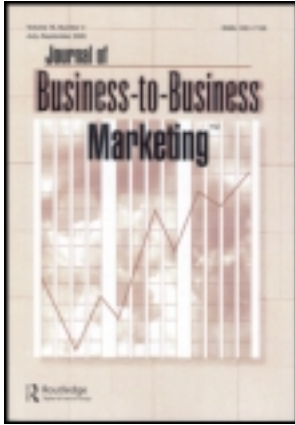


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### The Role of Social Mechanisms in Promoting Supplier Flexibility

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## The Role of Social Mechanisms in Promoting Supplier Flexibility

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*Purpose: This study explores a conceptual framework for social mechanisms (trust and shared vision) to induce supplier flexibility (i.e., volume, mix, new product, and delivery flexibility).*

*Design/methodology/approach: The current study is based on marketing research reviews of social mechanisms and supply chain flexibility literature. To explore these issues, the authors developed and tested hypotheses with data from 162 members of the SMIT (Supply Management Institute, Taiwan).*

*Findings: The results show that trust has a direct impact on supplier's volume flexibility and delivery flexibility. Furthermore, the findings indicate that a shared vision has direct impact on supplier's mix, new product, and delivery flexibility. Finally, shared vision plays a mediating role among trust and mix, new product, and delivery flexibility.*

*Research limitations/implications: This research considers buyer's perspective in examining social mechanisms that enhance supplier flexibility. A clear understanding of social mechanisms effects could evaluate competence trust and risk of respective flexibility that may affect social mechanism effectiveness.*

*Practical implications: This article contributes to management guidelines on how to align suppliers to respond quickly to customer demands.*

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*Originality/value:* The study provides novel insights into social mechanism impact on suppliers' respective flexibility.

**KEYWORDS** supply chain, flexibility, trust, shared vision

## INTRODUCTION

R. Sanchez (1995) indicated that a firm with flexibility could respond effectively to a dynamic environment. Relational contracting literature has identified flexibility as an important relational norm (Heide and John 1990; Kaufmann and Dant 1992; Lusch and Brown 1996; Noordewier, John, and Nevin 1990). As supply chain management practices extend beyond the boundaries of a single firm, supplier flexibility enhances buyer capabilities to improve performance. *Supplier flexibility* refers to a supplier's capability to manage production resource and uncertainty to meet a specific buyer demand for modifications. Supplier flexibility for a buyer implies the ability to obtain additional services in response to changes in market demands. Chase, Aquilano, and Jacobs (2001) summarized that "recent trends, such as outsourcing and mass customization, are forcing companies to find flexible ways to meet customer demand. The focus is on optimizing core activities to maximize the speed of response to changes in customer expectations." Accordingly, understanding how a buyer manages supplier flexibility is an important issue for management and practice.

Social capital, encompassing norms and values, facilitates relationships (Coleman 1990) and lowers transaction cost (Chiles and McMackin 1996). In the literature of interorganizational relationships, trust exists when a party has confidence in the exchange partner's reliability and integrity (Gulati, Nohria, and Zaheer 2000; Morgan and Hunt 1994; Ring and Van de Ven 1992). Tsai and Ghoshal (1998) declared that a shared vision embodies collective goals and aspirations of the members of an organization. Following Nahapiet and Ghoshal (1998), shared vision manifests the cognitive dimension of social capital. Fitting the flexibility of interorganizational relational norm strategy requires a firm to extend cognitive resources "not only to become aware of alternatives, but also to be willing to change behavior based upon an assessment of available alternatives" (Griffith and Myers 2005: 258). *Relationship marketing* refers to all marketing activities directed toward establishing, developing, and maintaining successful relational exchanges (Morgan and Hunt 1994). The core theme of the relationship marketing perspective is focus on a cooperative and collaborative relationship between firms. Dwyer, Schurr, and Oh (1987) characterized such cooperative relationships as interdependent and long-term orientated rather than concerned with short-term discrete transactions. The main premise of the resource-dependence theory is the need for heightened interfirm coordination when

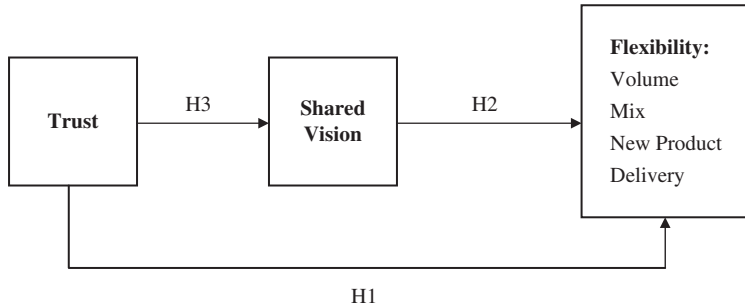
task uncertainty and complexity increases (Pfeffer and Salancik 1978). Heide (1994) claimed that dependence and uncertainty are the key antecedent variables motivating the establishment of interorganizational relationships.

From a relational contract perspective, trust is an important mechanism for encouraging future exchanges (Hewett and Bearden 2001). Shared vision as a social mechanism facilitates cooperative actions (Li 2005). However, little is known about social mechanism effectiveness to motivate supplier flexibility from either an empirical or a theoretical standpoint. With the growing importance of purchasing as a frontier source of supply chain improvement, this research examines the consequences of social mechanisms on supplier flexibility, including volume, mix, new product, and delivery flexibility. The remainder of this article is divided into three parts. First, this article reviews the literature on flexibility and social mechanisms and presents the conceptual framework. Next, this study develops specific hypotheses about potential antecedents and outcomes of supplier flexibility. Finally, the conclusions summarize the research findings and implications of this study, and this article discusses limitations and future research directions.

## RESEARCH FRAMEWORK AND HYPOTHESIS

Environmental turbulence is the main reason for pursuing manufacturing flexibility (Corrêa 1994). Current market turbulence involving continuous changes in customer preferences or demands (Jaworski and Kohli 1993) and technological turbulence involving the rate of technological change (Calantone, Garcia, and Droge 2003) leads a firm to respond quickly in striving for future business opportunities. In an increasingly dynamic environment, a buyer's ability to successfully manage its relationships with suppliers is emerging as a key competence and source of sustainable competitive advantage.

Researchers have conceptualized social capital as embedded resources within cooperative relationships (Burt 1992; Nahapiet and Ghoshal 1998). Nahapiet and Ghoshal (1998) distinguished social capital as structural, relational, and cognitive dimensions. According to Nahapiet and Ghoshal (1998) and Tsai and Ghoshal (1998), the structural dimension includes social interaction, the relational dimension includes trust and trustworthiness, and the cognitive dimension includes shared vision. From the social exchange theory, partners involved in repeated exchange might begin to trust each other. Previous studies have suggested that trust emerges from social interactions (Gulati 1995; Lewicki, McAllister, and Bies 1998). Once trust is built, both partners are more likely to coordinate their efforts because each party does not act only for its own interests (Anderson and Narus 1990; Mohr and Spekman 1994; Morgan and Hunt 1994). This study examines the effects of the relational and cognitive dimension on supplier flexibility. Figure 1



**FIGURE 1** Conceptual model.

depicts the conceptual model that summarizes the research interests and objectives of this study. Based on the literature reviews, this work generates three hypotheses associated with the model. These hypotheses focus on the interrelationships among trust, shared vision, and respective flexibility of the supplier.

