



The role of trust and relationship structure in improving supply chain responsiveness

Robert B. Handfield^{a,*}, Christian Bechtel^{b,1}

^aDepartment of Business Management, College of Management, North Carolina State University, CB 7229, Raleigh, NC 27695-7229, USA

^bRichard DeVos Graduate School of Management, Northwood University, 4000 Whiting Drive, Midland, MI 48640-2398, USA

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Abstract

In order to reduce cycle times between supply chain entities, managers must work to create new relational forms that rely on trust to a greater extent. We present a model suggesting that to build relationships based on trust, suppliers must invest in site-specific and human assets, and buyers must judiciously apply contracts to control for relative levels of dependence within the relationship. Our model also suggests that buyer-dependence, supplier human asset investments, and trust are all positively associated with improved supply chain responsiveness, defined in this study as the supplier's ability to quickly respond to the buying party's needs. This model is tested with data gathered from a sample of purchasing managers in North American manufacturing firms. The results suggest that even in cases when buyers do not have a great deal of control over their suppliers, working to build trust within the relationship can improve supplier responsiveness. © 2002 Elsevier Science Inc. All rights reserved.

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1. Introduction

With the advent of business-to-business (B2B) electronic commerce (e-commerce) and increasingly complex and dynamic competitive markets, firms are exploring alternative long-term relationships with their suppliers in order to improve supply chain agility [30,34]. The relationship between value creation and interorganizational relationships has been explored in transaction cost economics [73,74], resource-dependence theory [26,58], marketing channel theory [1,12,36,70], and relational governance [19,49,53]. A central proposition that populates these theories is that when organizations invest in relation-specific assets, engage in knowledge exchange, and combine resources through governance mechanisms, a supernormal profit can be derived on the part of both exchange parties. The most recent theoretical term for this benefit is a “relational rent” [19].

One of the most important performance outcomes expected from improved interorganizational relationships is cycle time reduction within the supply chain [29,30]. The *supply chain* encompasses all activities associated with the flow and transformation of goods from the raw materials stage (extraction), through to the end user, as well as the associated information flows [30]. Manufacturers wish to position themselves so they have more flexibility and reduced lead time in their supply chain processes, and less obsolete inventory. Obsolescence is a function of the growing need for mass customization [27,45] as well as the need to respond to web-based customer sales requests. Although Dell Computer pioneered selling through the web in the electronics industry, automotive manufacturers such as General Motors are seeking the same type of response system as web-based sales increase [42,46]. A critical enabler for web-based selling is improved flexibility and response times in order to avoid the “bull-whip effect” that occurs as buffer inventories increase throughout the supply chain [30].

This study seeks to develop and test a model that addresses the following question: *How can purchasing managers structure relationships with suppliers to achieve a desired outcome (supply chain responsiveness), given varying degrees of dependence on suppliers and different*

* Corresponding author. Tel.: +1-919-515-4674; fax: +1-919-515-6943.

E-mail addresses: robert_handfield@ncsu.edu (R.B. Handfield), bechtelc@pilot.msu.edu (C. Bechtel).

¹ Tel.: +1-517-837-4497.

market channel forms? In addressing this question, we begin with an overview of buyer–supplier relationships that identifies the drivers (globalization, information technology, and customer requirements) behind the “new” forms of relationships that are beginning to evolve. Supply chain responsiveness is introduced as a primary desired performance outcome from these relationships by purchasing organizations. The paper then argues that the primary relational requirement for improved responsiveness is the development of greater levels of trust between purchasing organizations and their suppliers. Further, relationships are often tempered by the nature of trust, the nature of the commodity/service being purchased, and the characteristics of the market channel [70]. In structuring these relationships to improve responsiveness, managers may require that suppliers conform to certain requirements, including relationship governance via detailed written contracts, dedicated capital assets, or dedicated human assets to support the relationship [19,48,67]. However, the degree to which the supplier is willing to agree to these requirements is tempered by the level of power the supplier has over the buyer, (or conversely, the degree to which the buyer depends on the supplier) [12,24]. We therefore integrate these salient elements from the literature into our model of relationship development. This model is subsequently tested using survey data gathered from the purchasing managers of 97 North American manufacturing firms. The resulting model provides a blueprint for managers to apply in seeking to build trust with key suppliers and thereby improve supply chain responsiveness.

2. An overview of buyer–seller relationships

At the beginning of the 20th century, interorganizational transactions were the domain of marketing and distribution personnel. Because material specifications were much more standard at this time, cost was the primary differentiator in transaction decisions. Interorganizational alliances or partnerships between buyers and sellers were generally not present among early 20th century organizations [23]. Instead, vertical integration was often used to eliminate supply uncertainty in market channels.

The first truly “long-term” interorganizational relationships evolved in Japan. During the post-World War II years, Japanese manufacturing organizations became regulated by the Ministry for International Trade, and subsequently established a new type of integration scheme known as the *keiretsu*, characterized by informal but strict cooperation among members [48,57,61]. Early studies of interactions among supply chain participants in the *keiretsu* noted that cycle times were significantly lower than those for American counterparts [53]. Since then, a series of shocks to the global economy have driven North American managers to consider alternative forms of relational governance. These shocks included (1) the globalization of the world economy,

(2) the evolution of the World Wide Web and new forms of B2B e-commerce solutions, and (3) increasing requirements for customer responsiveness.

2.1. Globalization

The effectiveness of the Japanese *keiretsu* and the globalization of the world economy dramatically changed the business climate, and these changes led many US firms to embrace new types of interorganizational relationships during the 1980s [61]. Most of these, at first, were still equity-based [75]. Increasingly, however, the rise of global competition and the fast pace of technological change convinced many firms that neither vertical integration, open market bargaining, nor equity sharing were effective mechanisms for tackling supply uncertainty and poor material quality. Managers today realize that a new form of supply chain relationship is required for suppliers to respond more quickly to global supply chain customers [27,34,35].

2.2. Information technology

With the emergence of the personal computer, optical fiber networks, the explosion of the Internet and the World Wide Web, the cost and availability of information resources allows easy linkages and eliminates information-related time delays in any supply chain network [30,34]. This means that organizations are moving toward a concept known as *e-commerce*, where transactions are completed via a variety of electronic media, including the World Wide Web. These technologies are supply chain “enablers,” in that they can substantially reduce paperwork, improve communication, and reduce supply chain cycle times if properly implemented. A primary requirement is that buyers develop relationships with suppliers characterized by a willingness to share and receive information and work in a collaborative manner to improve efficiencies and reduce cycle time [30,33].

2.3. Increased customer responsiveness

As organizations began to consider their key core competencies, they began to outsource those activities considered as “noncore.” Partnering occurred as firms sought to take advantage of market opportunities through a synergistic combination of strategic core competencies. This typically led to a reduction in the number of suppliers of a particular part or service as buyers identified those suppliers with the greatest potential for partnering, a process often described as “supply base optimization” [5]. In general, firms were constrained in their reduction efforts by capacity considerations (on the down side) and the number of suppliers with which it is feasible for them to communicate and share resources (on the up side). Conversely, suppliers are limiting the number of customers they do business with, to focus only on their “best” customers. A requirement for supplier/

customer optimization is that supply chain participants have a solid mutual understanding of the underlying business processes and capabilities of their selected partners [48].

