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Under environmental uncertainty, firms face opportunism of their exchange partners and have difficulty in expecting benevolence from their exchange partners because the participating firms are unable to predict changes in the external environments due to lack of information, knowledge and understanding. Meanwhile, firms’ economic actions and outcomes, like all social action and outcomes, are affected by the actors’ dyadic relations as well as by the structure of the overall relations, which is referred to as network embeddedness. Firms are embedded in the network by maintaining strong ties or weak ties with their exchange partners. As such, firms’ participating network embeddedness influences the inter-firm relationship under environmental uncertainty. This study hypothesizes that environmental uncertainty is positively related to opportunism and is negatively related to benevolence. This study also hypothesizes that these relations are moderated by the network embeddedness. The statistic results demonstrate that all of the hypotheses of this study turn out to be significant. The implication of this study is that participation in strong tie networks enables the exchange partners to exchange fine-grained information and to deeply understand the operations of the partners. As such, firms have a belief that the exchange partners have the intentions and motives beneficial to the firms even in uncertain environments. Therefore, firms should carefully consider how they are embedded in the network with their exchange partners when they make a business decision under environmental uncertainty.

Keywords: Environmental Uncertainty, Opportunism, Benevolence, Network Embeddedness Benevolence

**Abstract**

All operations of an organization are embedded in the web of social networks within their corresponding industries. Gulati (1998) argues that economic actions are influenced by the social context in which they are embedded, and that the actions can be influenced by the position of actors in the social network. Uzzi (1996) also suggests that the competitive production market will be characterized by the embedded networks of organizations rather than by an atomistic mass of discrete firms. Granovetter (1985, 1992) refers to network embeddedness as economic actions and outcomes, like all social actions and outcomes, which are affected by the actor’s dyadic relations and by the structure of the overall network of relations. Thus, in the study of inter-organizational relationship, network embeddedness should be considered as the most critical contextual factor since the economic actions of all firms are embedded in the network of their exchange partners.

This study attempts to present network embeddedness as the contextual factor of the inter-firm relationship under environmental uncertainty. In uncertain environments, firms face changes under external environmental conditions that are beyond their control and are difficult to anticipate (Dess and Beard, 1984), such as volatility or market unpredictability (Aldrich, 1979). Volatility refers to the rate and unpredictability of change in an environment over time, which creates uncertainty regarding future conditions (Williamson 1985). However, since it is difficult to anticipate all possible future contingencies ex ante, ex post adjustment usually becomes necessary in volatile environments. As such, volatility makes the exchanges more conducive toward opportunism and thereby increasing its probability of occurrence.

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Environmental uncertainty makes firms to rely more on formal enforcement mechanisms, such as elaborate and complex contract for the settlement of dispute, due to the fear of opportunist behavior by partners (Joshi and Stump, 1999; Walker and Weber, 1984). When they face great fear of opportunistic behavior from their partners, firms are more likely to rely on contract-based governance, which emphasizes the use of a formalized, legally binding agreement or use of a contract to govern the inter-firm partnership (Joshi and Stump, 1999). However, a greater reliance on an elaborate and complex contract has the risk of impeding development of benevolence between the exchange partners, because benevolence is the belief that one party is genuinely interested in the welfare of the other party and that both are motivated to seek mutually beneficial gains (Doney and Cannon, 1997; Ganesan, 1994; Geyskens, Steenkamp and Kumar, 1998). As such, firms under environmental uncertainty face opportunism of its exchange partners. Firms also have difficulty in expecting benevolence from its exchange partners due to the unpredictability of future contingencies ex ante and from the fear of partners’ opportunistic behaviors ex post. Since all economic actions of firms are embedded in an inter-organizational network (Granovetter, 1985, 1992), the relationship between firms should be considered in the context of network embeddedness.

The two main characteristics of network embeddedness are strong ties and weak ties (Granovetter, 1985, 1992). Strong ties are associated with the exchange of fine-grained information and serve as part of the social control mechanism (Larson, 1992). Weak ties do not possess the control and coordination mechanism governing the hierarchies or markets (Granovetter, 1973). These characteristics of firms’ network embeddedness influence the relationship between environmental uncertainty and opportunism / benevolence. The principal objective of this study is to explore the effect of network embeddedness on inter-firm relationships. Specifically, this study attempts to explain the moderating role of a firm’s network embeddedness on the relationship between environmental uncertainty and opportunism of its exchange partners, as well as on the relationship between environmental uncertainty and benevolence of its exchange partners.