### Flexibility

Flexibility becomes a critical order-winning criterion since a firm with flexibility gains competitive advantage by rapid response to customer's volatile demand. Gupta and Goyal (1989: 120) defined *flexibility* as "the ability of a manufacturing system to cope with changing circumstances or instability caused by the environment." Zhang, Vonderembse, and Lim (2003: 178) regarded *manufacturing flexibility* as "the ability of the organization to manage production resource and uncertainty to meet various customer requests." In addition, Upton (1994) described *internal flexibility* as what the firm can do and *external flexibility* as what the customer sees. Examples of internal flexibility include machine, material handling, and routing flexibility. External flexibility directly affects a firm's competitiveness; by contrast, internal flexibility relates to a firm's operational efficiency (Chang et al. 2003). Examples of external flexibility are volume, mix, new product, and delivery flexibility (Chang et al. 2003). In contrast, internal flexibility relates to operational efficiency instead of market demand (Chang et al. 2003). To achieve customer value (i.e., delivery on time, high quality, and low cost), firms must look beyond their internal flexibility (Lummus, Duclos, and Vokurka 2003; Zhang, Vonderembse, and Lim 2002). From the perspective of buyers, the following external flexibilities significantly relate to supplier response to environmental turbulence.

1. Volume flexibility: the ability to change the level of aggregated output.
2. Mix flexibility: the ability to change the range of products made within a given time period.

3. Product flexibility: the ability to introduce novel products or to modify existing ones.
4. Delivery flexibility: the ability to change planned or assumed delivery dates.

#### VOLUME FLEXIBILITY

*Volume flexibility* is the ability to effectively adjust aggregate production in response to customer demand (Hayes and Wheelwright 1984). Volume flexibility permits the firm to adjust production upwards and downwards within wide limits (Khouja 1998). Vickery, Calantone, and Droge (1999) related volume flexibility to high market share and financial performance, especially in highly cyclical markets. Firms rely on their external supplies as long-term sources of volume flexibility (Jack and Raturi 2002). With changing customer demand, the buyer not only adjusts its own capacity, but also needs its suppliers to meet customer demand quantities. With regard to supplier volume flexibility, the buyer is concerned with quantity, cost, time, and quality (Beamon 1999; D'Souza and Williams 2000; Suarez, Cusumano, and Fine 1996) associated with volume change. The strategies for increasing volume flexibility include building slack resources, building inventory buffers, and training cross-functional workers. Research suggested that suppliers reach the volume flexibility requirement through production efficiency (e.g., just-in-time delivery) and resource utilization (e.g., overtime). In addition, reserve capacity and change over time affect volume flexibility (Yang, Lin, and Sheu 2007). In other words, suppliers with the ability to alter equipment operating rate and the speed and knowledge of base workers have an internal capacity focus. Tan, Lyman, and Wisner (2002) also suggested that quality, quick response, and volume flexibility are critical criteria in evaluating supplier performance. Buyers will regard suppliers that cannot respond to demand fluctuations and manage effectively to achieve buyer's requirements as unqualified. Volume flexibility is an important primary flexibility of the manufacturing system. The buyer is concerned with the supplier's capacity for volume requirement.

#### MIX FLEXIBILITY

*Mix flexibility* refers to the ability to change various products produced within a given period of time economically and effectively without incurring major set-up costs (A. Das 2001; Gerwin 1982; Slack 2005). Mix flexibility implies the capability of a firm to respond quickly and economically to different product mix changes in the market (Karuppan and Ganster 2004) to enhance customer satisfaction (Gerwin 2005). A firm with mix flexibility efficiently uses resources and responds to market change (Gerwin 1993). From a buyer's perspective, a buyer will require its suppliers to produce differentiated products in a certain capacity and change over quickly from

one product to another to respond to a variety of customer preferences without incurring a major cost penalty (e.g., changeover cost). Hutchison and Das (2007) listed capabilities to achieve mix flexibility: manufacturing processes that produce a wide range of products, workforce flexibility, and quick changeover times. Gerwin (2005) also indicated that flexible manufacturing competencies include machines, labor, material handling, and routing flexibilities.

#### NEW PRODUCT FLEXIBILITY

Koste and Malhotra (1999) proposed addressing product flexibility by two different dimensions: modification flexibility and new product flexibility. *Modification flexibility* refers to the ability to make minor design changes into a specific product (D'Souza and Williams 2000; Gerwin 1993). As products have a short life cycle, a buyer needs to shorten the lead-time of new product development. Sethi and Sethi (1990) discussed product flexibility measurements as either the time or cost required for introducing new products to existing operations. Studies have shown that the early stage of product development involving determining the specifications and designs of a product to be critical to new product success (Bacon et al. 1994; Cooper 1990). Chang et al. (2005) presented that manufacturing involvement, multi-skilled workforce developments, and manufacturing/design integration have significant positive effects on new product flexibility. Kara and Kaysi (2004: 471) described, "Multi-skilled workers and continuous learning are some of the factors enhancing product/new product/modification flexibility." The new product pre-launch stage includes concept generation, preliminary technical assessment, testing, and marketing plan. All supply chain partners jointly share the responsibility for achieving new product flexibility (Kumar et al. 2006). Suppliers that work closely with the buyer to provide technical or design support during the new product pre-launch stage and the engineering change on existing products could save the buyer time or cost during product development.

#### DELIVERY FLEXIBILITY

With regard to supplier's delivery performance, on-time delivery, lead-time, and reliability are primary metrics (Shin, Collier, and Wilson 2000). *Delivery reliability* refers to the ability to deliver on or before the promised scheduled due date (Handfield and Pannesi 1992), and *delivery dependability* refers to the ability to deliver on time with accurate quantities and kinds of products needed (White 1996). *Delivery flexibility* is "the ability to accommodate last-minute changes to order quantities, small-batch deliveries, fast deliveries, and higher on-time delivery rates" Ketokivi (2006: 220). A. M.