While supply base optimization represented an opportunity for those supplier remaining in the pool “after the cuts,” it also resulted in a new breed of customer that demanded increased responsiveness and flexibility to a dynamic set of requirements. In these new supply chains, buying firms are purchasing not only their suppliers’ products or services, but also their suppliers’ systems and capabilities, which in turn require high levels of coordination [67]. Second, buying firms in such relationships provide more than just financial compensation to their suppliers. Buyers share information with their suppliers and they also provide suppliers with guarantees of future volumes and prices, resources, and creativity, which may be tied to suppliers’ cost reduction and quality improvement efforts [27]. Mutual interdependence, close organiza-

tional cooperation, increased levels of trust, and a strong tendency towards information sharing thus characterize such relationships [49].

Despite the strong drivers for closer supply chain relationships, the managerial processes and success of these relationships is fraught with pitfalls. An excellent illustration of the difficulty of maintaining integrated supplier–customer relationships is the breakdown between Office Max and Ryder Integrated Logistics [51]. In this case, Office Max sued Ryder Integrated Logistics for 21.4 million dollars, for breach of contract after 21 months of a 7-year contract (initially dubbed as a “strategic alliance”). Ryder Integrated Logistics countersued Office Max for 75 million dollars. Moreover, it is becoming clear that a delicate balance between formal (economic and legal) and informal (social–psychological) factors is necessary to sustain long-term interorganizational relationships [31,63,67,71]. Managers require a blueprint for action that

Table 1
Rationale for inclusion of key study variables

Variable of interest	Representative theoretical studies	Range of possible managerial actions	Impact on supply chain responsiveness
Human-specific asset investments	[16–19,32,53,72,73,76]	<ul style="list-style-type: none"> • Supplier colocation • Supplier membership on NPD teams • Information sharing • Communication and visits by buying team 	<ul style="list-style-type: none"> • Better supplier understanding of customer requirements • Reduced use of forecasts • Alignment of buyer/supplier process requirements • Reduction of unique items with long cycle times • Better alignment of multiple supply tiers
Site-specific asset investments	[16–19,32,53,72,73,76]	<ul style="list-style-type: none"> • Investments in specific equipment, capacity, or personnel to support customer relationship • Investment in specific information systems or training 	<ul style="list-style-type: none"> • Reduced equipment setup time • Fewer capacity bottlenecks • Inventory positioning within the supply chain to reduce delays • Better alignment of supplier process capabilities with buyer’s product requirements
Contracts	[42,47,57,60,63]	<ul style="list-style-type: none"> • Specific performance metrics with evergreen clauses • Detailed legal documents • Informal “hand-shake agreements” 	<ul style="list-style-type: none"> • Clear communication of expectations • Conflict resolution techniques • Less reliance on litigation as a means of resolving issues • Evergreen clauses create incentives for cycle time improvements
Trust	[12,25,63,67,71]	<ul style="list-style-type: none"> • Detailed precontractual supplier assessment • Dedicated supplier relationship manager • Ombudsman and other problem resolution mechanisms 	<ul style="list-style-type: none"> • Buyer understanding of supplier performance and capacity limitations • Improved communication and information-sharing • Improved forecasts • On-going problem-resolution and communication of information • Paves the way for B2B e-commerce applications
Buyer-dependence (on supplier)	[12,22,24,26,28,58]	<ul style="list-style-type: none"> • Reduce/increase dependence through single/multiple sourcing • Supply base optimization • Insourcing/outsourcing • Using industry standard products 	<ul style="list-style-type: none"> • Increased competition for business can create incentives for cycle time improvements • Fewer suppliers results in simplified supply chain networks and reduces transaction complexity • Automated purchasing systems • Potentially creates greater supplier loyalty

considers this balance and results in improved supply chain responsiveness.

In developing and testing such a model for action, we limited the study to a smaller set of variables based on (1) theoretical salience in the literature on buyer–seller relationships, (2) managerial relevance, (3) variables having the greatest impact on supply chain responsiveness. While other variables of interest pertaining to supply chain relationships exist (information sharing, commitment, information technologies, etc.), we sought to include the primary variables that explain the greatest proportion of variance in supply chain responsiveness, based on the most obvious tangible actions that managers can employ in achieving these results. The justification for including these variables is summarized in Table 1. In the following section, we develop a set of hypotheses that explicate the key points in Table 1, and describe the posited relationships between these actions in the form of a process model for managers to follow.

3. Hypotheses

The model shown in Fig. 1 is based on a number of theoretical and managerial studies, which suggest that supplier investments in buyer-specific assets, the level of power asymmetry in the relationship determined by market conditions, and the extent to which formal contracts are employed by the buying firm contribute to the level of trust the buyer places in the supplier. The model also posits that the level of trust, degree of dependence on the supplier, and human asset specificity are ultimately linked to the supplier’s evoked response in the form of improved or deteriorating responsiveness. The model is tested using a set of questions measuring the buying company representative’s perceptions of a primary supplier’s actions along these lines. We make no attempt to identify the perceptions of the corresponding supplier representative.

Although dyadic data would certainly make for a fuller model, this was not done for several reasons. First, the marketing literature provides multiple studies of interorganizational relationships assessing these elements from the supplier’s perspective [14,32,55], but relatively few models assess the buying company’s perspective [19,42]. Second, problems involved in collecting dyadic data using this sampling frame proved to be insurmountable in this case. Most of the buyers surveyed were reluctant to provide the identity of the suppliers they were identifying, and we were unable to obtain contacts for a dyadic survey instrument. However, we believe this represents an important avenue for further research, and describe the implications for such a study later in the conclusions.

The desired outcome studied in this model is supply chain responsiveness. Recent research has demonstrated that some companies are more effective than others in achieving high levels of supplier performance [20]. The performance of companies’ suppliers varies and authors in the academic and trade literature have noted that the performance and capabilities of suppliers must improve if their customers’ products are to be competitive in their respective markets [27]. As such, we focused this study on buyer’s management of suppliers, the structure of the resulting relationship, and the relative impact on supplier’s responsiveness to the buyer’s needs.