The contribution of this study is twofold. First, this study introduces the importance of network embeddedness as a moderator in order to explain the way of managing opportunism. Firms that are embedded in strong tie networks are unlikely to seek opportunism even though they are facing uncertain environments, because firms’ network embeddedness serves as part of a social control mechanism governing partnership behaviors. Second, this study promotes the way companies build benevolent inter-firm relationships under environmental uncertainty. This study suggests that the embedded network plays a key role in promoting a benevolent relationship between companies facing uncertain environments. The conceptual model, put to empirical test, is provided in Figure 1.

Theoretical Background and Hypotheses

Environmental Uncertainty

There are many definitions of uncertainty illustrating similarities in relation to the perceived influence of lack of information, knowledge and consequently, understanding (Spender, 1986; Milliken, 1987; Van der Heijden, 1996; Sutcliffe and Zaheer, 1998).

Spender (1986) reports the relationship between uncertainty and a lack of information and knowledge. Milliken’s (1987) consideration of uncertainty is based on the type of information that is lacking. He suggests that environmental uncertainty grows from the inability to understand changes, events and causal relationships in the exter-

FIGURE 1
Conceptual Framework

[Diagram showing the relationship between Environmental Uncertainty, Network Embeddedness, Opportunism, and Benevolence]
nal environment, coupled with an inability to predict the effects that these will have on the firm and, consequently, an inability to develop response options and predict their consequences. Van der Heijden (1996) recognizes different levels of knowledge, together with the application of judgment and reasoning in uncertain situations. Sutcliffe and Zaheer’s (1998) typology is based on a lack of knowledge about specific aspects of the external environment as well as the consequential lack of understanding. Hence, the common themes running through each of these typologies of uncertainty is lack of information and knowledge, lack of understanding and an inability to predict changes in the external environment.

Uncertainty also refers to the difference between the amount of information required to perform the task and the amount of information already possessed by the organization (Galbraith, 1973). Environmental uncertainty may result from changes in the external environmental conditions faced by an organization that are beyond its control and are difficult to anticipate (Dess and Beard, 1984), such as volatility or market unpredictability (Aldrich, 1979). Environmental uncertainty increases the perceived potential of opportunistic behavior between the exchange parties (Hill, 1990).

Uncertainty is an important construct in the transaction cost economics (TCE) literature. Williamson (1975, 1985) points out that uncertainty is created from ‘bounded rationality’. A rational actor cannot foresee all the possible contingencies at a given point of time, which gives rise to uncertainty. Williamson further argues that when these contingencies become numerous, they exceed the data processing capabilities of the concerned party. Under these circumstances, ‘the complete decision tree simply cannot be generated’ (Williamson, 1975). Empirical work in transaction cost economics has generally defined uncertainty as volatility. This conceptualization follows Williamson’s (1985) focus on the ‘governance branch’ of TCE, which emphasizes environmental volatility and asset specificity, two constructs that do not invoke issues of measurement.

Volatility refers to the rate and unpredictability of change in an environment over time, which creates uncertainty over future conditions. Since it is difficult to anticipate all possible future contingencies ex ante, ex post adjustment usually becomes necessary in volatile environments.

Ambiguity, in contrast, refers to the degree of uncertainty inherent in the perceptions of the environmental state irrespective of its change over time. Ambiguity is less about uncertain futures as about uncertainty about the present and past experiences (Carson et al., 2006).

Volatility makes exchanges more conductive toward opportunism and increases its probability of occurrence. Volatility engenders a need to renegotiate agreements in order to avoid mal-adaptation to the external environment. Confrontation and non-cooperative bargaining are inherent in such renegotiations among self-interested parties (Williamson, 1985).

