertainty	Ex post transaction costs	Greater asset specificity and increased vertical integration reduce ex post transaction costs Greater asset specificity and increased coordination supplier relationships reduce ex post transaction costs as the flexibility of the buyer's manufacturing technology increases Environmental uncertainty is positively related to ex post transaction costs
Buvik & Andersen (2002)	Vertical coordination in international buyer-seller relationships (n=182)	Asset specificity; Behavioral uncertainty; Vertical coordination; Asset specificity x behavioral uncertainty; Vertical coordination x behavioral uncertainty; Asset specificity x vertical coordination; Asset specificity x vertical coordination x behavioral uncertainty	Ex post transaction costs	Ex post transaction costs are higher in international relationships When high levels of assets specificity, vertical coordination is more effective in lowering ex post transaction costs in international relationships

Table 1 (cont'd)

Author(s)	Context	Independent Variable(s)	Dependent Variable(s)	Key Findings
Buvik & Gronhaug (2000)	Interfirm coordination in buyer-seller relationships (n=182)	Asset specificity; Environmental uncertainty; Transaction frequency; Asset specificity x environmental uncertainty	Vertical coordination	When asset specificity is low, environmental uncertainty is positively related to vertical coordination When asset specificity is high, vertical coordination is less appropriate for simultaneously handling the adaptation to environmental uncertainty and safeguarding
Buvik & John (2000)	Vertical coordination in buyer-seller relationships (n=161)	Asset specificity; Environmental uncertainty; Vertical coordination; Frequency of transaction; Asset specificity x environmental uncertainty; Vertical coordination x environmental uncertainty; Asset specificity x vertical coordination; Asset specificity x vertical coordination x environmental uncertainty	Ex post transaction costs	Transaction frequency leads to reduced ex post transaction costs When asset specificity is low, environmental uncertainty is positively related to vertical coordination When environmental uncertainty is high increased vertical coordination is beneficial

Table 1 (cont'd)

Author(s)	Context	Independent Variable(s)	Dependent Variable(s)	Key Findings
Buvik & Reve (2001)	Specific assets in buyer-seller purchasing relationships (n=161)	Asset specificity	Formalized purchase contract	No difference in formalized purchase contracting with unilateral buyer-held specific assets and mutual-low asset specificity Formalized purchase contract is greater for unilateral supplier held specific assets than with mutual-low asset specificity Formalized purchase contract is greater in unilateral supplier-held specific assets than with unilateral buyer-held assets Formalized purchase contract is greater for mutual-high asset specificity than with mutual-low asset specificity Formalized purchase contract is greater for mutual-high asset specificity than with unilateral buyer-held specific assets
Cannon, Achrol & Gundlach (2000)	Plural form of governance in buyer-seller relationships (n=424)	Asset specificity; Environmental uncertainty; Relational norms	Supplier performance	For relationships with specific assets and high environmental uncertainty increases in contract formalization will not improve performance For relationships with low specific assets and low environmental uncertainty, increases in contract formalization will improve performance

Table 1 (cont'd)

Author(s)	Context	Independent Variable(s)	Dependent Variable(s)	Key Findings
Cannon, Achrol & Gundlach (2000) (cont'd)				For relationships with specific assets and high environmental uncertainty increases in relational content positively related to performance Relationships with low specific assets and low environmental uncertainty increases in relational content in presence of contractual governance will not improve performance
Cannon & Perreault (1999)	Interfirm coordination in buyer-seller relationships (n=443)	Asset specificity; Relational norms; Legal bonds; Operational linkages	Customer satisfaction	Cooperative and collaborative relationships with low specific assets exhibit high levels of relational norms, with collaborative types relying more heavily on formal contract
			Customer evaluation of supplier performance	Customer supply relationships with high specific assets use contracts, norms, or trust relatively modestly, with market governance most prominent Mutually adaptive relationships with high specific assets but relatively low levels of trust and relational norms are governed by the hostage model
Celly, Speckan & Kamauff (1999)	Vertical coordination in international buyer-seller relationships (n=163)	Technological uncertainty; Competition; Importance of supplier responsiveness; Importance to buyer of traditional purchasing criteria	Asset specificity	Technological uncertainty and importance of supplier responsiveness are positively related to asset specificity

Table 1 (cont'd)

Author(s)	Context	Independent Variable(s)	Dependent Variable(s)	Key Findings
Celly, Speckan & Kamauff (1999) (cont'd)		Asset specificity	Relationship stability	Asset specificity is positively related to relationship stability
			Buyer information sharing	Asset specificity is positively related to buyer information sharing
Coles & Hesterly (1998)	Make or buy decision in hospitals (n=2500+)	Asset specificity; Environmental uncertainty x asset specificity	Vertical integration	Asset specificity with increased environmental uncertainty will induce firms to integrate at lower levels of asset specificity Asset specificity is positively related to vertical integration
Combs & Ketchen (1999)	Interfirm cooperation and performance (n=94)	Asset specificity; Specific knowledge; Geographic dispersion	Interfirm cooperation	Asset specificity is positively related to interfirm cooperation
Dahlstrom & Nygaard (1999)	Opportunism in franchisor-franchisee relationships (1st stage n=179, 2nd stage n=216)	Opportunism; Cooperation; Formalization	Bargaining costs; Monitoring costs; Maladaption costs	Opportunism is positively related to bargaining, monitoring, and maladaption costs Effects of opportunism have a enduring influence on bargaining, monitoring, and maladaption costs

Table 1 (cont'd)