3.1. Asset specificity

The influence of asset specificity on insourcing/out-sourcing decisions was originally described by transaction cost theorists [72,73], and the concept was later extended to help explain the formation of “clans” [57]. Several studies have found that increased levels of asset specificity serve to “lock-in” the interests of the contracting parties, and therefore promote joint action or continuity between partners in interorganizational relationships [32,53,72,73]. In addition, buying firms are more likely to consider long-term partnerships with suppliers who demonstrate a willingness to commit a variety of different assets to a set of future transactions [48]. In his study of the evolution of Japanese keiretsu, Nishiguchi [53] identified four types of supplier asset specificity (based on Ref. [73]) that influence buyers to commit to long-term supplier relationships:

Physical asset specificity refers to the mobile and physical features of assets such as specific dies, molds, and tooling for the manufacture of a contracted product. *Dedicated asset specificity* represents discrete and/or additional investment in generalized (as opposed to specific) production capacity in the expectation of making a significant sale of a product to a particular customer. *Human asset specificity* arises in a learning-by-doing fashion through long-standing customer-specific operations. *Site asset specificity* refers to the successive stages that are immobile and are located in close proximity to one

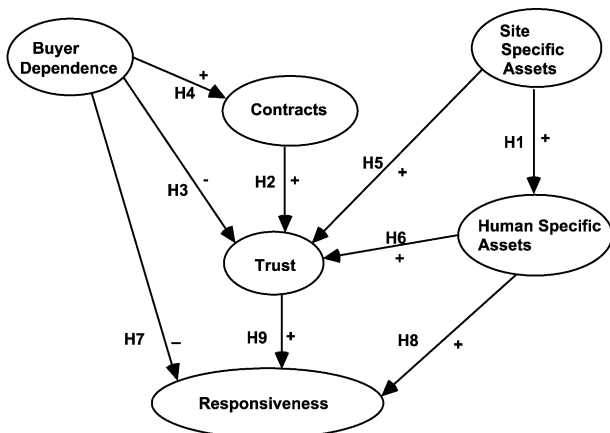


Fig. 1. Model of long-term interorganizational relationship development.

another so as to economize on inventory and transportation expenses.

Of these forms of asset specificity, we are most interested in site assets and human assets. Moreover, physical assets are typically a function of the nature of the product (i.e., whether it requires tooling, etc.) and may not distinguish a relational form. Dedicated asset specificity is a form of investment that is limited in use in North America. Some automotive and electronics companies have begun to require suppliers to build facilities or expand near their facilities, but for the most part this has not become a standard requirement for doing business [27].

Supplier investments in human- and site-specific assets, however, are increasingly becoming requirements for suppliers who wish to conduct business in global supply chains [27,30]. Dedicated customer investments represent a requirement that buying company managers may choose to apply as a means to structure a supplier relationship. Further, dedicated and human supplier investments are increasingly studied in both the management and marketing literature [9,12,16,17,19,67]. These supplier investments may include people with special skills or highly specialized machines that are specific to a particular customer. Such investments are nontransferable, and the benefits of the investment are unrecoverable for the supplying firm if the relationship is prematurely dissolved [9]. When applied properly, supplier-based investments permit tighter integration, improved communication and alignment between supply chain partners [27,28].

In contrasting successful and unsuccessful partnership agreements, Nishiguchi [53] found that successful partnerships had greater levels of site asset specificity and three times as much human asset specificity as their less successful counterparts. Dyer [15] also found that successful partnerships invested substantially more in site, dedicated, and human asset specificity. Dyer also suggested that site and dedicated asset specificity leads to investments in customer-specific human assets. Specifically, the most successful automotive firms during the years 1982–1991 had suppliers who invested in site-specific assets that provided proximity to their plants. This proximity helped facilitate human-specific assets in the form of greater information and personnel exchange, leading eventually to superior firm performance and responsive suppliers. Other recent work in the area of “customer relationship management” and personal marketing approaches supports the logic that once firms make the financial commitment to supporting a customer, they follow with dedicated account representatives and engineers who work closely (and are sometimes colocated) at the customer’s location [48,64,67]. We therefore propose that:

Hypothesis 1: Suppliers investing in greater perceived site-specific assets are more likely to invest in greater levels of perceived human-specific assets.

3.2. Contracts

Contracts are legal instruments that explicitly define the terms of interorganizational agreements. Ring and Van de Ven [63] have concluded that even when “a high level of trust is present in a relationship, a reliance on trust at the interpersonal level may be conditioned by legal systems or organizational role responsibilities, mitigating the ability of the parties to rely on trust as a matter of first preference.” They have likened this situation to two people in a boat, who nevertheless wear life jackets despite the implicit knowledge that the other party would jump in and attempt to save the other if he were to fall overboard. This suggests an interesting paradox: Although long-term interorganizational relationships may be based on trust, the existence of preventative formal contracts may help to ensure the buyer that trust in the supplier is well-founded (and vice versa). Ring and Van de Ven [63] took this argument a step further by developing an evolutionary model suggesting that formal contracts lead to greater levels of trust, which over time, lead to informal psychological contracts between buyers and suppliers.

When trust is limited between the parties, contractual agreements are commonly established to enhance their legal obligations. These can range from limited single function agreements, to very specific and broad-based contractual agreements that cover complete business operational activities, such as franchise contracts [70]. We argue that such contractual safeguards are important in determining the level of trust the buyer has in the supplier, in that they help define the nature of the relationship between the partners from the outset.

Hypothesis 2: The presence of detailed signed contracts will increase the buyer’s perceived level of trust in the supplier.

3.3. Perceived buyer-dependence on supplier

The perception of dependence is an important dimension of buyer–seller relationships. Dependence exists when one party does not entirely control all of the conditions necessary for achievement of an action or a desired outcome performed by the other party. Resource-dependence theory [22,58] specifies conditions under which one social unit is able to obtain compliance with its demands when dependence between the parties is present. Three critical factors that affect the degree of perceived dependence include the importance of the resource, the extent to which the interest group has discretion over it, and the extent to which there are limited alternatives [58]. In this context, we refer to increased buyer-dependence as a situation when there are few suppliers of an important commodity within a local market, or the supplier is the only party capable of providing the product or service.

In such situations, the supplier can potentially exploit their market power, and buyers will have fewer opportu-

ities to obtain competitive price quotes and less leverage in negotiating terms of agreements [48]. For instance, Provan and Skinner [62] found that dealers of agriculture equipment were less opportunistic when they depended on a primary supplier, whereas suppliers with greater control over dealers' decisions exhibited greater opportunism. Thus, we also propose that the degree of trust between buyers and suppliers can be mitigated by asymmetries in market power related to buyer-dependence. Theorists advocate that social coordination of interdependent actors is possible as a means for managing mutual interdependence [8,24]. A variety of power asymmetries can lead to different levels of buyer trust. For example, buyers may trust a supplier when they have more than one suppliers (multiple sourcing), but trust another supplier less simply because they feel vulnerable due to the fact that the supplier is the only source in the market for a unique product or service.

Hypothesis 3: Increased levels of perceived buyer-dependence on the supplier has a negative impact on buyer trust.

Dependence on a single supplier will be functional only if both companies perceive the strategic benefits of such an arrangement [2,69]. In such cases, the supplier may choose not to exploit their position of power. Longer-term relationships are clearly more flexible than ownership (i.e., vertical integration), but depend to a large extent on voluntary behavior on the part of both parties to the transaction. Firms only agree to enter such linkages when the expectation of future benefits is present [19].