On the contrary, the measurement branch of TCE emphasizes the metering problem, or measurement ambiguity (Alchian and Demsetz, 1972). Ambiguity, on the other hand, increases the opportunity for parties to shrink, cheat or otherwise engage in opportunism without being caught (Ouchi, 1980). Since some opportunism will go unnoticed when perceptions of partner behavior are ambiguous, ambiguity reduces the sanctions against opportunism (i.e., punishment), thereby increasing its likelihood of occurrence. Similarly, under ambiguity, some cooperative acts will be incorrectly sanctioned as opportunistic, reducing the incentives for cooperation (Carson et al., 2006). Duncan (1972) suggested that external environmental influences can be divided into environmental complexity and environmental dynamism. Environmental complexity refers to different external forces with which an organization interacts, whereas environmental dynamism refers to the rate of change in the environment and the unpredictability of environmental changes. Complexity is associated with the uncertainty inherent in a situation at a given point in time, whereas dynamism refers to uncertainty over time.

Duncan (1972) found that environmental dynamism had far greater impact on the perceived environmental uncertainty than on environmental complexity. This is because, over time, decision makers can resolve various complexities as they gather more information. However, dynamism, by definition, is difficult to predict. For firms under environmental uncertainty, environmental dynamism may be an even more important source of uncertainty than complexity, because firms may not have sufficient resources to understand and develop responses to the changes arising due to environmental dynamism.

In uncertain environments, firms are more likely to rely on formal enforcement mechanisms, such as elaborate contract for the dispute settlement, and less likely to rely on informal mechanisms, such as relational norm (Birnbirg, 1998; Poppo and Zenger, 2002). When faced with a greater fear of opportunistic behavior by partners, firms are more likely to rely on contract-based governance as compared to trust-based relational governance (Joshi and Stump, 1999). Contractual-based governance emphasizes the use of a formalized, legally binding agreement or a contract to govern the inter-firm partnership, while trust-based relational governance emphasizes the role of mutual trust, commitment and relational capital in the governance process (Joshi and Stump, 1999). A greater reliance on elaborate and complex contracts has the risk of threatening the development of inter-partner trust. Examining the interplay between structural governance and relational governance in the context of alliances, Fears et al. (2008) found that broad contracts promote while narrow contracts hinder trust development. Given that trust involves the willingness to take risk and increase vulnerability (Krishnan et al., 2006; Mayer et al., 1995), firms are likely to be apprehensive about developing inter-organizational trust with their partners and suppliers under uncertain market conditions.

Opportunism

Opportunism is defined as self-interest seeking with guile (Williamson, 1975) and includes such activities as stealing, cheating, breach of contract, dishonesty, distorting data,
obfuscating issues, confusing transactions, false threats and promises, cutting corners, cover ups, disguising attributes or preferences, withholding information, deception and misrepresentation (Anderson, 1988; John, 1984; Wathne and Heide, 2000; Williamson, 1981, 1987, 1993). In short, opportunism is aggressive selfishness and disregards the impact of the firm’s actions on others (Lai, Liu, Yang, Lin, and Tsai, 2005; Macneil, 1981; Williamson, 1975). Wathne and Heide (2000) show how active and passive opportunism manifest themselves under existing and new circumstances, respectively. For example, opportunism in the form of quality shrinking means that a party is withholding efforts, or passively failing to honor an agreement. In contrast, breaching a distribution contract by selling in an unauthorized territory involves an active effort. According to the discussion of the forms of opportunism by Wathne and Heide (2000), under existing circumstances, passive opportunism takes the form of shrinking, or evasion of obligation. Passive opportunism under new circumstances takes the form of inflexibility, or refusal to adapt. Active opportunism under existing circumstances means that one party is engaging in violations or behaviors that were explicitly or implicitly prohibited. Active opportunism under new circumstances means that one party uses the new circumstances to extract concessions from the other, such as forced renegotiations. The occurrence of opportunism in exchange relationships has important practical implications. If the risk of opportunism in a particular exchange relationship is sufficiently high, considerable resources must be spent on control and monitoring resources that could have been deployed more productively for other purpose. In addition, the risk of opportunism may produce substantial opportunity costs in the form of ‘valuable deals that won’t be done’ (Calfee and Rubin, 1993).