Sanchez and Perez (2005) argued that delivery flexibility is the firm's capability to adapt lead-time to meet changing customer requirements. From the literature, delivery flexibility not only encompasses delivery reliability and delivery dependability, but the ability to cater to changing orders in a very short time (Sawhney 2006). Market demand has previously been more stable and product life cycle longer. Now, customer preferences and demand are difficult to forecast. A firm should be able to change planned delivery dates in meeting customers' requirements. A buyer's collaboration practices with suppliers enable it and its partners to act together to improve delivery performance. The supplier that lacks the ability to accommodate rush orders and deliver on promised due dates (Chan 2003) will result in additional cost to the buyer (e.g., line down cost) and negative customer value. Suppliers' delivery flexibility is the ability to change the product mix and reallocate capacity to accommodate buyers' rush or special orders. In other words, suppliers that operate at different output levels and quickly and easily change production quantities, and quickly change to a different product mix or to producing various products without a major changeover, are more responsive to buyers' demands and deliver on the promised due date. In summary, suppliers with mix and volume flexibilities achieve delivery reliability and dependability and accommodate buyer's rush orders.

### Trust

Researchers have defined *trust* as the belief that a partner's word or promise is reliable to fulfill its obligations in the relationship (Schurr and Ozanne 1985) and as a willingness to rely on an exchange partner in whom one has confidence (Moorman, Zaltman, and Deshpande 1992). Trust also refers to one party that believes others to be benevolent and honest (Larzalare and Huston 1980). Trust is the most important variable in relational exchange by social exchange theorists (e.g., Blau 1964; Homans 1958). The social exchange theory assumes that parties maintain a relationship to gain a valued outcome. Lambe, Wittmann, and Spekman (2001) suggested that trust building between two parties might start with relatively minor transactions and increase as the number or size of interactions increases. If a party receives increased benefit from the other, it will reciprocate as the benefit increases (Homans 1958). The issue of trust in buyer-supplier relationships is significantly important, since the dyadic relationship often involves a high degree of interdependence. Gao, Sirgy, and Bird (2005: 398) argued, "Based on the principle of reciprocity in exchange theory (Blau 1964), mutual trusting behaviors and bilateral perceptions of trustworthiness must exist for a relationship to become stable and long lasting" (Anderson and Weitz 1992; Smith and Barclay 1997). According to the principle of reciprocity in exchange theory (Blau 1964), "trust entails trust" (cf. McDonald 1981). In the context of buyer-supplier relationships, the supplier's perceived trust in



the buyer as dependable and benevolent will contribute to joint responsibility, shared planning, and a flexible arrangement (Johnston et al. 2004). This work specifically measures the trust of the buyer in the supplier. According to Doney and Cannon (1997), buyers select reliable suppliers who demonstrate behaviors that consider buyer's interest to reduce their perceived risk. Morgan and Hunt (1994: 23) defined *commitment* as "an exchange partner believing that an ongoing relationship with another is so important as to warrant maximum efforts at maintaining it; that is, the committed party believes the relationship endures indefinitely." In other words, the causal relationship between trust and commitment results from the principle of generalized reciprocity.

To achieve the flexibility required in the supply chain where there are unforeseen circumstances, buyers and suppliers need to devote high levels of cooperation and joint planning. Research has found that trust significantly and positively relates to commitment (Geyskens, Steenkamp, and Kumar 1999; Morgan and Hunt 1994) and cooperation (Anderson and Narus 1990; Morgan and Hunt 1994). Trust also facilitates interorganizational communication and information sharing to improve responsiveness (Handfield and Bechtel 2002). According to the social exchange theory, trust is created with reciprocally mutual beneficial actions through manifold interactions over time (Blau 1964; Homans 1958). If previous exchanges have been positive, supply chain partners may anticipate that further exchange will bring positive outcome. Positive outcome over time increase partners' trust of each other and commitment to maintaining the exchange relationship (Lambe et al. 2001). Trust increases the probability of maintaining valuable buyer-supplier relationships. Therefore, the supplier will be motivated to increase the value delivered to the buyer by adapting its own products, processes, and procedures to the buyer's specific needs. This enables suppliers' willingness to make an effort to generate desired outcomes. Hence, it is expected that a buyer's trust in its supplier positively influences supplier flexibility. Hence, we propose the following hypothesis:

- H1: A buyer's trust in its suppliers has a positive impact on supplier  
 (1) volume flexibility, (2) mix flexibility, (3) new product flexibility, and  
 (4) delivery flexibility.

### Shared Vision

Hoe and McShane (2002: 283) indicated, "A shared vision is a clear, common, specific picture of a truly desired future state." When exchange parties have a shared vision, they have the same perception about how to integrate strategic resources and how to interact with one another. Empirical studies have shown that parties in a supply chain with a shared vision have better performance (e.g., Spekma, Kamauff, and Spear 1999). By contrast,

Boddy, Macbeth, and Wagner (2000) found that a lack of shared vision between suppliers and customers causes difficulty in cooperation. Without a shared vision in buyer–supplier relationships, the exchange partners may promote their own interests at the expense of others and further impair cooperative relationships. In other words, a shared vision contributes to relationship continuity. Developing a shared vision between buyers and suppliers helps focus on their strategic goals (Voss 2005) and aligns them in the same direction. Thus, a shared vision helps to create commonality between buyer–supplier relationships and provides coherence in interactive activities.

Developing a shared vision helps each actor in buyer–supplier relationships see the potential benefit and understand their expected contribution (Riis 2009). A shared vision aligns goals and values resulting from increased communication, information sharing, and understanding between the partners (Young-Ybarra and Wiersma 1999). Buyers and suppliers with a shared vision have a greater perspective toward long-term orientation (Ganesan 1994; Lusch and Brown 1996), which focuses on achieving future goals. Frequent and close interactions allow buyers and suppliers to perceive that they are a team that shares important values and aspirations, in which partners are expected to strengthen cooperative goals. If both buyers and suppliers understand the importance of collaborating and improving the supply chain, they will facilitate cooperative actions (Li 2005) to meet the manufacturer's flexibility requirements. Hence, we propose the following hypothesis:

H2: Shared vision has a positive impact on supplier (1) volume flexibility, (2) mix flexibility, (3) new product flexibility, and (4) delivery flexibility.

### The Mediating Role of Shared Vision between Trust and Supplier Flexibility

Various studies have identified trust as an essential element of a long-term buyer–supplier partnership (e.g., Anderson and Narus 1990; Rousseau et al. 1998). Prior studies claimed that trust induces joint efforts (Gambetta 1988) or shared resources (Tsai and Ghoshal 1998). Trust facilitates interorganizational communication and commercial or confidential information sharing to improve responsiveness (Handfield and Bechtel 2002). Based on the social exchange theory, if exchange partners realize the benefits of previous transactions, the parties may engage in riskier behavior that provides greater benefits to exchange partners while trust increases over time. Growing trust indicates an orientation of parties toward ultimate values rather than immediate rewards (Huston and Burgess 1979). Thus, a buyer with a high level of trust in its suppliers will (1) communicate sensitive information and

(2) provide advance information (Kingshott 2006) about changes to market and customer preference.