Noordewier et al. [55] have employed a new construct, the "limitation of power," to help explain the role of power in buyer/supplier relationships. They define "limitation of power" as the extent to which parties exercise voluntary restraints on the use of power. It is assumed that the likelihood of a strong relationship between manufacturer and supplier being maintained over time increases if relational exchange norms emerge between parties that limit the exercise of market power [55]. Since contracts can help to establish and insure these relationship exchange norms, we expect that buyers would rely more readily on formal contracts when a high degree of dependence on the supplier exists [21,65]. This view is consistent with resource-dependence theory, which argues that organizations will attempt to create negotiated environments with existing parties when they are faced with uncertain situations [26,58]. We therefore hypothesize that:

Hypothesis 4: When perceived buyer-dependence is high, the use of formal contracts by buyers will increase.

3.4. Trust

A variety of different underlying dimensions of trust appear to exist. One school of thought differentiates between personal characteristics [2,12,67] and organiza-

tional capabilities [63]. McAllister [44] posits that trust occurs in cognitive and affect-based forms. The former has its roots in reliable role performance, cultural–ethnic similarity, and professional credentials, while the latter is a function of "citizenship" behavior and interaction frequency. Both forms were also found to enhance coordination by lowering administrative costs. In this study, we make no attempt to differentiate between these different elements of trust, but recognize that future studies should attempt to do so to improve the predictability of the model.

Research suggests that asset specificity can play a major role in cultivating trust between the partners of interorganizational relationships. The role of trust is addressed in the area of relational marketing, in which investments in supplier relationships are established to minimize risk, involving activities traditionally considered the exclusive domain of the other party. Such investments lead to significant increases in the quality and duration of relationships, which further increase the likelihood that parties may be willing to make greater investments in future transactions [63]. In this sense, trust inevitably requires some sense of mutuality and reciprocal loyalty [12,31,38]. Transaction-specific investments serve as endogenous safeguards; under conditions of uncertainty, the redeployment of assets committed to cooperative relationships will be inefficient [19,63]. This phenomenon has also been referred to as "bilateral hostages" [7], and suggests that an important linkage exists between asset specificity and trust. Case studies also support the fact that supplier investments in human- and site-specific assets help promote the level of trust between buyers and suppliers [16,17,27].

Hypothesis 5: Suppliers investing in greater levels of site-specific assets will increase the buyer's trust in them.

Hypothesis 6: Suppliers investing in greater levels of human-specific assets will increase the buyer's trust in them.

3.5. Performance outcomes: responsiveness

As we noted earlier, one of the most important performance outcomes expected from improved interorganizational relationships is cycle time reduction within the supply chain [29,30]. High-velocity business environments are forcing firms to respond quickly to changing competitive priorities. Rapid shifts in the bases of competition are driving firms to place greater emphasis on cycle time-based capabilities in order to capture the benefits of flexible response to changing conditions [26,34,35]. Research suggests that suppliers who are able to respond quickly to changes in order volumes through strategies such as vendor managed inventory, just-in-time delivery, and inventory positioning within the supply chain can significantly improve customer satisfaction [30].

Manufacturers requiring commodity products are clearly less likely than producers requiring more complex products to benefit from interorganizational cooperation [55]. Com-

modity products tend to be widely available and can be procured from many different sources, so availability is usually not a problem. When supply and demand attributes are changing rapidly, however, greater uncertainty is created in supply markets. This is particularly true in oligopolistic situations in which the buyer is dependent on a supplier, who in turn is aware that the buyer has limited alternatives. In such situations, suppliers may not respond quickly to a buyer's orders, and in fact become complacent [27]. Although the type of product, supply and demand attributes, and industry type may influence power and responsiveness, we will examine only the general case in this study. As a result we suggest that:

Hypothesis 7: Increased perceived buyer-dependence is associated with lower levels of supplier responsiveness.

Alternatively, suppliers may decide that despite their position of potential power, they may wish to continue to provide the buyer with a high level of responsiveness and service, in order to maintain the relationship and be awarded even more business in the future [27]. In cases where suppliers invest in specific human assets dedicated to a buyer's business, a closer relationship with this buyer is often established. For example, in a US electronics contract manufacturer, a co-located supplier was responsible for managing the inventory and order processes, and had a close relationship with the shop floor managers in doing so [30]. Other cases of co-located supplier associates who assume complete responsibility over the order management process have been documented [15,50,53]. Such efforts provide coordination mechanisms and improve information flows, thereby establishing a seamless and highly responsive supply chain between the two organizations. We therefore propose that:

Hypothesis 8: Suppliers investing in high levels of human-specific assets are associated with higher levels of supplier responsiveness.

Trust among partners in interorganizational relationships improves communication and dialogue and can create common strategic visions [32]. As informal psychological contracts among parties are upheld, and trustworthiness is affirmed, formal safeguards can be "relaxed" further and exceptions to the contract made [41]. Suppliers will often be more willing to go out of their way (beyond contractual agreements) and expedite orders for a buyer who has

remained loyal to them and exhibited a high level of trust. Thus, we hypothesize that:

Hypothesis 9: Higher levels of buyer trust are associated with higher levels of supplier responsiveness.

Note that this model hypothesizes that buyer-dependence on the supplier exerts both a positive effect (acting through contracts and then through trust), and a negative direct effect on responsiveness. Although this may appear contradictory, in fact we are proposing that in the absence of a detailed contract stipulating performance requirements, a buyer's perceived dependence on a supplier will result in deteriorating responsiveness. Alternatively, a lower perceived dependence might not require a contract, in which case there would be a direct effect resulting in higher responsiveness. In the next section, we describe the methodology used to test these hypotheses.

4. Methods

4.1. Sample

The study employed a mail survey sent to purchasing managers responsible for managing a primary supplier relationship. The survey asked respondents to focus on a key-input supplier of a "critical" component or material used in the production of its main product line. Although the unit of analysis in each case was the buyer, the data focused on the buyer's relationship with a supplier of the critical component. Here, "critical" refers to components that contribute the greatest value-added to the product or to components that have the largest delivery cycle time if inventory falls to zero. The survey also specified that the components should be frequently ordered items as opposed to infrequently ordered items. In all cases, respondents were able to identify such a component or input.

The original survey instrument was pretested through a set of interviews with purchasing managers at 10 American manufacturing companies in the Southeastern US. These companies were from several different industries, and the researcher had worked with them previously developing case studies of cycle time reduction. The survey required the manager to answer a set of questions regarding supplier performance, the characteristics and mechanics of the rela-

Table 2
Correlations, means, and standard deviations

	Correlations						Mean	S.D.
Trust	1.00						4.128	0.852
Contracts	.029	1.00					2.784	1.196
Site-specific assets	.283 *	.173 *	1.00				3.107	1.080
Buyer-dependence	-.071	.202 *	.115	1.00			2.247	1.033
Human-specific assets	.184	.225 *	.567 *	.143	1.00		2.984	0.991
Responsiveness	.330 *	.121	.173	-.357 *	.143	1.00	3.067	1.031

* Significant at $P < .05$.