In the discussions managing these different forms of opportunism, transaction cost literatures identified several strategies that appear to be capable of solving opportunism problems. The emphasis in the early transaction cost literature was on the use of monitoring efforts and incentive structure. Indeed, the rationale for vertical integration as a governance strategy rests on the ability to control opportunism through monitoring and incentive schemes (Williamson, 1975). To the extent that information asymmetry exists in a relationship, it is possible for a party to act opportunistically without being detected. Monitoring of either the partner’s behavior or the partner’s outcomes (Celly and Frazer, 1996) can overcome this problem.

Theoretically, there are two different reasons that support the notion that monitoring may reduce opportunism. First, from a behavioral perspective, the monitoring process itself may place uncomfortable social pressure on a party and thereby increase compliance (Blau and Scott, 1962; Murry and Heide, 1998). Second, from an economic perspective, monitoring increases the ability to detect opportunism and ultimately, increases the ability to match rewards and sanctions to the partner’s behavior in an appropriate way. In the original transaction cost framework (Williamson, 1975), one of the inherent benefits of an organizational hierarchy, such as monitoring, is its ability to administer incentives that reduce the payoff from an opportunistic behavior.

Research on the so-called self-enforcing agreement (Kaufmann and LaFontaine, 1994; Telser, 1980) has suggested that similar effects can also be achieved in relationships between independent firms. The basic premise of such agreements is to align parties’ individual interests by creating an incentive structure that makes the long-term gains from cooperative behavior exceed the short-term payoff from opportunism. If such agreements are appropriately structured, they reduce the likelihood of opportunism in the first place. The subsequent transaction cost literature has demonstrated how the monitoring and incentive properties of organizational hierarchies can be crafted in relationships between independent firms (Lai, 1990; Telser, 1980). The emerging literature has also augmented the early work by suggesting that opportunism can be managed through selection and socialization efforts (Ouchi, 1980; Stump and Heide, 1996). In principle, the most straightforward way of managing opportunism is to select exchange partners a priori that are not opportunistically inclined or are inherently cooperative with respect to a particular task (Orbell and Dawes, 1993). In contexts of marketing, selecting efforts are implemented through screening and qualification programs of various kinds. For example, franchisors seek to minimize the risk of quality shirking by subjecting potential franchisees to comprehensive screening processes. Similarly, automobile manufacturers subject their component suppliers to formal qualification programs in order to prevent subsequent quality programs (Wathne and Heide, 2000). An alternative strategy of managing opportunism is to use socialization processes in order to make the agent internalize the principal goals.

Granovetter (1985) argues that the transaction cost theory has failed to recognize the notion that economic transactions are frequently embedded in social relationships that mitigate the risk of opportunism. According to this view, one apparent solution to the opportunism problem is to deploy deliberately socialization tactics that promote goal convergence.

**Nature of Trust**

Trust has received a great deal of attention in social psychology (Deutsch, 1960; Lewicki and Bunker, 1995; Lindskold, 1978), sociology (Lewis and Weigert, 1985; Strub and Priest 1976) and economics (Dasgupta, 1988; Williamson 1991), as well as marketing (Anderson and Weitz, 1989; Dwyer, Schurr and Oh, 1987; Ganesan, 1994; Moorman, Deshpande and Zaltman, 1993; Moorman, Zaltman and Deshpande, 1992). Each discipline offers unique insights into the nature of trust, its definition and the processes through which it develops. Lewicki et al. (1998) reviewed the extent literature on trust and defined trust as ‘confident positive expectations regarding another’s conduct’. At the inter-organizational level, Bradach and Eccle (1989) defined trust as a focal organization’s expectation that another firm will not act opportunistically. There is a recurring
theme across different literature streams emphasizing the expectations of the exchange partners regarding mutual positive behavior in the measurement of trust (Das and Teng, 2002). Thus, in the inter-organizational context, trust is defined as the expectation that the promise of another party can be relied on and that, in unforeseen circumstances, the other will act in a spirit of cooperation with the trust or (Hagen and Choe, 1998). Many researchers explore the importance of trust in interpersonal dyads (Rotter, 1967; Schlenker, Helm and Tedeschi, 1973). Although some researchers disagree as to whether organizations can be targets of trust, a large stream of literature emphasizes that people can develop trust in public institutions (Lewis and Weigert, 1985) or organizations (Morgan and Hunt, 1994), as well as in individuals. Therefore, the trust literature suggests that in an industrial buying context, customers can trust the supplier firm and its salesperson, or both. The trust literature also suggests that, regardless of the level of analysis, trusting parties must be vulnerable to some extent in order for trust to become operational. Specifically, decision outcomes must be uncertain and important to the trust or (Deutsch, 1962; Moorman, Zaltman and Deshpande, 1992; Schlenker, Helm and Tedeschi, 1973).