Ali and Birley (1998) argued that shared vision is the component of ability, in which shared vision is not just a common value but the ability to achieve a collective goal and align actions accordingly. A shared vision of dyadic relationships likely varies over time in response to opportunities and needs (Lai et al. 2009). Buyer–supplier relationships are difficult to sustain because of different visions, which can result in interorganizational conflicts. As the buyer and supplier frequently interact, both are more likely to perceive each other as trustworthy actors (Gabarro 1978), to share important information, and to create a common goal. A positive relationship between trust and a shared vision may be expected, because a trusting relationship between a buyer and its suppliers implies that the buyer and suppliers engage in greater information sharing. Hence, a shared vision requires trust as a prerequisite. In other words, trust helps to convey a sense of identity in interorganizational relationships and may create commitment to collective goals. We propose the following hypothesis:

H3 (a): A buyer's trust in its suppliers will help to develop a shared vision.

Trust has positive social benefits that draw parties closer together, embedding them in a social framework that promotes cooperation (Stinchcombe 1986; Thibaut 1968) and facilitates a common understanding of aims and objectives (Anderson and Weitz 1989). As in our prior discussion, trust helps a buyer and its suppliers to develop a shared vision. This study also proposes that a buyer's trust in its supplier will affect supplier flexibility. Additionally, if the supplier has a clear picture of mutual goals in the supply chain, it will have a strong intention to integrate resources and engage in productive behaviors to meet the buyer's flexibility requirements. In linking this evidence for shared vision on supplier flexibility with our proposition of the influence of trust on shared vision, we can expect a shared vision to mediate in the trust–supplier flexibility linkage. The above arguments lead to the following hypothesis:

H3 (b): Shared vision mediates the relationship of a buyer's perceived trust and its suppliers' (1) volume flexibility, (2) mix flexibility, (3) new product flexibility, and (4) delivery flexibility.

### Control Variables

A large-scale buyer may have more resources and power on its suppliers that lead to supplier flexibility. On the supplier enablement front, large

buyers with available resources can withdraw their demand or offer more orders to compel suppliers to achieve flexibility requirement. The duration of the collaborative relationship with suppliers may also affect supplier flexibility. According to the relational contracting theory (RCT), the relationship duration will help to develop trust and a shared vision. Following Heikkilä (2002), relationship duration contributes to information flows and cooperation, further leading to high supply chain efficiency. The level of environmental turbulence (market and technological turbulence) might have different effects on social mechanisms of suppliers' flexibility. The effectiveness of social mechanisms also varies among different industries. In the face of environmental turbulence, buyers in the high-technology industry may prefer interorganizational trust and shared vision building among their suppliers to quickly respond to technological turbulence and a dynamic market. Therefore, this study includes the size of the buyer, measured by its total number of employees, duration of relationship, type of industry, market turbulence, and technological turbulence as the control variables. These enable us to identify the nature of the relationship between supplier flexibility and social mechanisms more effectively.

## METHODOLOGY

### Sample and Data Collection

This research investigated the relationship between social mechanisms and supplier flexibility in the supply chain. A survey of major Taiwanese firms was conducted. A questionnaire was pre-tested with 25 middle or top managers from different companies not included in the final study. Based on their responses, several questions were eliminated and reworded. We obtained suggestions for adaptations to ensure the clarity and appropriateness of items. We revised and eliminated several redundant and ambiguous items accordingly. The revised survey questionnaires were sent out through e-mail to 1,000 members chosen at random from among the 5,000 membership of SMIT (Supply Management Institute, Taiwan), which is an institute for purchasing management certification (e.g., Certified Purchasing Professional and Certified Purchasing Manager) training. All the items adapted from English scale were translated into Chinese. Survey questionnaires were sent out through e-mail to the purchasing managers of buyers who are in charge of transactions with suppliers. Purchasing managers were selected as they are often the main point of interaction with their firm's suppliers. Participants were asked to select one important supply relationship and to answer all questions referring to this one supplier. After two weeks of initial mailing, we sent the follow-up mail to nonrespondents with a copy of questionnaire. As a result, 175 returns were received out of 1,000 questionnaires (17.5 percent). After elimination of 13 incomplete questionnaires, the final

**TABLE 1** Characteristics of Informant Firms

Characteristics	Number in sample	%
Industry		
High-tech manufacturing	82	50.62
Traditional manufacturing	80	49.38
Number of employees		
<1,000	94	58.02
>1,000	68	41.98
Relation duration with supplier		
<10 years	83	51.23
>10 years	78	48.15
Not reported	1	0.62
Relation type		
Purchasing	98	60.49
Outsourcing	18	11.11
Both	46	28.40

sample was 162 questionnaires for analysis (12.2 percent). Table 1 presents characteristics of our final samples.

Rutner and Gibson (2001) reported an expected response rate of 5.7 percent on the data collection by “e-mail-out–e-mail return” method. In addition, their study on logistics information systems indicated that different survey techniques yield different rate of return ranging from 3.7 percent to 12.6 percent. Namely, our survey return rate was acceptable from e-mail surveys and supply chain targets. To assess non-response bias, we compared early and late respondents (Armstrong and Overton 1977). The results showed that there were no significant differences in terms of number of employees ( $t = 0.993$ ,  $p = 0.322$ ) and duration of relationship ( $t = 1.2$ ,  $p = 0.231$ ).

### Measures

We followed the procedures suggested by Churchill (1979). First, we defined the domain of each construct. Second, we searched the literature for appropriate scale. The measurements for each construct in this study are listed in the appendix. Informants responded to five-point Likert-type scales for all variables from 1 (*strongly disagree*) to 5 (*strongly agree*).

### FLEXIBILITY

In regard to flexibility, the measurements of volume and mix flexibility were adapted from Zhang et al. (2003). There were five items for volume flexibility and six items for mix flexibility measurement. For delivery flexibility and new product flexibility, scales were adapted from previous researches (cf. Chan 2003; Duclos, Vokurka, and Lummus 2003; D’Souza and Williams

2000; Krause, Pagell, and Curkovic 2001; Koste and Malhotrar 1999; Sawhney 2006). There were five items for delivery flexibility and four items for product flexibility measurements.

#### TRUST AND SHARED VISION

To examine the effect of trust and shared vision, we further employed the construct from prior researches. We adapted scales from Kumar et al. (1995), Kozak and Cohen (1997), and Spekman et al. (1999) to measure trust. For shared vision, scales were adapted from Li and Lin (2006). There were nine items for trust and three items for shared vision.

#### CONTROL VARIABLES

Size of the buyer was measured by employee headcounts 1- more than 1,000 and 0- less than 1,000. Duration was measured by more than 10 years of cooperative experience with 1 and less than 10 years with 0. In regard to industry type measurement, 1 represented high-tech firms and 0 represented traditional manufacturing firms. Market turbulence measurement items were adopted from Jaworski and Kohli (1993) and technological turbulence items were from (Calantone et al. 2003).