Table 3
Covariance matrix

Trust	.731					
Contracts	.038	1.431				
Site-specific assets	.241	.209	1.166			
Buyer-dependence	-.062	.246	.127	1.067		
Human-specific assets	.161	.269	.585	.144	.982	
Responsiveness	.296	.155	.174	-.376	.152	1.063

relationship with the supplier, and the internal characteristics of the buying company organization. Several of the questions were reworded in order to improve comprehension in the pretest stage. Several questions were also added that went into further depth regarding supplier investments in equipment and people, based on comments from these managers explaining their supplier integration strategies. Although none of the items were dropped, a post hoc review of the analysis suggests that the pretest should have probed the possibly different bases for trust that had developed between the manager and his/her primary suppliers.

A subsample of 500 purchasing managers was obtained from a larger sample of 1500 National Association of Purchasing Management (NAPM) members who expressed an interest in or were currently involved in global sourcing. (The subsample included only companies who were larger manufacturing interests, as many of the questions were focused on manufacturing applications.) This sample included buyers responsible for managing relationships with supplier who were located both in the US and globally. This list was obtained through the International Purchasing Committee at NAPM. The subsample was screened to include manufacturing concerns in all 50 states. Respond-

ents returned 108 surveys, of which 11 were unusable. The 97 usable surveys represented a response rate of just under 20%. The sample included manufacturing firms from the automotive, computer, chemical, consumer products, electronics, industrial equipment, pharmaceutical, and steel industries. Annual sales for the organizations varied from US\$22 million to US\$16 billion, with a mean of US\$1.49 billion in sales (this figure was not released by all of the respondents). The number of employees ranged from 50 to 112,000, with a mean of 5693. Finally, the cost of materials as a percentage of total cost ranged from 5% to 95%, with an average of 54%. These sample characteristics are consistent with other surveys of manufacturing organizations [11], suggesting that our sample is representative of North American manufacturing firms.

To investigate the possibility of nonresponse bias in our data, we tested for statistically significant differences in the responses of early and late waves of returned surveys [3,40]. The last wave of surveys received was considered to be representative of nonrespondents. Specifically, 10 of the survey items initially used for the analysis were randomly selected, the sample was split into two groups on the basis of early and late survey return times, and *t* tests were performed on the responses of the two groups. The groups represented the first 50 and last 47 responses of the total 97 responses received. The *t* tests yielded no statistically significant differences among the 10 survey items tested. These results suggested that nonresponse bias might not be a problem in this study.

A cross-industry sample of purchasing managers was believed to be appropriate for studying the interorganizational relationships proposed in the hypotheses. A study by

Table 4
Structural equation model results^a

Sign	Regression coefficient		Regression weight	Standard regression weight	Standard error	Critical ratio ^b	<i>R</i> ^{2c}	Hypothesis supported
	From	To						
Hypothesis 1 (+)	site-specific assets	human-specific assets	.522	.570	.079	6.581**	.325	yes
Hypothesis 2 (+)	contracts	trust	-.003	-.004	.073	-0.040	.091	no
Hypothesis 3 (-)	supplier power	trust	-.089	-.107	.085	-1.040	.091	no
Hypothesis 4 (+)	buyer-dependence	contracts	.233	.200	.118	1.975*	.040	yes
Hypothesis 5 (+)	site-specific assets	trust	.212	.269	.097	2.191*	.091	yes
Hypothesis 6 (+)	human-specific assets	trust	.036	.042	.105	0.347	.091	no
Hypothesis 7 (-)	supplier power	responsiveness	-.360	-.359	.092	-3.898**	.248	yes
Hypothesis 8 (+)	human-specific assets	responsiveness	.146	.139	.098	1.493	.248	no
Hypothesis 9 (+)	trust	responsiveness	.339	.279	.114	2.981**	.248	yes

$\chi^2 = 8.327$ (5 *df*, *P* = .139, $\Delta_1 = .90$, $\Delta_2 = .95$, GFI = .91, AGFI = .90).

^a *n* = 97. The squared multiple correlation represents the percentage of variance explained in the dependent construct by all of the variables in the specified model.

^b Critical ratio = ratio of regression weight to standard error. Under assumptions of independent observations and multivariate normal distributions, this ratio approximates the standard normal distribution and is used as a test of significance.

^c The squared multiple correlation represents the percentage of variance explained in the endogenous variable by all of the corresponding variables.

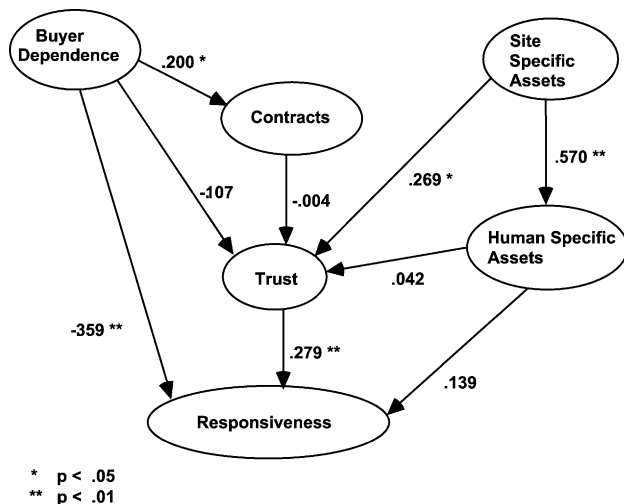
* Significant at *P* = .05.

** Significant at *P* = .01.

the NAPM [52] evaluated the amount of divergence in purchasing activities for different types of industries. A survey with 1500 respondents revealed that there were few differences in terms of the general tasks or duties that were performed in different sectors. Moreover, over 75% of respondents in a variety of manufacturing industries were all involved in developing effective relationships with suppliers, ensuring the maintenance of contracts, resolving delivery problems, conducting supplier analyses, and other related activities. In most buyer–seller relationships, the purchasing managers or buyers is the primary (and in some cases the only) contact point with the seller. This is particularly the case in manufacturing companies. Although the concept of “cross-functional commodity teams” responsible for sourcing decisions is beginning to infiltrate several industries, at the time of the study many companies continued to rely on the primary purchasing agent to manage the relationship. Thus, the perception of these managers is an appropriate unit of analysis for measuring the characteristics of the relationship with the seller.

5. Results

The operationalized hypotheses were tested using a fully specified structural equations model. Details regarding the statistical analysis, construct validity, and model testing are presented in Appendix A. Tables 2 and 3 show the correlation coefficients and covariance matrix for the variables, and Table 4 presents the parameter estimates and whether each hypothesis was support/not supported. The key results are summarized in Fig. 2 showing the hypothesized relationships among the variables with the standardized parameter estimates for each relationship. The data represents an adequate fit to the model.



$$\chi^2 = 8.327 (5 \text{ d.f.}, p = .139 \quad \Delta_1 = .90 \quad \Delta_2 = .95 \quad \text{GFI} = .91 \quad \text{AGFI} = .90)$$

Fig. 2. Model of long-term interorganizational relationship development standard regression coefficients.