In the realm of marketing, much research on trust has been conducted in the context of distribution channels (Anderson and Narus, 1990; Anderson and Weitz, 1989; Morgan and Hunt, 1994), in which vulnerability is created by the high degree of interdependence usually found in channel relationships (Gundlach and Cadotte, 1994; Kumar, Scheer and Steenkamp, 1995). In typical distribution channel arrangements (i.e., manufacturer-distributor or manufacturer-retailer), switching costs are relatively high. Therefore, this research stream emphasizes the influence of trust on constructs central to building long-term relationships with customers, such as commitment (Dwyer, Schurr, and Oh, 1987; Morgan and Hunt, 1994), long-term orientation (Ganesan, 1994) and propensity, in order for parties to stay in the relationship (Anderson and Weitz, 1989).

Marketing scholars working in the domain of inter-firm and group relationships distinguish among three dimensions of trust: honesty, credibility and benevolence (Doney and Cannon, 1997; Ganesan, 1994; Geyskens, Steenkamp and Kumar, 1998). Honesty is a channel member’s belief that one’s partner is reliable, stands by its word, fulfills promised role obligations and is sincere (Anderson and Narus, 1990; Dwyer, Schurr and Oh, 1987). Credibility is the belief that the partner’s word in written statement can be relied on (Lindskold, 1978). Benevolence is a channel member’s belief that its partner is genuinely interested in the welfare of the partner and is motivated to seek joint gains. A benevolent partner who subordinates immediate self-interest for long range group gain will not take unexpected actions that would have a negative impact on the firm (Anderson and Narus, 1990). This study adopts this view of trust and note that it is the benevolence dimension of trust identified by marketing scholars that properly reflects the trust of the inter-firm and group context purchase situation. A buying firm facing environmental uncertainty under a purchase situation turns to a supplier or a salesper-

son that the buyer believes is able to perform effectively and reliably and is also genuinely interested in the welfare of the customer (Doney and Cannon, 1997). Benevolence involves showing consideration and sensitivity for the needs and interests of the other party in the relationship, acting in a way that protects these interests and refraining from exploiting the other party for the benefit of one’s self-interest (Mayer, Davis and Schoorman, 1995; Rich, 1997; Whitener et al., 1998). The characteristic of benevolence in the inter-firm relationship occurs when the transaction is conducted in uncertain environments. Benevolence is based on the extent to which the firm believes that the exchange partner has intentions and motives beneficial to the firm when new conditions arise, conditions for which a commitment was not made (Ganesan, 1994). For example, in case the part supply is uncertain due to a lack of inventory in the market, the supplier may act opportunistically by calling a higher price above the market price or by switching the supply of parts to another buyer who promises to pay a higher price than the existing buyer. Meanwhile, the buyer requests elaborate forms of the contract in order to manage the supplier’s opportunistic behaviors. However, this contract cannot prevent all of the supplier’s opportunistic behaviors in the future; moreover, there are very limited chances of promoting the buyer’s benevolence to the supplier in uncertain environments. In inter-organizational studies, marketing researchers argue that benevolence fosters a spirit of cooperation, which can lower the cost of a transaction by reducing the extent of opportunism by one or more of the transacting parties, as well as the need to guard against opportunism by the other parties (Bromiley and Cumming, 1995; Casson, 1991; Matiland, Bryson and Van de Ven, 1985). Opportunism, according to transaction cost economists, is the behavior that violates the cooperative spirit of agreements (Williamson, 1975).