#### Reliability and Validity

This research conducted confirmatory factor analyses (CFA) using AMOS 7.0 to assess the reliability and convergent and discriminant validity for our measurement models (Bagozzi and Yi 1988) and to drop some items that possessed low factor loadings. To assess model fit, this article used the overall model chi-square measure ( $\chi^2$ ), root mean square error of approximation (RMSEA), root mean square residual (RMR), comparative fit index (CFI), normed fit index (NFI), and goodness-of-fit index (GFI). Because the sample sizes were not large, this study estimated two measurement models: the two independent variables, trust and shared vision ( $\chi^2(7) = 8.098, p > 0.05$ ; RMSEA = 0.031; RMR = 0.01; CFI = 0.99; NFI = 0.99; GFI = 0.984); and the second for supplier's flexibility ( $\chi^2(74) = 90.792, p > 0.05$ ; RMSEA = 0.038; RMR = 0.026; CFI = 0.986; NFI = 0.929; GFI = 0.933). The results of these models are presented in the Table 3-1 and Table 3-2.

The convergent validity of the scales was tested in two ways. First, the results on indicator loadings were significant ( $p < .001$ ). The composite reliability (CR) and Cronbach's alpha of each factor ranged from 0.7 to 0.9 (Nunnally 1978). Second, this study checked the average variance extracted (AVE) for each construct to evaluate the discriminant validity of the focal constructs. The results showed that the AVE for each factor is higher than

**TABLE 2** Means, Standard Deviation, and Correlation Matrix of Constructs

Construct	VOL	DLV	MIX	NP	TST	SHV
Volume flexibility (VOL)	1.00					
Delivery flexibility (DLV)	0.351**	1.00				
Mix flexibility (MIX)	0.484**	0.503**	1.00			
New product flexibility (NP)	0.397**	0.449**	0.599**	1.00		
Trust (TST)	0.233**	0.328**	0.251**	0.256**	1.00	
Shared vision (SHV)	0.176*	0.401**	0.321**	0.395**	0.511**	1.00
<i>M</i>	3.673	3.877	3.601	3.671	3.895	4.008
<i>SD</i>	0.550	0.521	0.624	0.628	0.484	0.640
Cronbach's $\alpha$	0.709	0.847	0.866	0.834	0.881	0.932
Composite trait reliability	0.790	0.850	0.848	0.845	0.884	0.905
Average variance extracted (AVE)	0.559	0.588	0.530	0.648	0.718	0.760

\*\*Correlation is significant at the 0.01 level (two-tailed).

\*Correlation is significant at the 0.05 level (two-tailed).

**TABLE 3** Fit Statistics—Confirmatory Factor Analysis for Constructs**TABLE 3-1** Result of CFA on Social Mechanisms

Construct	Measurement	Standardized loading
TST	TST4	0.776
	TST5	0.939
	TST6	0.83
SHV	SHV1	0.815
	SHV2	0.956
	SHV3	0.95

$\chi^2 (7) = 8.098$ .

RMSEA = 0.031, CFI = 0.99; NFI = 0.99, GFI = 0.984, RMR = 0.01.

**TABLE 3-2** Result of First-order CFA on Flexibility

Construct	Measurement	Standardized loading
VOL	VOL1	0.604
	VOL2	0.641
	VOL4	0.632
DLV	DLV1	0.689
	DLV2	0.766
	DLV4	0.685
	DLV5	0.834
	DLV5	0.834
NP	NP2	0.807
	NP3	0.814
	NP4	0.761
	MIX1	0.611
	MIX2	0.702
	MIX3	0.728
	MIX4	0.875
	MIX5	0.875
	MIX5	0.793

$\chi^2 (74) = 90.792$ .

RMSEA = 0.038, CFI = 0.986, NFI = 0.929, GFI = 0.933, RMR = 0.026.

**TABLE 3-3** Result of Second-order CFA on Flexibility

Construct	Standardized loading
VOL	0.684
MIX	0.919
DLV	0.667
NP	0.778

TST = trust; SHV = shared vision; VOL = volume flexibility; MIX = mix flexibility; VOL = volume flexibility; DLV = delivery flexibility; NP= new product flexibility.  $\chi^2$  (76) = 92.81, RMSEA = 0.037, CFI = 0.986, NFI = 0.927, GFI= 0.931, RMR= 0.025.

**TABLE 4** Results of Discriminant Validity Tests

Factors	Constrained model		Unconstrained model		$\Delta\chi^2$
	$\chi^2$	df	$\chi^2$	df	$\Delta\chi^2$ (1)
MIX-DLV	230.519	27	93.065	26	137.454
MIX-NP	131.332	20	54.792	19	76.54
MIX-TST	300.032	20	49.578	19	250.454
MIX-SHV	451.683	20	61.314	19	390.369
MIX-VOL	112.003	20	61.642	19	50.361
DLV-VOL	92.983	14	20.778	13	72.205
DLV-NP	164.55	14	38.058	13	126.492
DLV-TST	269.228	14	27.572	13	241.656
DLV-SHV	259.42	14	33.999	13	225.421
VOL-NP	70.526	9	10.011	8	60.515
VOL-TST	96.871	9	10.788	8	86.083
VOL-SHV	95.895	9	5.917	8	89.978
NP-TST	177.077	9	7.203	8	169.874
NP-SHV	167.876	9	18.395	8	149.481
TST-SHV	211.436	9	15.698	8	195.738

TST = trust; SHV = shared vision; VOL = volume flexibility; MIX = mix flexibility; VOL = volume flexibility; DLV = delivery flexibility; NP = new product flexibility. All values were significant at the  $p < 0.01$  level.

0.5 and larger than the squared correlation between the factor pair (see Table 2). These results support the convergent validity of the scale items (Anderson and Gerbing 1988; Fornell and Larcker 1981).

To further assess the validity of supplier's flexibilities as a second-order construct, this research further conducted a second-order CFA to examine the underlying unidimensionality of flexibility constructs. The model exhibited an excellent model fit, with a ratio of chi-square to degree of freedom of 1.221, RMSEA of 0.037, RMR of 0.025, CFI of 0.986, and GFI of 0.931. The result revealed all four first-order factors loaded on the second-order factor strongly ( $>0.67$ ). The second-order confirmatory factor analysis supported the view of flexibility as a single overall construct composed of four distinct



sub-dimensions (see Table 3-3). Finally, the evaluation of discriminant validity was checked by chi-square difference test between each pair of construct (Anderson and Gerbing 1988). In all cases, combining each of flexibility and social mechanism dimensions with another resulted in a significant increase in the chi-square statistic ( $p < 0.01$ ). The results of Table 4 support the discriminant validity.