Author(s)	Context	Independent Variable(s)	Dependent Variable(s)	Key Findings
Dahlstrom & Nygaard (1999) (cont'd)			Opportunism	Cooperation and formalization are negatively related to opportunism
Delmas (1999)	Interfirm cooperation and performance (n=927)	Asset specificity; Environmental uncertainty	Governance Structure	Asset specificity is positively related to acquisition Environmental uncertainty is positively related to alliance formation
Dutta, Bergen, Heide, & John (1995)	Dual distribution channels (n=199)	Incumbency/Lock-in; Performance ambiguity	Single versus dual channels	Incumbency and performance ambiguity increase the use of dual channel distribution Environmental uncertainty is positively related to alliance formation
Dutta, Heide & Bergen (1999)	Vertical territorial restrictions (n=199)	Free-rideable services; Information asymmetry; Behavioral uncertainty; Asset specificity; Manufacturer competition; Distributor heterogeneity; Exclusive dealing	Deployment of territorial restrictions	Higher behavioral uncertainty leads to less deployment of territorial restriction Asset specificity is positively related to deployment of territorial restrictions

Table 1 (cont'd)

Author(s)	Context	Independent Variable(s)	Dependent Variable(s)	Key Findings
Dyer (1996a)	Supplier governance in auto industry (n=192)	Asset specificity; Trust; Reputation; Financial hostages; Legal contract	Governance type	Greater asset specificity in Japanese networks
				Japanese network realize the advantages of hierarchy without high transaction costs
				Japanese network employs self-enforcing safeguards
Dyer (1996b)	Supplier governance in auto industry (n=192)	Asset specificity	Quality	Interfirm human asset specificity positively related to quality
			New model cycle time	Interfirm human asset specificity positively related to model cycle time
			Inventory holding cost	Greater interfirm site specificity the lower the inventory cost
			Profitability	Interfirm asset specificity is positively related to profitability

Table 1 (cont'd)

Author(s)	Context	Independent Variable(s)	Dependent Variable(s)	Key Findings
Dyer (1997)	Supplier governance in auto industry (n=192)	Asset specificity	Transaction cost	Japanese have lower transaction costs due to (1) repeated transactions with small set of suppliers. (2) economies of scale in transacting with small supplier group (3) extensive interfirm information exchange (4) use of noncontractual self-enforcing safeguards, and (5) investments in cospecialized assets
Dyer & Chu (2003)	Trust as part of supplier governance in auto industry (n=344)	Asset specificity; Trust; Buyer trustworthiness	Ex post transaction costs	Greater trust lowers ex post transaction costs
			Ex post transaction costs	Trustworthiness of buyer lowers buyer ex post transaction costs
			Information sharing	Greater trust increases information sharing
Erramilli & Rao (1993)	International entry mode of service firms (n=381)	Asset specificity; Capital intensity; Inseparability; Cultural distance; Environmental uncertainty; Asset specificity x capital intensity; Asset specificity x inseparability; Asset specificity x environmental uncertainty;	Control in entry mode	When asset specificity is low, service firms tend to favor shared-control modes and this intensifies when services are inseparable, country risk increases, and firms are smaller

Table 1 (cont'd)

Author(s)	Context	Independent Variable(s)	Dependent Variable(s)	Key Findings
Fein & Anderson (1997)	Credible commitments in distribution channels (n=362)	Asset specificity	Degree of brand selectivity granted to supplier by distributor	Asset specificity is positively related to brand selectivity when suppliers have made investments in the distributor
			Degree of territory selectivity granted to distributor by supplier	Asset specificity is positively related to territory selectivity when distributors have made investments specific to the manufacturer
Folta (1998)	Trade-off between administrative control and commitment (n=402)	Environmental uncertainty; Asset specificity; Environmental uncertainty x asset specificity	Equity investment versus acquisition	Environmental uncertainty and the interaction between environmental uncertainty and asset specificity are positively related to equity collaboration
				Asset specificity is positively related to acquisition
Frazier & Lassar (1996)	Credible commitment of retailers (n=85)	Asset specificity	Distribution intensity	Contract restrictions weakens the relationship between brand positioning on quality and distribution intensity
				Retailer investments weakens the relationship between manufacturer coordination efforts and distribution intensity
				Retailer investments strengthens the relationship between manufacturer support programs and distribution intensity

Table 1 (cont'd)

Author(s)	Context	Independent Variable(s)	Dependent Variable(s)	Key Findings
Ganesan (1994)	Retail buyer-seller relationships (n=124 retailers and 52 vendors)	Asset specificity; Environmental uncertainty	Perception of retailer's dependence on vendor	Retailer asset specificity increases the perception of retailer's dependence on the vendor
			Vendor's dependence on retailer	Vendor asset specificity increases the vendor's dependence on the retailer
Gatignon & Anderson (1988)	Degree of ownership in subsidiaries of U.S. multinationals (n=1267)	Asset specificity; Environmental uncertainty; Behavioral uncertainty; Asset specificity x environmental uncertainty	Degree of ownership of foreign subsidiary	Environmental uncertainty is negatively related to the degree of equity ownership
				Behavioral uncertainty is positively related to the degree of equity ownership
				High asset specificity and behavioral uncertainty and low environmental uncertainty increase the likelihood of total ownership
Ghosh & John (2005)	Buyer-seller relationships (n=193)	Contract incompleteness	Asset specificity	The more incomplete the ex ante contract, the higher the levels of OEM investment in supplier-specific assets

Table 1 (cont'd)

Author(s)	Context	Independent Variable(s)	Dependent Variable(s)	Key Findings
Gulati, Lawrence & Puranam (2005)	Buyer-seller relationships (n=222)	Reciprocal task interdependence; Environmental uncertainty; Asset specificity; Environmental uncertainty x reciprocal interdependence	Procurement mode	Supplying units will be more differentiated from procuring units in market and hybrid procurement Supplying units will be more integrated from procuring units in internal and hybrid procurement Environmental uncertainty has greater adverse effects on the performance of internal procurement Interaction of environmental uncertainty and reciprocal task interdependence will be less adverse on hybrid procurement
Heide, Dutta & Bergen (1998)	Exclusive dealing in buyer-seller relationships (n=147)	Free riding on manufacturer services; Transaction costs (costs to monitor actions of distributor); End customer costs; Manufacturer differentiation; Entry deterrence	Use of exclusive dealing	Business efficiency factors play a significant role in firms' decisions regarding exclusive dealing Greater potential for other manufacturers to free ride the greater the likelihood of exclusive dealing