6. Discussion

6.1. Theoretical implications

The empirical evidence supports the view, suggested by Hypothesis 1, that site-specific asset investments on the part of suppliers are linked to further investments in human resources. These same investments ultimately lead to greater buyer trust in their supplier. The study suggests that suppliers that dedicate local facilities and equipment to serving the customer are demonstrating their commitment to the relationship, thereby establishing a basis for further communication. This communication takes the form of site visits, joint development of new products, and sharing of sensitive information. Furthermore, the commitment of site-specific assets leads to greater trust on the part of buyers (supporting Hypothesis 5). Moreover, buyers are provided with tangible evidence of the commitment, which establishes the basis for a more harmonious relationship.

Despite the strong linkage between site-specific asset investments and buyer trust, our model suggests that such relationships may be overshadowed by power asymmetries that exist at an industry level. A set of hypotheses (Hypotheses 2–4) examined relationships among the level of dependence of the buyer on the supplier, the degree of contractual formality, and perceived levels of buyer trust perceived in the relationship. Buyers in this study tended to employ a set of formalized contracts as countermeasures against strong market positions held by powerful suppliers (supporting Hypothesis 4). Such contracts had little effect on the level of trust the buyer placed in the supplier (Hypothesis 2 was not supported).

The hypothesized linkage between human asset investments and trust (Hypothesis 6) was not supported. This result contradicts prior findings that link citizenship behavior (help and assistance in face-to-face situations) with affect-based trust [44]. Our results suggest that even when information is shared between parties, face-to-face interactions may not always lead to greater levels of trust. In this regard, the metaphor of the life jacket in the rowboat proposed by Ring and Van de Ven [63] has some validity: without a tangible physical investment in the relationship to supplement information-sharing, the buyer’s level of trust in the supplier may not be influenced.

Nevertheless, the study’s results suggest that powerful suppliers are not as responsive to buyer’s demands, and have longer lead times, less reliable delivery performance, and lower levels of schedule responsiveness (Hypothesis 7). While this is not a surprising result, it is somewhat at odds with the previously discussed results (that buyer-dependence and use of contracts have no impact on trust). The remaining hypotheses (Hypotheses 8 and 9) speculated that supplier investments in human assets and higher levels of buyer trust were associated with improved responsiveness. Only the latter of these constructs (trust) had a significant influence on supplier responsiveness.

6.2. Managerial implications

Subsequent informal discussions with purchasing managers elicited an interesting set of possible explanations for some of these results, especially regarding the use of contracts. During these interviews, several purchasing managers stated that they did not like to use detailed contracts with suppliers, but preferred to use one-page or verbal contracts that specified price, delivery, and payment terms for the coming year. If suppliers failed to live up to these simple agreements, they were not used in the following year. Moreover, such informal contracts appeared to supersede formal legal contracts. It is conceivable that the use of legal contracts can, in fact, be an impediment to the development of trust. If buyers and suppliers cling to the “safety” offered by such contracts, this reliance may actually discourage either party to move beyond contracts toward a reliance on interpersonal trust. Ring and Van de Ven [63] may be correct in arguing that contractual understandings can facilitate the development of trust at an early stage of a cooperative relationship, but the evolution of trust may be based not so much on the existence of formal contracts, as on the tangible commitment of assets or a record of satisfactory performance that emerges over time. Similarly, while supplier power does influence the use of contracts, it has little affect on buyers’ trust levels (Hypothesis 3 was not supported).

The results also suggest that buyer–seller relationships may develop at two levels: at an industry level reflected in legal contracts, and at a cognitive level that reflects the buyer’s true assessment of the supplier. These two dimensions may have very different influences on the development of interorganizational relationships. For instance, many buyers are required to use contracts by their legal departments, but place little emphasis on these agreements due to their cumbersome nature, and only rarely do firms take legal action in the face of minor variations in supplier performance. Buyers ultimately put more faith on the supplier’s actions, rather than its conformance to a legal document. The relatively greater influence of actions over legal contracting in developing interorganizational relationships is supported by evidence suggesting that opportunistic behavior on the part of powerful suppliers seems to be fading [59,66]. Indeed, many large corporations, having experienced severe foreign competition in several years, have adopted *total quality management* practices, which emphasize a customer-oriented approach to management, and advocate customer satisfaction above all else [10]. It is therefore possible that powerful suppliers (in spite of strong market positions) may seek to develop trusting relationships with dependent buyers [49,54,68].

The importance of supplier actions in the development of trust is also suggested by studies of “social reputation,” which propose that firms will avoid taking advantage of a powerful market position in order to maintain a posture of

goodwill with their customers. This view was expressed in an informal conversation with a purchasing manager, who noted that “if a supplier goes back on a commitment to you, word gets out and people in the industry start to talk . . . From a supplier’s point of view, that’s bad for business.” Such a violation constitutes a far more serious action than infringement of a written contract. This line of research has not yet been explored in studies of buyer–seller relationships.

While these findings do suggest that trust is the central feature of buyer–seller relationships, this set of findings is somewhat counterintuitive. For instance, consider the following two scenarios that seem plausible given the findings. First, a buyer purchases items from a powerful supplier who is not responsive, yet the buyer implicitly trusts this supplier and describes the relationship as harmonious. In the second case, we have a buyer who purchases from a small supplier in a market with many competitors. The supplier is very responsive, yet the buyer does not fully trust the supplier. In explaining these scenarios, it is helpful to consider the prior proposition that interorganizational relationships develop along two dimensions: at an industry level and at the level of the buyer’s cognitive processes.

In the first case, it is possible that buyers face the challenge of escalating commitment and find it difficult to switch suppliers, claiming a lack of alternatives. In some cases, purchasing managers will go to heroic measures to justify *not* switching suppliers simply because they cannot remove themselves from the evaluation decision. Ring and Van de Ven [63] noted that personalities can play an important role in the evolution of a buyer/supplier relationship. If a personal relationship evolves between buyer and supplier representatives over a number of years, the buyer may make every attempt to maintain the commitment despite the supplier’s deteriorating performance. Perhaps the buyer’s representative, at a cognitive level, justifies this action by reasoning that the effort required to find, evaluate, and select a new supplier will be too time-consuming and expensive. The implication in such cases is that firms involved in interorganizational relationships need to separate day-to-day transactions with a supplier from the supplier evaluation process. A formal system may be needed to review supplier performance periodically at major junctures and determine whether the relationship is proceeding according to expectations [39,48].

In the second scenario, a powerful buyer does not trust its primary critical supplier, even though it has demonstrated an acceptable level of responsiveness. At the industry level, the supplier does not have a strong position, as many alternative suppliers exist and the commodity or item may not be highly differentiable. The supplier therefore makes every effort to provide excellent service to the buyer, in order to keep the account. The buyer, however, may still not trust the supplier for a variety of reasons.

Since trust is often a function of sustained reliable performance [25,67], the supplier may not have had time to foster a trusting relationship. Perhaps the buyer's perception of supplier performance is determined by other factors, such as technological capabilities or ability to reduce cost (factors that were not included in the operationalization of our responsiveness variable). A final possibility is that the buyer distrusts the supplier's representative for reasons related to differences in cultural alignment. For instance, the two managers may come from very different organizational cultures, and hence find it impossible to create a foundation on which trust can be built. While these explanations do not provide a full picture of the dynamics involved, they do suggest the existence of a multidimensional relationship between parties in supply chain relationships.