## RESULTS

Hypotheses tests were examined by using structural equation model. Because this study posited that shared vision mediates the effects of trust on four flexibility dimensions (i.e., volume, mix, new product, and delivery flexibility), tests were conducted by examining whether mediated models fit significantly better than the direct effect model. In the direct effect model, trust and shared vision were modeled to have independent effects on four flexibility dimensions. The model fit indices indicate less good fit for direct effect model:  $\chi^2(161) = 240.825$ ,  $p < 0.01$ ; RMSEA = 0.055; RMR = 0.056; CFI = 0.96; NFI = 0.892; GFI = 0.884. Next, the mediated model was estimated and resulted the good fit of indexes:  $\chi^2(160) = 192.246$ ,  $p < 0.05$ ; RMSEA = 0.036; RMR = 0.035; CFI = 0.984; NFI = 0.913; GFI = 0.905. Chi-square difference tests indicate that mediated model is significantly better fit,  $\Delta\chi^2(1) = 12.579$ ,  $p < 0.01$ .

According to Baron and Kenny (1986) and Kenny et al. (1998), this research conducted four steps to determine whether the shared vision mediates the effect of trust on suppliers' respective flexibility dimensions, four conditions must hold: (1) the predictor variables (trust) must affect the dependent variables in the predicted direction; (2) the predictor variables (trust) must affect the mediator (shared vision) in the predicted direction; (3) the mediator (shared vision) must affect the dependent variables (i.e., volume, mix flexibility, new product, and delivery flexibility) in the predicted direction; and (4) the impact of the predictors on the dependent variables must be not significant (full mediation) or reduced (partial mediation) after controlling for the mediator (shared vision) (Baron and Kenny 1986; Holmbeck 1997). Table 5 contains the analyses necessary to examine the mediated hypothesis. First, the estimates on the direct effect of trust on four flexibility dimensions are all significant at the 0.01 level (Model 1). Second, the direct effect of shared vision on volume flexibility is significant at  $p < 0.05$  and other flexibilities are all significant at  $p < 0.01$  level (Model 2). Third, in Model 3, the direct effects of trust on volume, mix, new product, and delivery flexibility were added to the original model, including the indirect effects, as mediated by shared vision. The results reveal that direct effect of trust on volume flexibility at  $p < 0.05$  and delivery flexibility is

**TABLE 5** The Effect of Social Mechanisms on Supplier Flexibility

Dependent variables	VOL	NP	MIX	DLV
<i>Standardized B (t-Value)</i>				
<i>Model 1</i>				
Control variables				
Size	-.019 (0.084)	.012 (0.96)	.023 (.095)	.092 (.076)
DUR	.065 (.86)	.032 (.429)	-.019 (-.252)	.008 (.113)
IND	-.057 (-.754)	-.007 (-.092)	-.059 (-.778)	-.074 (-1.02)
MTU	-.057 (-.578)	-.064 (-.656)	.034 (.344)	-.165 (-1.75)
TTU	.132 (1.342)	.182* (1.857)	.119 (1.221)	.239** (2.529)
Independent variables				
TST	.225*** (2.964)	.239*** (3.161)	.236*** (3.129)	.308*** (4.224)
<i>Model 2</i>				
Control variables				
Size	-.015 (-.199)	-.004 (-.05)	.014 (.187)	.081 (1.15)
DUR	.052 (.681)	.001 (.012)	-.044 (-.598)	-.023 (-.333)
IND	-.059 (-.763)	-.028 (-.386)	-.073 (-.985)	-.092 (-1.297)
MTU	-.068 (-0.677)	-.084 (-.885)	.017 (.177)	-.186** (-2.037)
TTU	.136 (1.366)	.153 (1.643)	.102 (1.066)	.218** (2.386)
Independent variables				
SHV	.164** (2.126)	.384*** (5.325)	.31*** (4.178)	.389*** (5.518)

(Continued)

**TABLE 5** (Continued)

Dependent variables	SHV	VOL	NP	MIX	DLV
<i>Standardized B (t-Value)</i>					
<i>Model 3</i>					
Control variables					
Size	.054 (.805)	-.023 (-.302)	-.006 (-.087)	.009 (.127)	.075 (1.075)
DUR	.083 (1.243)	.06 (.79)	.004 (.049)	-.04 (-.542)	-.018 (-.251)
IND	.063 (.939)	-.061 (-.81)	-.029 (-.4)	-.075 (-1.012)	-.094 (-1.342)
MTU	.047 (.547)	-.06 (-.611)	-.081 (-.866)	.022 (.228)	-.18** (-1.987)
TTU	.092 (1.063)	.126 (1.283)	.15 (1.608)	.096 (1.01)	.21*** (2.323)
Independent variables					
TST	.495*** (7.376)	.193** (2.185)	.067 (.805)	.113 (1.313)	.155* (1.908)
SHV		.066 (.454)	.35*** (4.179)	.253*** (2.946)	.311*** (3.831)

TST = trust; SHV = shared vision; VOL = volume flexibility; MIX = mix flexibility; NP = new product flexibility; DUR = duration; IND = industry type measurement; MTU = market turbulence measurement ; TTU = technological turbulence; TST = trust; SHV = shared value.  
 \* $p < .10$ . \*\* $p < .05$ . \*\*\* $p < .01$ .

significant at the 0.1 level, and there is no effect of trust on mix flexibility and new product flexibility. In addition, the effect of shared vision on volume flexibility is nonsignificant, and new product flexibility, mix flexibility, and delivery flexibility are all significant at  $p < 0.01$  level. Further, details of the result also show that the effect of trust on shared vision is significantly supported ( $\beta = 0.495, p < 0.01$ ). Additionally, we used Sobel's (1982) test to verify the mediated effect of shared vision on volume flexibility. The result supports that there is no mediated effect of shared vision on volume flexibility ( $z = 0.604, p < 0.05$ ). Furthermore, the relation between trust on mix flexibility and new product flexibility controlling the mediator (shared vision) is zero, suggesting that the effects of trust on mix flexibility and new product flexibility is fully mediated through shared vision. When the mediator was controlled, the effect of trust on delivery flexibility was significant ( $\beta = 0.193, p < 0.05$ ). The relation between trust on delivery flexibility through shared vision is ascertained by analyzing  $\beta$  for trust on delivery flexibility added shared vision ( $\beta = 0.155$ ) to model is significantly smaller than direct effect of trust on delivery flexibility in Model 1 ( $\beta = 0.308$ ). The data suggest that shared vision is a partial mediator between trust and delivery flexibility. Therefore, the effect of trust on mix and new product flexibility is fully mediated, and delivery flexibility is partial mediated by shared vision (Baron and Kenny 1986; Venkatraman 1989). The finding showed trust is the main drive of volume flexibility instead of shared vision. Finally, size, duration of relationship, and industries as the control variables revealed no significant effect on dependent variable. In contrast, market turbulence has negative effect on supplier delivery flexibility ( $\beta = -0.18, p < 0.05$ ) and technological turbulence has positive effect on supplier delivery flexibility ( $\beta = 0.21, p < 0.01$ ). The possible explanation is customer-changing preferences may constrain supplier accommodation to rush orders or adjustment of production planning. Under higher technology change rate, suppliers might promote their delivery flexibility to reduce risk of obsolete inventories. However, our findings reveal shared vision plays a mediator between trust and delivery flexibility with market turbulence and technological turbulence as control variables.