Table 1 (cont'd)

Author(s)	Context	Independent Variable(s)	Dependent Variable(s)	Key Findings
Heide, Dutta & Bergen (1998) (cont'd)				Greater the difficulty in evaluating distributors' adherence, the lower the likelihood of exclusive dealing
				Higher the costs imposed on end customers, the less the likelihood of exclusive dealing
Heide & John (1988)	Dependence in buyer-seller relationships (n=199)	Supplier asset specificity; Product complexity; Number of principals; Concentration of exchange	Offsetting investments	Increased supplier asset specificity is positively related to offsetting investments
			Replaceability of principal	Supplier asset specificity is negatively related to replaceability of partner
Heide & John (1990)	Joint action in buyer-seller relationships (n=155)	Specific investments of buyer; Specific investments of supplier; Environmental uncertainty; Performance ambiguity	Joint action	Specific investments by the buyer and the supplier increase the level of joint action
			Expectations of continuity	Technological unpredictability decreases the expectation of continuity
			Supplier verification efforts	Performance ambiguity increases the level of verification efforts

Table 1 (cont'd)

Author(s)	Context	Independent Variable(s)	Dependent Variable(s)	Key Findings
Heide & John (1992)	Norms in buyer-seller relationships (n=147)	Buyer specific assets; Relational norms; Buyer concentration; Buyer specific assets x relational norms	Buyer's control over supplier decisions	Absence of norms, it is not possible for parties whose specific assets are at risk to acquire vertical control as per the transaction cost perspective Increases in buyer asset specificity decreases buyer control Interaction of buyer asset specificity and relational norms is positively related to buyer control Buyer concentration and in-house manufacturing increases buyer control over supplier decisions
Heide & Stump (1995)	Buyer-seller relationships (n=155 buyers n=60 suppliers)	Asset specificity; Environmental uncertainty; Asset specificity x continuity; Environmental uncertainty x continuity	Performance	Interaction of supplier asset specificity and continuity is positively related to performance Buyer investments in supplier asset specificity decrease performance Interaction of environmental uncertainty and continuity is positively related to performance Environmental uncertainty is negatively related to performance

Table 1 (cont'd)

Author(s)	Context	Independent Variable(s)	Dependent Variable(s)	Key Findings
Houston & Johnson (2000)	Buyer-seller contract versus joint venture (n=107)	Asset specificity; Behavioral uncertainty; Reputation	Contract versus joint venture	Asset specificity is positively related to joint venture formation Performance ambiguity is positively related to joint venture formation Reputation is negatively related to joint venture formation
Ingham & Thompson (1994)	Wholly-owned versus joint venture (n=292)	Asset specificity	Wholly-owned versus joint venture	Asset specificity is positively related to wholly-owned affiliates
Jap (2001)	Buyer-seller relationships (n=220)	Bilateral asset specificity; Goal congruence; Interpersonal trust; Suspicions of ex post opportunism	Suspected ex post opportunism	Asset specificity safeguards at high and low levels of suspected ex post opportunism Goal congruence safeguards at high levels of suspected ex post opportunism Interpersonal trust safeguards at high and low levels of suspected ex post opportunism

Table 1 (cont'd)

Author(s)	Context	Independent Variable(s)	Dependent Variable(s)	Key Findings
Jap & Anderson (2003)	Buyer-seller relationships (n=154)	Bilateral asset specificity; Goal congruence; Interpersonal trust; Ex post opportunism	Suspected ex post opportunism	Bilateral idiosyncratic investments safeguard all performance outcomes in both high and low levels of ex post opportunism Goal congruence is positively related to evaluation of counterpart's performance and achievement of competitive advantages at high levels of ex post opportunism Interpersonal trust is positively related to performance outcomes at low levels of ex post opportunism only
Jap & Ganesan (2000)	Buyer-seller relationships (n=1457)	Supplier asset specificity; Retailer's asset specificity; Relational norms; Explicit contracts; Supplier asset specificity x retailer's asset specificity; Retailer's asset specificity x relational norms; Retailer's asset specificity x explicit contracts	Perception of supplier commitment	Retailer's transaction investments are negatively related to its perception of supplier commitment Supplier's transaction specific investments are positively related to the perception of supplier commitment Relational norms are positively related to perceptions of supplier commitment

Table 1 (cont'd)

Author(s)	Context	Independent Variable(s)	Dependent Variable(s)	Key Findings
Jap & Ganesan (2000) (cont'd)				Use of explicit contracts is negatively related to perceptions of supplier commitment
John (1984)	Opportunism is franchising channel arrangements (n=147)	Bureaucratic structuring; Perceptions of coercive power attribution; Attributions of non-contingent power	Opportunism	Bureaucratic structuring is positively related to opportunism Coercive power attributions are positively related to opportunism
John & Weitz (1988)	Forward integration in distribution channels (n=87)	Asset specificity; Environmental uncertainty; Behavioral uncertainty; Sales volume; Density of sales territories	Degree of direct sales	Asset specificity is positively related to direct channels Environmental uncertainty is positively related to direct channels Behavioral uncertainty is positively related to direct channels
John & Weitz (1989)	Salary versus incentive compensation for salesforce in manufacturing firms (n=161)	Asset specificity; Replaceability; Environmental uncertainty; Behavioral uncertainty; Replaceability x environmental uncertainty	Salary as percentage of compensation	Behavioral uncertainty, replaceability and the interaction of replaceability and environmental uncertainty are positively related to the percentage of salary compensation

Table 1 (cont'd)