6.3. *Limitations to the study*

There are several limitations to the study. The fact that only the buyer's perceptions were measured limits the generalizability of the results. A research design that includes measures of power asymmetries (i.e., buyer and supplier market power) as well as the supplier's perceived trust in the buyer is necessary to fully develop the proposed framework. Some of the measures used to assess the different constructs also need to be expanded. For instance, measures of physical and dedicated asset investments could provide additional insights [53]. As we noted earlier, we make no attempt to differentiate between these different elements of trust, but recognize that future studies should attempt to do so to improve the predictability of the model. Alternative measures of trust could be expanded to include both affect- and cognitive-based dimensions from the perspective of both parties [44]. The findings linking citizenship behavior to trust could have been very different had cognitive trust been measured; in fact, this could have impacted many areas of the model. A number of other dimensions of supply chain performance (technology development, quality, and price) are needed to fully assess the impact of trust and relationship structure on these variables.

6.4. *Directions for future research*

Additional research is needed to better understand the role of contracts in managing buyer–seller relationships. As we noted earlier, Ring and Van de Ven [63] argue that contractual understandings can facilitate the development of trust at an early stage of a cooperative relationship, but the evolution of trust may be based not so much on the existence of formal contracts, as on the tangible commitment of assets or a record of satisfactory performance that emerges over time. A temporal study of how a set of buyer–seller relationships unfolds over time would provide some potentially very interesting results, particularly with respect

to the use of contracts and the relative levels of trust that occur. The use of “critical incident” techniques could also be used to identify how buyers and sellers respond to different supply chain events. This type of study could also be implemented using a supply chain simulation with a group of managers or students.

As we noted earlier, the type of product, supply and demand attributes, and industry type may influence power and responsiveness, and that future studies should explore the influence of market characteristics on dependence and relative levels of responsiveness. A good example of this would be the case of Wal-Mart and its relative power downstream in the supply chain vs. an upstream source of power such as DuPont that supplies many smaller customers. By studying the relative positions of power and dependence in a supply network and the relative level of responsiveness that occurs, researchers could provide additional insights into the buyer and seller behavior with the supply chain.

7. **Conclusion**

Results of our empirical analysis suggest that the dedication of site-specific assets by a supplier is an important precursor to greater human asset investments and can lead to a greater level of trust between the parties. Managers who are serious about improving supply chain responsiveness should work towards building greater levels of trust with key-input suppliers, and explore opportunities for colocation and information sharing on a regular basis. The results also suggest that buyer–seller relationships may develop at two levels. At the industry level, intervening forces such as market power and legal contracts are closely related, yet appear to have little bearing on buyer–seller relationships at the interpersonal and cognitive level. Such a perspective is suggested by the result that the level of perceived buyer-dependence on a supplier was not associated with the level of trust in that supplier. In addition, when suppliers were willing to make site-specific asset commitments in the form of capacity and equipment, higher levels of trust were developed. The implication is important; even in cases when buyers do not have a large degree of control over a supplier, working with them to improve levels of trust may be helpful in improving supply chain responsiveness.

As organizations seek to identify means of managing these new forms of relationships, researchers must develop new models and methods to identify which suppliers to approach in relationship development, the methods for implementing and sustaining such relationships, and the appropriate processes for dealing with conflicts within such relationships when they arise. Future studies should also consider the new elements developed in this study: site-specific asset investments, human asset investment, contract formalization, dependence, and trust.

Appendix A.

A.1. Survey items

Identify a “key” or critical material that you are responsible for sourcing for your manufacturing plant. A “key” or critical material may reflect any of the following features:

- (a) the *largest cost* component of the main product,
- (b) the *differentiating* feature of the product,
- (c) the *main technical factor* in the functioning of the product,
- (d) the purchased item on which you spend most of *your time*,
- (e) the most *difficult item to obtain, volatile price, the longest lead time, etc.*

Of the available suppliers for this key-input material, identify one who is the primary supplier of this key input.

This survey focuses on identifying some of the relevant factors that characterize the relationship between you and your key-input supplier. Please respond to all statements and questions in reference to your key-input supplier.

A.1.1. Site-specific assets ($\alpha=.78$)

How would you characterize the relationship between you and your key-input supplier (strongly agree/strongly disagree):

This supplier has dedicated equipment and reserved equipment and reserved capacity specifically to maintain our purchasing relationship (five categories)

This supplier has dedicated personnel specifically to maintain our purchasing relationship (five categories)

This supplier has purchased specialized equipment to meet our needs for this key-input material (five categories)

A.1.2. Human-specific assets ($\alpha=.76$)

How would you characterize the relationship between you and your key-input supplier (strongly agree/strongly disagree):

We share our weekly, daily, or hourly production schedules with this supplier (five categories)

Nonsales personnel from this supplier have visited our plant to see how their product is used in our process (five categories)

The supplier works closely with our engineering and design area for new product development (five categories)

We share a great deal of sensitive information with this supplier (five categories)

Our manufacturing personnel regularly visit this supplier’s facility (five categories)

A.1.3. Contracts ($\alpha=.68$)

How would you characterize the relationship between you and your key-input supplier (strongly agree/strongly disagree):

We sign an agreement specifying price, delivery, lead-time, quality specifications, and estimated annual usage (five categories)

In addition to an agreement we sign a detailed legal contract with this supplier (five categories)

We undertake no contractual agreements with this supplier beyond each order as it is placed (five categories) — reverse-scored

A.1.4. Perceived buyer-dependence on supplier ($\alpha=.67$)

The following factors affected the buyer’s decision to use this key-input supplier (strongly agree/strongly disagree):

The supplier is the only source of input (five categories)

The key-input material is not produced or not available in the United States (five categories)

How would you characterize the relationship between you and your key-input supplier (strongly agree/strongly disagree):

There are many suppliers from which we can purchase this key input (five categories) — reverse-scored

A.1.5. Trust ($\alpha=.92$)

Indicate how accurately one term or other describes your relationship with the key-input supplier:

Antagonistic vs. cooperative (five categories) — reverse-scored

Distrust vs. trust (five categories) — reverse-scored

Harmony vs. discord (five categories)

A.1.6. Responsiveness ($\alpha=.83$)

The following factors affected the buyer’s decision to use this supplier (strongly agree/strongly disagree):

Short lead-times (five categories)

Outstanding on time delivery record (five categories)

Ability to modify their product to meet our requirements (five categories)

How would you characterize the relationship between you and your key-input supplier (strongly agree/strongly disagree):

There is a short lead time between the time that the order is placed with this supplier and when it is received (five categories)

A.2. Measurement development

The two antecedent variables in the model are dedicated asset specificity and supplier power. The four dependent variables of interest are (1) human asset specificity, (2) the use of contracts, (3) the degree of trust present in buyer/supplier relationships, and (4) supplier responsiveness. Many of the measures for these variables were developed using prior studies of inter-organizational relationships [32,66]. All measures were evaluated using a five-point Likert scale, grounded by 1 as *strongly disagree* and 5 as *strongly agree*. As expected, responses to the multiple items assessing the variables were highly intercorrelated, so item measures for each variable were standardized and then added to form single indices.