## CONCLUSIONS AND IMPLICATIONS

How the B2B buyer promotes supplier flexibility through its relationships is critically important and has been unexplored. The buyer teams up with its suppliers to establish long-term collaborative relationships for a sustainable and competitive supply chain. Long-term supply chain success requires trust to develop a shared vision of the future. A customer-oriented buyer should be able to adjust suppliers' capacity to match dynamic customer demand. Findings from this study provide important insights into how

social mechanisms lead to supplier flexibility for responsiveness. We suggest that the buyer leverage supplier flexibility to meet customer requirements through social mechanisms. Exchange partners with trust will also ensure their shared vision development. Partners with a shared vision will view their goal as cooperative instead of competitive. A shared vision helps facilitate group actions that benefit the whole supply chain. Concerning the effect of social mechanisms on flexibility, although trust induces supplier flexibility, this study finds shared vision as the mediator between trust among mix, new product, and delivery flexibility. On the other hand, trust has direct impact on volume flexibility without a mediator.

### Trust and Supplier Flexibility

Flexibility is the willingness to alter conditions to meet an unanticipated situation (Johnston et al. 2004). Buyer–supplier collaboration strengthens the buyer’s responsiveness (Squire et al. 2009). Suppliers need to reallocate their capacity and change over to meet volume flexibility requirements from buyers. Achieving mix flexibility and new product flexibility need more investments [e.g., human resources or research and development (R&D) expenditures]. Slack (2005: 1193) claimed, “volume and delivery flexibility seemed to be interchangeable to some extent.” A buyer not only delivers to customers on time, but also has the ability to change the planned delivery date (Sawhney 2006). According to Johnston et al. (2004), higher levels of buyers’ perceived trust of suppliers lead suppliers to involve and facilitate performance. From the social exchange theory, trust building is a gradual process through increased exchange and positive outcomes. Joshi and Stump (1999) suggested that trust strengthens the effect of supplier asset specificity on their joint action relationships. While a supplier tries to meet a buyer’s requirements (i.e., quickly change quantities, produce various product combinations, minimize the time to implement new product development and accommodate special orders), the supplier needs to change over its capacity and production plans and devote efforts in R&D and human resources. If a supplier benefits from cooperating with the buyer, it will be willing to maintain the relationship and commit to the buyer with the expectation for future benefit. Hence, trust positively relates to supplier flexibility for responsiveness to a buyer’s needs.

### Shared Vision as the Mediating Role on Supplier Flexibility

Shared vision is regarded as a necessary condition (Li 2005) and a bonding mechanism (Tsai and Ghoshal 1998) for exchange partners to combine or integrate resources. Shared vision means that the buyer and supplier have similar objectives and a shared understanding of the importance of collaboration. Ratnasingham and Kumar (2000) characterized trust by an increased

level of open communication and information sharing. A buyer with high-perceived trust will have more confidence that the suppliers will act honestly. Under this circumstance, the buyer is willing to share more strategic and sensitive information with its suppliers, thus the buyer–supplier relationships possess common goals and perceive the dyadic relationship as a whole team. This research found that trust facilitates buyer–supplier shared vision.

Volume flexibility enables a firm to meet customer satisfaction by quickly providing volume in response to unanticipated demand and quickly reducing volume to eliminate excess and obsolete inventories. Additionally, Ndubisi et al. (2005) showed no significant relationship between cost, technology consideration, and volume flexibility. They concluded that the level of supplier involvement is not as high as other flexibility dimensions. A buyer that highly trusts the supplier to keep its commitment and perform internal capacity adjustment for meeting volume change enhances supplier volume flexibility. Suppliers gain mix flexibility through both direct labor and indirect labor to design and implement the expanded product mix. Suarez et al. (1996) described that skilled workers or sophisticated equipment to achieve mix flexibility increases additional cost. Suppliers' involvement in new product development promotes new product flexibility (Narasimhan and Das 1999). A. M. Sanchez and Perez (2003) argued that supplier development significantly contributes to new product time and cost minimization. Suppliers' involvement, including R&D, marketing, and manufacturing, is essential to new product development. The new product introduction process also involves more people in the decision-making process and greater uncertainty. With regard to mix and new product flexibility, suppliers need greater involvement and more investments to achieve the buyer's requirement. Investment risks include additional cost and holdup between buyer–supplier transactions. Thus, a buyer should develop tighter relationships with suppliers to drive them to make risky investments. Findings from this study suggest that shared vision mediates the relationship between trust and mix/new product flexibility. In other words, a buyer with a high level of trust in its suppliers builds a shared vision to promote its suppliers' mix/new product flexibility. Oke (2005) indicated that delivery flexibility is the consequence of volume and mix flexibility. Kandemir, Yaprak, and Cavusgil (2006) presented the concept of "alliance coordination," and Miller, Besser, and Malshe (2007) further claimed that shared vision generates alliance coordination. From this perspective, closely coordinating with the buyer facilitates suppliers' delivery flexibility, involving suppliers' operation decision. Hence, shared vision influences suppliers' delivery flexibility so that suppliers act responsively.

### Managerial Implications and Theoretical Implications

Suppliers can display flexibility toward buyer-requested adjustments (Noordewier et al. 1990). With respect to flexibility, buyers who quickly

respond to customers' product requirement or change technical specifications cultivate a closer connection to customers (Homburg 1998). While organization and marketing studies have already discussed trust and shared vision, this study focuses on the effects of these two social mechanisms on supplier flexibility. The developed conceptual model gives business managers insightful assessment of interorganization relationships and management practices in supply chains. The key contributions of this study include a profound understanding of the buyer's roles for suppliers' responsiveness and identifying how the social mechanisms of trust and shared vision influence their expectation of suppliers' compliance to respective flexibility. This research demonstrates two specific managerial and theoretical implications and gives a few ideas for future research.

#### MANAGERIAL IMPLICATIONS

First, the results highlight that shared vision is the critical determinant on suppliers' mix, new product, and delivery flexibility. From the resource-based view, managers of buyer firms need to build new capabilities, transform their resource base, and reconfigure processes to leverage new valuable resource combinations to sustain competitive advantage in changing environments. Powell (1990) argued that firms engaging in fast-moving industries with short product cycles are likely to engage in network partnerships to reposition products rapidly and respond quickly to changing market conditions. In today's turbulent business environment, firms are teaming up with each other due to technological complexity and diverse customer needs. In the new business model, competitors would rather be individual firms than an entire supply chain. Interfirm relationships with a shared vision have collective goals and aspirations, and strategically align with mutual interests. Specifically, this value centers on the belief that collaboration leads to better mutual benefit. To achieve buyers' flexibility requirement, suppliers should commit and be willing to allocate their resources. We suggest that managers be involved in shared vision development between interfirms rather than using a buying-selling approach.