Author(s)	Context	Independent Variable(s)	Dependent Variable(s)	Key Findings
Joshi & Arnold (1997)	Buyer dependence and opportunism against supplier moderated by relational norms (n=148)	Buyer dependence; Relational norms (moderator)	Opportunism	Buyer dependence and opportunism are positively related under low relational norms Buyer dependence and opportunism are inversely related under high relational norms
Joshi & Stump (1999)	Buyer-supplier relationships (n=184)	Manufacturer asset specificity; Supplier asset specificity; Decision making uncertainty; Trust in supplier; Manufacturer asset specificity x supplier asset specificity; Manufacture asset specificity x decision making uncertainty; Manufacturer asset specificity x trust in supplier	Joint action	Manufacturer asset specificity is positively related to joint action Increasing asset specificity attenuates the relationship between manufacturer asset specificity and joint action The relationship between manufacturer asset specificity and joint action is enhanced with increasing levels of decision making uncertainty and trust
Joskow (1987)	Buyer-seller relationships (n=277)	Asset specificity	Duration of contract	Asset specificity is positively related to contract duration

Table 1 (cont'd)

Author(s)	Context	Independent Variable(s)	Dependent Variable(s)	Key Findings
Klaas, McClendon, & Gainey (1999)	Role of transaction costs in HR outsourcing (n=432)	Asset specificity x HR outsourcing; Uncertainty x HR outsourcing	Perceived benefits of outsourcing	Asset specificity and uncertainty positively moderated the relationship between HR outsourcing and perceived benefits of outsourcing
Klein (1989)	Control of export channels (n=338)	Asset specificity; Environmental uncertainty; Transaction frequency	Vertical Control	Asset specificity and transaction frequency are positively related to vertical control of the export channel Environmental uncertainty complexity is positively related and dynamism is negatively related to vertical control of the export channel
Klein, Frazier, & Roth (1990)	Channel integration in foreign markets (n=375)	Asset specificity; Environmental uncertainty	Channel integration	Asset specificity is positively related to channel integration Environmental volatility is positively related to use of hierarchy-subsidiary governance Environmental diversity is inversely related to hierarchy-domestic governance
Klein & Roth (1993)	Export channel performance (n=329)	Environmental uncertainty; Behavioral uncertainty	Channel Satisfaction	Environmental uncertainty is positively related to channel satisfaction Behavioral uncertainty is negatively related to channel satisfaction

Table 1 (cont'd)

Author(s)	Context	Independent Variable(s)	Dependent Variable(s)	Key Findings
Krafft (1999)	Salesforce control (n=270)	Asset Specificity; Environmental uncertainty; Behavioral uncertainty; Asset specificity x environmental uncertainty	Sales force control	Environmental uncertainty is positively related to behavioral control Behavioral uncertainty is positively related with behavioral control
Lee (1998)	Strategic alliances between exporters and importers (n=105)	Decision-making uncertainty; Cultural distance; Economic ethnocentrism	Opportunism	Exporters' decision making uncertainty is positively related to opportunism Cultural distance is positively related to opportunism Exporters' economic ethnocentrism is positively related to opportunism
Leiblein & Miller (2003)	Make-or-buy decisions (n=469)	Asset specificity; Environmental uncertainty; Asset specificity x environmental uncertainty	Vertical integration	Asset specificity is positively related to vertical integration Environmental uncertainty is positively related to vertical integration Interaction of asset specificity and environmental uncertainty is positively related to vertical integration and is inversely related to hierarchy-domestic governance

Table 1 (cont'd)

Author(s)	Context	Independent Variable(s)	Dependent Variable(s)	Key Findings
Leiblein, Reuer, & Dalsace (2002)	Make-or-buy decisions (n=714)	Asset specificity; Environmental uncertainty	Governance choice	Asset specificity is positively related to external governance (buy) Environmental uncertainty is positively related to external governance (buy) Interaction of asset specificity and environmental uncertainty is positively related to internal governance (make)
Levy (1985)	Vertical integration in B2B relationships (n=69 firms in 37 industries)	Asset specificity; Environmental uncertainty; Asset specificity x environmental uncertainty	Vertical integration	Asset specificity and environmental uncertainty are positively related to vertical integration
Lieberman (1991)	Backward integration (n=203)	Asset specificity; Environmental uncertainty	Level of backward integration	Asset specificity is positively related to backward integration Environmental uncertainty is positively related to backward integration when the other buyers of the input have high demand variability
Majumdar & Ramaswamy (1994)	Downstream integration (n=1392)	Asset specificity; Environmental uncertainty; Behavioral uncertainty; Transaction frequency	Vertical integration	Asset specificity, behavioral uncertainty, environmental uncertainty, and transaction frequency are all positively related to vertical integration
Masten (1984)	Make-or-buy decisions (n=1887)	Asset specificity; Environmental uncertainty	Make-or-buy decision	Asset specificity and environmental uncertainty are positively related to internal organization

Table 1 (cont'd)

Author(s)	Context	Independent Variable(s)	Dependent Variable(s)	Key Findings
Masten, Meehan, & Snyder (1991)	Make-or-buy decisions (n=74)	Asset specificity; Environmental uncertainty	Cost of internal organization	Asset specificity and environmental uncertainty are positively related to internal organization
McNaughton (2002)	Use of multiple distribution channels for foreign markets (n=120)	Asset specificity; Environmental uncertainty	Multiple export channels	Physical asset specificity negatively related to multiple channel use Environmental volatility is negatively related to multiple channel use Environmental diversity is positively related to multiple channel use
Montevede & Teece (1982)	Automotive industry vertical integration (n=133)	Asset specificity	Internalization	Asset specificity is positively related to internalization
Noordewier, John & Nevin (1990)	Buyer-seller relationships (n=140)	Environmental uncertainty	Relational governance	Increased relational governance on transaction performance occur only when uncertainty is relatively high
Parkhe (1993)	Cooperation in strategic alliances (n=111)	Perception of opportunism; History of cooperation; Asset specificity	Performance	The perception of opportunism is negatively related to performance Asset specificity is positively related to performance