In determining the measurement properties of the constructs used in the analysis, the reliability and construct validity of the variables in the model were assessed, and the reliability of each construct was examined using Cronbach's α . All of the multi-item measures (except contracts and supplier power) had a reliability of at least .70, an accepted indication of sufficiently reliability. Nunnally [56] suggests allowing a somewhat lower threshold (.60) for exploratory work involving the use of newly developed scales. Because contracts and supplier power are relatively new scales and the α values were very close to the .70 cutoff (.68 and .67, respectively), they were considered sufficiently reliable for use in the analysis. The next several sections describe the development of variable measures and provide the reliabilities for each variable operationalization.

A.2.1. Site-specific assets

As mentioned earlier, this construct taps into both physical and dedicated asset specificity, which refers to the mobile and physical features of assets as well as additional investments in generalized production capacity [53]. This construct was therefore assessed using three measures of the type of "hard" capacity devoted by the supplier to the buying organization.

A.2.2. Human-specific assets

The theoretical and practitioner literature suggests that human asset specificity can be assessed on the basis of whether certain activities are present in relationships, including interactions between supplier and buyer personnel at buyers' facilities, integration of suppliers into new product development projects, sharing of sensitive information between parties, visits by manufacturing personnel to the suppliers facility, and greater interaction on a daily basis [32,38,47,53]. Respondents were asked to evaluate their relationships with suppliers along these dimensions, using

scales proposed by Smith and Aldrich [66]. These measures produced an α of .76.

A.2.3. Contracts

When levels of demand or rates of technological change are uncertain, buyers will suffer considerable expense to audit performance through detailed evaluation schemes. This provides a mechanism for judging the fulfillment of contractual obligations, which can be especially important in monitoring the success of long-term relationships. While almost all transactions are covered by the Uniform Commercial Code, buyers often employ contracts, especially in cases involving nondomestic suppliers. Therefore, one measure of the formality of contract use is whether the buyer signs an agreement specifying price, delivery lead time, quality specifications, and estimated annual usage. A second indication of contract formality is whether contracts contain the types of "evergreen" and "escape" clauses described earlier. Finally, buyers were asked whether they undertake any contractual agreements with the supplier beyond each order as it is placed. Measures of these items were standardized and averaged to obtain an overall index of contract use ($\alpha=.68$).

A.2.4. Perceived buyer-dependence

The perceived buyer-dependence on the key-input supplier was assessed using three measures of market conditions for purchasing the key input. Higher values of this measure reflect dependence on a smaller number of suppliers, and therefore, greater supplier power. This operationalization is similar to a measure used by Provan and Skinner [62] in their study of dealer-dependence.

A.2.5. Trust

The literature concerning trust generally refers to either a business risk view based on confidence in the predictability of expectations [43,77], or a view based on another's goodwill [13,63]. Alternatively, trust can be conceptualized as either cognition- or affect-based [44]. Our measure taps into the goodwill/affect-based dimensions, by applying three anchored scales that measure the buyer's assessment of the relationship with the key-input supplier: antagonistic/cooperative, distrust/trust, and harmony/discord. We do not differentiate between affect- or cognition-based trust. Higher scores for all three measures are associated with greater trust.

A.2.6. Responsiveness

While an emphasis on cost has also been documented as another source of performance in purchasing management, responsiveness tends to have a higher priority in situations where the item is a critical component of the product [48]. Thus, responsiveness is operationalized as the ability of suppliers to react to schedule changes, process orders in a timely fashion, deliver quickly, and meet scheduled due dates.

A.3. Analysis and construct validity

All the variables in the model were successfully measured, and the mean, standard deviations, and correlation coefficients are presented in Table 2, with the covariance matrix shown in Table 3. The univariate distributions of the variables were also examined for excessive skewness and/or kurtosis using D'Agostino's test statistic. These tests showed that the skewness and kurtosis of the variables were not statistically different from normal distributions, a prerequisite for using path analysis methods. All of the variables were examined for outliers and other departures from nonnormality. Detection of multidimensional outliers was carried out using a general screening device and no outliers were detected in the sample.

The extent of convergent validity for the constructs was determined through confirmatory factor analysis. The variables used to measure each construct are summarized in Appendix A.2. The measurement model for each construct was independently tested using structural equation modeling, prior to the testing of the structural model. To test the extent of internal and external consistency among these variables, the factor scores for each of the multi-item constructs were examined. All of the standardized factor loadings were greater than .50. The χ^2 statistic and goodness of fit (GFI) measures for each measurement model were deemed acceptable, using standard "cut-off" criteria [6,37]. In addition, the standard regression coefficients for the effects of the latent variables on the observed variables had significant critical ratios (we have not included the results here for the sake of brevity).

Following this procedure, the scores for each indicator variable were standardized, and the mean used in the subsequent predictive model. (Note that the combined measurement and structural model were not tested simultaneously, as the implied number of free parameters could not be estimated given the limited sample size.)

The model in Fig. 1 predicts a set of positive or negative path coefficient for the arrows, signifying the effect of one construct on another as specified by corresponding hypotheses. The path coefficients in the model were determined using maximum likelihood estimation [6,37]. *P* values of .10 are usually indicative of a reasonable fit of the model to the data [6,37].

A second method of determining model fit in structural equation models is to use incremental fit indices. Such indices are determined by comparing a restricted baseline model to a hypothesized (maintained) model. The baseline model is typically one that suggests that no factors underlie the observed variables, and the incremental index determines what proportion of improvement is obtained through the maintained model. One such index is the Bentler and Bonnett [4] normed fit index 1, used to test the proportionate reduction in the fitting function when moving from the baseline to the maintained model. Bollen [6] has proposed an alternate measure 2, which takes into account the means

of the sampling distributions. Although there is no unambiguous answer to how large 1 and 2 must be to indicate an "adequate" fit, a typical lower bound for such measures is 1 and 2 > .90. In this analysis, the maintained model is compared to a baseline model in which no relationship between the proposed factors is specified. The GFI and adjusted goodness of fit (AGFI) indices proposed by Joreskog and Sorbon [37] are also shown for the model. The significance of each path coefficient is tested using the critical ratio, which is the ratio of regression weight to standard error. Under assumptions of independent observations and multivariate normal distributions, this ratio approximates the standard normal distribution and is used as a test of significance [6].

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Robert B. Handfield, PhD, is the Bank of America University Distinguished Professor of Supply Chain Management and the Director of the Supply Chain Resource Consortium in the College of Management at North Carolina State University.

Christian Bechtel, PhD, graduated from Michigan State University with a PhD in Supply Chain Management, and is an Assistant Professor at the Richard DeVos Graduate School of Management at Northwood University.