Second, research has regarded trust as a catalyst in the buyer-supplier relationship, since it provides an expected successful exchange. T. K. Das and Teng (2001) argued that trust is a state of mind that reduces perceived relation risk. When trust exists between exchange parties, they are more willing to increase information sharing. In addition, when buyers trust in suppliers, they are inclined to provide critical or confidential information to suppliers. Although our findings suggest that trust alone advances supplier volume flexibility, trust is still the important element of buyer-supplier relationships. To advance supplier flexibility requirements, managers should frequently interact with suppliers to involve in mutual trust as an integral part of relationships and then develop a shared vision through communication and information sharing.

## THEORETICAL IMPLICATIONS

Trust is the crucial element in the industrial marketing relationship. For instance, Johnston et al. (2004) empirically showed that supplier's perceived trust has significant impact on joint responsibility and flexibility arrangement. Handfiel and Bechtel (2002) also found out that higher levels of buyer trust relate to higher levels of supplier responsiveness. Trust significantly influences the relationship commitment in which partners maximize their efforts to maintain relationships (Morgan and Hunt 1994). The social exchange theory suggests that causal relationship between trust and commitment result from the principle of generalized reciprocity (McDonald 1981). Suppliers that are willing to make specific asset commitments develop higher level of trust (Handfiel and Bechtel 2002). Trust attracts and secures partner commitments (Kingshott 2006). Our finding is consistent with the previous studies that trust significantly impacts supplier flexibility.

Our framework provides helpful guidance for identifying and examining relationships between buyers and suppliers. Despite the strong linkage between trust and supplier flexibility, our model suggests that shared vision plays a crucial role among trust, mix, new product, and delivery flexibility. As prior discussions in our study, suppliers require high levels of involvement and idiosyncratic asset investments to achieve mix, new product, and delivery flexibility. The risk of those prerequisites is higher than volume flexibility achievement. Although trust provides a motivation for trustee commitment, whether that commitment manifests in actions depends on the risk of involvement and investments. However, trust leads to a high level of sensitive information (Handfiel and Bechtel 2002) and critical and proprietary information sharing (Lambe et al. 2009). Shared vision develops through communication and information sharing. While a buyer perceives its suppliers as trustworthy, increased strategic or critical information-sharing facilitates the same team identification and whole goal understanding. Thus, suppliers are more willing to make adaptations for buyer needs. In contrast to most previous studies, which suggest that trust always leads to desirable outcomes (Dirks and Ferrin 2001), we demonstrate that shared vision building effectively extends trust and the commitment theory.

## LIMITATIONS AND FURTHER RESEARCH

Future research can address several limitations of this study. First, because our samples only consist of buyers, the results of a single investigation may have limited generalizability. However, this limitation should be somewhat tempered because every respondent was from a different firm. Second, this study empirically demonstrates social mechanisms: (1) Trust has significant effect on supplier flexibility; (2) trust helps buyers and suppliers to evolve a shared vision; and (3) shared vision is the mediating role on supplier



flexibility (i.e., mix, new product, and delivery flexibility). However, we do not measure the risk to suppliers of providing respective flexibility in detail. Future studies might examine perceived risk on respective flexibility from the supplier's side. Finally, this study focused on the effect of trust, which refers to the firm's intention to make things work rather than the ability to perform (T. K. Das and Teng 2001; Nooteboom 1996). Following Singh and Sirdeshmukh (2000), goodwill trust and competence trust may provide more insight into exchange relationships. How does a buyer's perceived competence trust in suppliers affect suppliers' actions in terms of flexibility? Theoretically intriguing and practically important questions such as this, deserve further study.

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## APPENDIX: MEASUREMENT ITEMS

**Market Turbulence** (Based on Jaworski and Kohli 1993)

MTU1: In our kind of business, customers' product preferences change quite a bit over time.

MTU2: Our customers tend to look for new product all the time

**Technological Turbulence** (Based on Calantone et al. 2003)

TTU1: The technology in our industry is changing rapidly.

TTU2: In our principal industry, the modes of production and service change often.

TTU3: In our principal industry, the modes of production and service change in major ways as opposed to slowly evolving.

**Flexibility**Volume flexibility (Based on Zhang et al. 2003)

VF1: The supplier can operate efficiently at different levels of output.

VF2: The supplier can operate profitably at different production volumes.

VF3: The supplier can economically run various batch sizes.

VF4: The supplier can quickly change the quantities for our products produced.

VF5: The supplier can vary aggregate output from one period to the next.

VF6: The supplier can easily change the production volume of a manufacturing process.

Mix flexibility (Based on Zhang et al. 2003).

MX1: The supplier can produce a wide variety of products in their plants.

MX2: The supplier can produce different product types without major changeover.

MX3: The supplier can build different products in the same plants at the same time.

MX4: The supplier can produce, simultaneously or periodically, multiple products in a steady-state operating mode.

MX5: The supplier can vary product combinations from one period to the next.

MX6: The supplier can changeover quickly from one product to another.



### Delivery flexibility

(Based on Chan 2003; Duclos et al. 2003; Krause et al. 2001; Sawhney 2006)

DLV1: The supplier is able to make dependable delivery promises.

DLV2: The supplier can deliver its products on promised due dates.

DLV3: The supplier can deliver in smaller lots and ship more frequently to replenish our stock levels.

DLV4: The supplier can move planned delivery dates forward to accommodate rush orders or special orders.

DLV5: The supplier can meet the accuracy of delivery quantities.

### New product flexibility

(Based on Chan 2003; D'Souza and Williams 2000; Koste and Malhotrar 1999)

NP1: The supplier can reduce the time to modify existing products.

NP2: The supplier can reduce the time to implement engineering change order.

NP3: The supplier is able to minimize the time or cost of new products introduced into production.

NP4: The supplier can provide the design support in new products pre-launch.

### **Trust**

(Based on Kozak and Cohen 1997; Kumar et al. 1995; Spekman et al. 1999)

TST1: The supplier has been open and honest in dealing with us.

TST2: The supplier respects the confidentiality of the information they receive from us.

TST3: Our transactions with the supplier do not have to be closely supervised.

TST4: We believe that the supplier is trustworthy.

TST5: The supplier usually keeps the promises that it makes to our firm.

TST6: We have complete confidence in the supplier's motives.

TST7: Maintaining this relationship is vital.

TST8: We share with the supplier a similar sense of fair play.

TST9: Rewards are shared equitably between us and the supplier.

**Shared Vision** (Based on Li and Lin 2006)

SHV1: We and the supplier have a similar understanding about the aims and objectives of the supply chain.

SHV2: We and the supplier have a similar understanding about the importance of collaboration across the supply chain.

SHV3: We and the supplier have a similar understanding about the importance of improvements that benefit the supply chain as a whole.