Table 1 (cont'd)

Author(s)	Context	Independent Variable(s)	Dependent Variable(s)	Key Findings
Parkhe (1993) (cont'd)			Perception of opportunism	Cooperative history is negatively related to the perception of opportunism
				Asset specificity is negatively related to the perception of opportunism
			Length of relationship	Asset specificity is positively related to length of relationship
			Contractual safeguards	The perception of opportunism is positively related to contractual safeguards
Pilling, Crosby, & Jackson (1994)	Manufacturer-supplier relationships (n=224)	Asset specificity; Environmental uncertainty; Transaction frequency	Ex ante and ex post transaction cost	Asset specificity is positively related to development and monitoring transaction costs
				Environmental uncertainty is positively related to development costs
Poppo & Zenger (1998)	Market or internal organization (n=1368)	Asset specificity; Environmental uncertainty; Behavioral uncertainty	Exchange performance	Asset specificity is negatively related to market performance
			Boundary choice	Asset specificity is negatively related to satisfaction with outsourcing
				Behavioral uncertainty is negatively related to satisfaction with internal activity

Table 1 (cont'd)

Author(s)	Context	Independent Variable(s)	Dependent Variable(s)	Key Findings
Provan & Skinner (1989)	Buyer-seller relationship (n=226)	Dependence; Control over decisions	Opportunism	Highly dependent dealers are less likely to engage in opportunistic behavior with their suppliers than less dependent dealers Supplier control over dealer decisions is positively related to dealer opportunism
Reuer & Arino (2002)	Alliances (n=91)	Asset Specificity; Environmental uncertainty	Contractual renegotiation	Asset specificity is positively related to contractual renegotiations
Robertson & Gatignon (1998)	Use of alliance versus internal R&D (n=264)	Asset specificity; Environmental uncertainty; Behavioral uncertainty	Alliance versus internal development	Asset specificity is negatively related to the use of alliances Environmental uncertainty is positively related to the use of alliances Behavioral uncertainty was positively related to the use of alliances
Rokkan, Heide & Wathne (2003)	Buyer-seller relationships (n=198)	Asset specificity; Extendedness; Solidarity	Supplier's perception of own opportunism	Asset specificity promotes opportunism when there are weak solidarity norms Strong solidarity norms reduced opportunism Possibility of future interaction reduces opportunism for buyers but not for suppliers

Table 1 (cont'd)

Author(s)	Context	Independent Variable(s)	Dependent Variable(s)	Key Findings
Sako & Helper (1998)	Buyer-seller relationships (n=1073)	Vertical integration; Asset specificity; Length of contract; Asset specificity x environmental uncertainty	Opportunism	Interaction of asset specificity and environmental uncertainty is positively related to buyer opportunism
				Environmental uncertainty is positively related to buyer opportunism
Schilling & Steensma (2002)	Sourcing of technology know-how (n=127)	Commercial uncertainty; Technical dynamism; Barriers to imitation; Uniqueness	Threat of opportunism	Barriers to imitation of the technology is positively related to threat of opportunism
		Threat of opportunism	Probability of acquisition versus licensing agreement	Threat of opportunism will increase the likelihood of technology being sourced through acquisition as opposed to a licensing agreement
Skarmeas, Katsikeas, & Schlegelmilch (2002)	Distributor-manufacturer relationships (n=216)	Exporter's opportunism; Cultural sensitivity; Environmental uncertainty; Importer's asset specificity	Importer's commitment	Importer's asset specificity investment is positively related to importer's commitment
				Exporter's opportunism is negatively related to the importer's commitment
		Cultural sensitivity; Environmental uncertainty	Exporter's opportunism	Environmental uncertainty is positively related to exporter's opportunism
				Exporter cultural sensitively is negatively related to exporter opportunism

Table 1 (cont'd)

Author(s)	Context	Independent Variable(s)	Dependent Variable(s)	Key Findings
Steensma, Marino, Weaver, & Dickson (2000)	Alliances (n=1470)	Environmental uncertainty; Culture variables x environmental uncertainty; Uncertainty avoidance x environmental uncertainty	Use of technology alliances	Technological uncertainty is negatively related to the use of technological alliances
				The interaction of technological uncertainty and uncertainty avoidance is positively related to the use of technology alliances
				The interaction of masculinity and technological uncertainty is negatively related to the use of technology alliances
			Use of equity ties	The interaction of individualism and technological uncertainty is negatively related to the use of equity ties
Stremersch, Weiss, Dellaert, & Frambach (2003)	Buyer-seller relationships (n=55)	Asset Specificity; Environmental uncertainty	Outsourcing versus internalization	Greater tacit know-how of buyer is negatively related to outsourcing and single sourcing
				Greater technological volatility is positively related to outsourcing and negatively related to single sourcing

Table 1 (cont'd)

Author(s)	Context	Independent Variable(s)	Dependent Variable(s)	Key Findings
Stump (1995)	Buyer-seller relationships (n=161)	Asset Specificity; Environmental uncertainty; Asset specificity x environmental uncertainty	Size of supplier set	Buyer asset specificity is positively related to size of supplier set
			Overall purchasing concentration	Buyer asset specificity is positively related to overall purchasing concentration
			Purchase volume to focal supplier	Buyer asset specificity is positively related to purchase volume of focal supplier
				Environmental uncertainty is negatively related to overall purchasing concentration
Stump & Heide (1996)	Buyer-seller relationships (n=164)	Asset Specificity; Behavioral uncertainty; Environmental uncertainty	Qualification of supplier ability	Buyer asset specificity is positively related to buyer qualification of supplier ability
				Behavioral uncertainty is negatively related to qualification of supplier ability
			Qualification of supplier motivation	Buyer asset specificity is positively related to supplier motivation
			Specific investments by supplier	Buyer asset specificity is positively related to supplier specific investments
				Environmental uncertainty is negatively related to specific investments by supplier

Table 1 (cont'd)

Author(s)	Context	Independent Variable(s)	Dependent Variable(s)	Key Findings
Stump & Heide (1996) (cont'd)			Buyer monitoring	Behavioral uncertainty is negatively related to buyer monitoring
Sutcliffe & Zaheer (1998)	Make-or-buy decisions (n=308)	Primary uncertainty; Competitive uncertainty; Supplier uncertainty (Behavioral uncertainty)	Vertical integration	Primary uncertainty is negatively related to vertical integration Competitive uncertainty is negatively related to vertical integration Supplier uncertainty is positively related to vertical integration
Walker & Weber (1984)	Make-or-buy decisions (n=60)	Environmental uncertainty	Make-or-buy decision	Volume uncertainty leads to making component Higher production cost advantage for supplier leads to buying component Greater supplier market competition leads to buying the component
Walker & Weber (1987)	Make-or-buy decisions (n=60)	Environmental Uncertainty	Make or buy	Interaction of market competition and volume and technological uncertainty affects make or buy decision

Table 1 (cont'd)

Author(s)	Context	Independent Variable(s)	Dependent Variable(s)	Key Findings
Weiss & Anderson (1992)	Use of integrated salesforce versus manufacturers' representatives (n=258)	Asset specificity; Behavioral uncertainty	Manufacturers' dissatisfaction with representatives	Asset specificity reduces dissatisfaction with current representative
		Behavioral uncertainty	Intention to integrate into selling	Behavioral uncertainty is positively related to intention to integrate into selling
Weiss & Kurland (1997)	Buyer-seller relationships (n=258)	Asset specificity; Asset specificity x length of relationship	Relationship termination	Manufacturer and customer asset specificity are negatively related to relationship termination
				Likelihood of relationship termination decreases with the length of the relationship when asset specificity is held constant
Widener & Selto (1999)	Outsourcing of activities (n=198)	Asset specificity; Environmental uncertainty; Behavioral Uncertainty; Transaction frequency; Asset specificity x environmental uncertainty; Asset specificity x behavioral uncertainty; Asset specificity x transaction frequency	Outsourced internal auditing	Asset specificity is negatively related to outsourcing
				Transaction frequency is negatively related to outsourcing

Table 1 (cont'd)

Author(s)	Context	Independent Variable(s)	Dependent Variable(s)	Key Findings
Widener & Selto (1999) (cont'd)				Interaction of asset specificity and transaction frequency is positively related to outsourcing
Zaheer & Venkatraman (1995)	Relational governance in interorganizational relationships (n=329)	Asset specificity; Behavioral uncertainty; Reciprocal investments	Quasi-Integration	Asset specificity is positively related to quasi-integration

Table 2

Network Categories and Examples of Research

Network Category	Function	Examples of Research
Vertical networks	Maximize the productivity of serially dependent functions by creating partnerships among independent skill-specialized firms	Wathne and Heide (2004) Wuyts, Stremersch, Van Den Bulte, and Franses (2004) Joshi and Campbell (2003) Wathne, Biong, and Heide (2001) Kale, Singh, and Perlmutter (2000)
Internal networks	Designed to reduce hierarchy and open firms to their environments	Day (1994) Jaworski and Kohli (1993) Kohli and Jaworski (1990)
Intermarket network	Seek to leverage horizontal synergies across industries	Dyer (1996a) Dyer (1996b) Dyer and Nobeoka (2000)
Opportunity network	Organized around customer needs and market opportunities and designed to search for the best solutions	Frels, Shervani, and Srivastava (2003) McEvily and Zaheer (1999) Rindfleisch and Moorman (2001)

Table 3

Network Theory Empirical Studies

Author(s)	Context	Independent Variable(s)	Dependent Variable(s)	Key Propositions/Findings
Ahuja (2000)	Collaborative linkages (n=268)	Number of direct ties; Number of indirect ties,	Innovation output	Direct ties is positively related to innovation output Indirect ties is positively related to innovation output Interaction of direct ties and indirect ties is negatively related to innovation output
Antia & Frazier (2001)	Buyer-seller relationships (n=213)	Network density; Network centrality; Network density x obligation criticality; Network centrality x obligation criticality	Contract enforcement	Network centrality and density dampen contract enforcement
Beckman, Haunschild & Phillips (2004)	Alliance and interlock partners (n=2182 1st period, n=3333 2nd period)	Firm-specific uncertainty; Market uncertainty; Centrality	Broadening or reinforcing	Firms facing market uncertainty seek to strengthen existing relationships
Bell (2005)	Industry clusters (n=77)	Centrality	Innovativeness	Centrality in the institutional network does not enhance performance

Table 3 (cont'd)

Author(s)	Context	Independent Variable(s)	Dependent Variable(s)	Key Propositions/Findings
Boje & Whetten (1981)	Referral networks (n=316)	Centrality	Influence	Central organizations have greater influence in referral exchanges, joint program strategies, and formal and informal strategic communications
Brass (1984)	Influence in networks (n=140)	Centrality; Distance from organizational boundary	Influence	Centrality is positively related to influence in work flow and communication networks
Brass & Burkhardt (1993)	Power in networks (n=75)	Centrality	Power; Use of exchange; Coalition formation	Centrality is positively related to perception of power
Burkhardt & Brass (1990)	Power in networks (n=49)	Centrality	Power	Early adopters increase their network centrality and power following a change in technology
Dankowski, Barnett & Friedland (1986)	Image (n=100)	Diversification; Media coverage; Public image	Centrality	Diversification, media coverage, and public image are positively related to centrality

Table 3 (cont'd)

Author(s)	Context	Independent Variable(s)	Dependent Variable(s)	Key Propositions/Findings
Gulati (1995b)	Alliance formation (n=2400)	Number of past alliances; Direct ties; Distance between two firms	Alliance formation	Number of past alliances is positively related to alliance formation Absence of prior direct ties the larger the number of common third-party ties is positively related to alliance formation Shorter the path between two firms is positively related to alliance formation
Gulati & Gargiulo (1999)	Alliance formation (n=2400)	Number of past alliances; Common third party ties; Distance between firms in the network	Alliance formation	Number of past alliances is positively related to alliance formation Number of common third party ties is positively related to alliance formation Shorter the distance in a network is positively related to alliance formation

Table 3 (cont'd)

Author(s)	Context	Independent Variable(s)	Dependent Variable(s)	Key Propositions/Findings
Gulati (1999)	Alliance formation (n=2400)	Centrality; Density	Alliance formation	Centrality in a network is positively related with alliance formation Density is positively related to alliance formation
Madhavan, Koka & Prescott (1998)	Change in structural position (n=130)	Centrality	Change in centrality	Centrality before and after is positively related to a structure-reinforcing industry event Centrality before and after is negatively related to a structure-loosening industry event
Rowley (1997)	Alliances (n=98)	Density; Centrality	Stakeholder influence	As network density increases the ability to constrain stakeholders increases As centrality increases the ability to resist stakeholders increases

Table 3 (cont'd)

Author(s)	Context	Independent Variable(s)	Dependent Variable(s)	Key Propositions/Findings
Rowley , Behrens & Krackhardt (2000)	Alliances (n=98)	Density	Structural embeddedness	Strong ties are greater in sparse networks
			Strategy	Density of ties is negatively related to performance in exploration strategy
				Density of ties is positively related to performance in exploitation strategy

Table 4

Pre-Test Results of Transaction Cost Economics and Control Variables

TCE Variable	Treatment	Mean	N	t-value	p-value
Buyer Asset Specificity	High	5.67	18	6.27	< .001
	Low	2.94			
Buyer Performance Ambiguity	High	5.28	18	6.06	< .001
	Low	3.39			
Buyer Demand Uncertainty	High	5.83	18	13.97	< .001
	Low	3.11			
Buyer Technological Uncertainty	High	6.00	18	9.95	< .001
	Low	3.11			
Control Variable					
Market Position	High	5.33	18	0.22	NS
	Low	5.22			
Number of Suppliers	High	3.67	18	-12.47	< .001
	Low	6.33			
Qualified Suppliers in market	High	3.5	16*	-7.30	< .001
	Low	5.50			
Purchase Frequency	High	4.39	18	3.06	< .01
	Low	3.22			

* Two returned surveys had missing data

Table 5

Pre-Test Results of Buyer Supplier Network Density and Supplier New Customer Centrality

Variable	Treatment	N	New Supplier	Produce Internally	Continue With Current Supplier	Chi-Square p-value	Mean	t-value	p-value	Different from zero p-value
Buyer Supplier Network Density	High	18	1	0	17	0.148	0.76	-0.249	NS	< .01
	Low		4	0	14		0.86			< .01
Supplier New Customer Centrality	High	18	1	0	17	1.000	1.00	1.031	NS	< .01
	Low		1	0	17		0.65			< .05

Table 6

Sample Characteristics

Hypothesis	Between Group Treatment	Within Group Hypotheses	Within Group Treatment	N	Gender		Industry (SIC)				Firm Size (Number of Employees)		Position (Job Title)	
					Female	Male	350	360	370	380	< 500	> 500	Manager	Non-Manager
1	High Buyer Asset Specificity	7a1, 7a2 and 7b	Centrality	36	11	25	13	10	5	8	10	26	21	15
	Low Buyer Asset Specificity	7a1, 7a2 and 7b	Centrality	36	12	24	14	7	11	4	8	28	20	16
	High Buyer Asset Specificity	8a1, 8a2 and 8b	Density	36	13	23	11	9	8	8	15	21	16	20
	Low Buyer Asset Specificity	8a1, 8a2 and 8b	Density	36	8	28	15	6	8	7	14	22	19	17
2	High Buyer Performance Ambiguity	9a1, 9a2 and 9b	Density	36	10	26	14	6	10	6	11	25	19	17
	Low Buyer Performance Ambiguity	9a1, 9a2 and 9b	Density	36	14	22	14	7	11	4	9	27	18	18

Table 6 (cont'd)

Hypothesis	Between Group Treatment	Within Group Hypotheses	Within Group Treatment	N	Gender		Industry (SIC)				Firm Size (Number of Employees)		Position (Job Title)	
					Female	Male	350	360	370	380	< 500	> 500	Manager	Non-Manager
3	High Buyer Demand Uncertainty	10a1, 10a2 and 10b	Density	36	15	21	11	12	10	3	9	27	16	20
	Low Buyer Demand Uncertainty	10a1, 10a2 and 10b	Density	36	7	29	9	7	10	10	14	22	15	21
4	High Buyer Technological Uncertainty	11a1, 11a2 and 11b	Density	36	16	20	12	11	5	8	8	28	16	20
	Low Buyer Technological Uncertainty	11a1, 11a2 and 11b	Density	36	17	19	12	14	7	3	8	28	18	18
5	High Buyer Performance Ambiguity		Centrality	36	11	25	13	7	8	8	12	24	17	19
	Low Buyer Performance Ambiguity		Centrality	36	10	26	14	10	5	7	11	25	19	17

Table 6 (cont'd)

Hypothesis	Between Group Treatment	Within Group Hypotheses	Within Group Treatment	N	Gender		Industry (SIC)				Firm Size (Number of Employees)		Position (Job Title)	
					Female	Male	350	360	370	380	< 500	> 500	Manager	Non-Manager
6	High Buyer Demand Uncertainty		Centrality	36	10	26	22	6	3	5	11	25	19	17
	Low Buyer Demand Uncertainty		Centrality	36	14	22	16	6	6	8	13	23	20	16
	Totals			504	168	336	190	118	107	89	153	351	253	251
	Percentage				33	67	38	23	21	18	30	70	50	50

Table 7

Results-Vertical Coordination

Hypothesis	Between Group Treatment	Within Group Treatment	Levene's Test for Equality of Variances	N	Mean	Standard Deviation	p-value	Research Support for Hypotheses
1	High Buyer Asset Specificity	-	0.995	72	4.72	1.363	0.028	Supported
	Low Buyer Asset Specificity			72	4.14	1.406		
2	High Buyer Performance Ambiguity	-	0.053	36	4.72	1.301	0.013	Supported
	Low Buyer Performance Ambiguity			36	3.92	1.680		
3	High Buyer Demand Uncertainty	-	0.021	36	5.19	1.564	0.012	Supported
	Low Buyer Demand Uncertainty			36	4.28	1.799		
4	High Buyer Technological Uncertainty	-	0.735	36	4.56	1.557	0.216	Not supported
	Low Buyer Technological Uncertainty			36	4.25	1.713		
5	High Buyer Performance Ambiguity	High Centrality	0.548	36	-0.50	2.478	0.228	Not supported
		Low Centrality		36	0.19	2.364		
	Low Buyer Performance Ambiguity	High Centrality	0.801	36	0.03	2.324	0.105	Not supported
		Low Centrality		36	0.92	2.273		

Table 7 (cont'd)

Hypothesis	Between Group Treatment	Within Group Treatment	Levene's Test for Equality of Variances	N	Mean	Standard Deviation	p-value	Research Support for Hypotheses
6	High Buyer Demand Uncertainty	High Centrality	0.805	36	0.11	2.081	0.593	Not supported
		Low Centrality		36	0.36	1.869		
	Low Buyer Demand Uncertainty	High Centrality	0.267	36	-0.28	2.250	0.069	Supported
		Low Centrality		36	0.61	1.809		
7b	High Buyer Asset Specificity	High Centrality	0.250	24	2.21	2.395	0.102	Not supported
		Low Centrality		34	1.47	1.958		
	Low Buyer Asset Specificity	High Centrality	0.032	27	1.74	2.297	0.251	Not supported
		Low Centrality		35	1.40	1.418		
8b	High Buyer Asset Specificity	High Density	0.271	33	2.70	1.630	0.439	Not supported
		Low Density		22	2.77	1.974		
	Low Buyer Asset Specificity	High Density	0.709	30	2.00	1.894	0.393	Not supported
		Low Density		20	1.85	1.927		

Table 7 (cont'd)

Hypothesis	Between Group Treatment	Within Group Treatment	Levene's Test for Equality of Variances	N	Mean	Standard Deviation	p-value	Research Support for Hypotheses
9b	High Buyer Performance Ambiguity	High Density	0.603	26	1.38	2.192	0.318	Not supported
		Low Density		23	1.70	2.382		
	Low Buyer Performance Ambiguity	High Density	0.015	30	1.37	1.629	0.350	Not supported
		Low Density		25	1.60	2.598		
10b	High Buyer Demand Uncertainty	High Density	0.500	31	1.48	2.158	0.176	Not supported
		Low Density		23	2.00	1.758		
	Low Buyer Demand Uncertainty	High Density	0.118	33	1.76	2.208	0.033	Supported
		Low Density		24	2.75	1.595		
11b	High Buyer Technological Uncertainty	High Density	0.317	33	1.36	2.119	0.070	Supported
		Low Density		22	2.18	1.763		
	Low Buyer Technological Uncertainty	High Density	0.729	35	1.94	2.028	0.272	Not supported
		Low Density		31	2.26	2.160		

Table 8

Results-Governance Choice

Hypotheses	Between Group Treatment	Within Group Treatment	Find a New Supplier	Produce Internally	Continue with Current Supplier	Total	df	Chi-Square	p-value	Research Support for Hypotheses
7a1 and 7a2	High Buyer Asset Specificity	High Centrality	10	2	24	36	2	9.057	0.011	7a1 and7a2 Supported
		Low Centrality	2	0	34	36				
	Low Buyer Asset Specificity	High Centrality	9	0	27	36	1	7.432	0.006	
		Low Centrality	1	0	35	36				
8a1 and 8a2	High Buyer Asset Specificity	High Density	3	0	33	36	2	9.600	0.008	8a1 and 8a2 Supported
		Low Density	12	2	22	32				
	Low Buyer Asset Specificity	High Density	5	1	30	36	2	6.556	0.038	
		Low Density	13	3	20	36				
9a1 and 9a2	High Buyer Performance Ambiguity	High Density	10	0	26	36	2	1.365	0.505	9a1 and 9a2 Not supported
		Low Density	12	1	23	36				
	Low Buyer Performance Ambiguity	High Density	6	0	30	36	2	2.455	0.293	
		Low Density	10	1	25	36				

Table 8 (cont'd)

Hypotheses	Between Group Treatment	Within Group Treatment	Find a New Supplier	Produce Internally	Continue with Current Supplier	Total	df	Chi-Square	p-value	Research Support for Hypotheses
10a1 and 10a2	High Buyer Demand Uncertainty	High Density	5	0	31	36	1	4.741	0.029	10a1 and 10a2 Supported
		Low Density	13	0	23	36				
	Low Buyer Demand Uncertainty	High Density	3	0	33	36	2	6.992	0.030	
		Low Density	11	1	24	36				
11a1 and 11a2	High Buyer Technological Uncertainty	High Density	3	0	33	36	2	9.450	0.009	11a1 and 11a2 Supported
		Low Density	13	1	22	36				
	Low Buyer Technological Uncertainty	High Density	1	0	35	36	1	2.909	0.088	
		Low Density	5	0	31	36				

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