Network Embeddedness

In line with the social network perspective introduced by organizational theorists, the most important facet of an organization’s environment is its social network (Powell and Smith-Doer, 1994). They emphasize the fact that economic action – like any other form of social action – does not take place in a barren social context but rather, is embedded in the social networks of relationships. A social network can be defined as ‘a set of nodes (e.g., persons, organizations) linked by a set of social relationships (e.g., friendship, transfer of funds, overlapping membership) of a specified type’ (Laumann, Galaskiewicz and Marsden, 1978: pp. 458). As such, network perspectives build on the general notion that economic actions are influenced by the social context in which they are embedded and that actions can be influenced by the position of actors in social networks (Gulati, 1998: 295). Uzzi (1996) also suggests that competitive production markets will be characterized by the embedded networks of organizations rather than by an atomistic mass of discrete firms.

How should organizations be embedded in the web of social networks in their industries? According to Granovetter (1985, 1992), embeddedness refers to the fact that ‘eco-
nomic actions and outcomes, like all social actions and outcomes, are affected by the actors’ dyadic (pairwise) relations and by the structure of the overall network of relations, which he refers to as relational embeddedness and structural embeddedness, respectively (Grovetter, 1992: 33). By bringing together the common elements from the social networks literature, organizational theorists define network tie strength as a function of the (1) frequency, (2) intensity, (3) stability of interactions and (4) levels of trust between network members (Antia and Frazier, 2001; Granovetter, 1973; Rindfleisch and Moorman, 2001; Uzzi, 1996, 1997). As a result, they argue that strong ties are associated with trust and fine-grained information exchanges between partners (Uzzi, 1997; Larson, 1992; Krackhardt, 1992). On the other hand, weak ties lead to innovation by enabling actors to access non-redundant and novel information exchange (Granovetter, 1973).

**Strong Ties**

In his review of a decade of research on the strength-of-weak-ties hypothesis, Granovetter (1982) points out that strong tie can play an important role, and the role should not be ignored. In fact, he noted: “Weak ties provide people with access to information and resources beyond those available in their own social circles; but strong ties have greater motivation to be of assistance and are typically more easily available”. Citing Pool (1980), he further asserts that strong ties are more likely to be useful to the individual when that individual is in an insecure position. Granovetter (1982) concludes that people in insecure positions are more likely to resort to the development of strong ties for protection and uncertainty reduction. In a parallel argument, Krackhardt and Stern (1988) posit that the pattern of friendship ties within an organization will be critical to an organization’s ability to deal with crises. Through a set of organizational simulations, they demonstrated that an organization characterized by friendship ties that cut across departmental boundaries is better suited for adapting to environmental changes and uncertainty. According to the social network theory literature, strong ties are shown to provide organizations with two primary advantages; i.e., fine-grained information exchanges and trust-based governance. First, strong ties are associated with the exchange of high-quality information and tacit knowledge. In his study of the New York apparel industry, Uzzi (1996) observes that firms participating in strong ties are able to exchange fine-grained knowledge. In the development of strong ties, inter-firm partners learn about each other’s organization, become more dependent on one another and develop relational trust (Larson, 1992). Based on a deep understanding of a partner’s operations, tacit knowledge is more readily transferred across organizational boundaries (Hagg and Johanson, 1983). Second, strong ties serve as part of the social control mechanism, which governs partnership behaviors. Firms enter strategic alliances with competitors in order to gain access to external resources, share risks and cost, or to pool complementary skills (Hagedoorn, 1993; Kogut, 1988; Hagg and Johanson, 1983). However, inter-organizational alliances with competitors come with potential hazards of the alliance partner’s association of opportunism. According to Williamson (1985), participating firms in strategic alliances are susceptible to threats associated with opportunism because the strategic alliance with the competitor itself does not possess the social control mechanism governing the participating firms’ opportunism. In this regard, Larson (1992) shows that strong ties incrementally promote and, in turn, enhance trust, mutual gain, reciprocity and a long-term perspective, serving as part of the social control mechanism. Consequently, partners maintaining strong ties are more likely to forgo seeking individual short-term interest; hence, they develop joint problem-solving arrangements (Powell, 1990; Uzzi, 1996). Strong ties produce and are governed by relational trust and norms of mutual gain and reciprocity, which grow through a history of interactions (Larson, 1992; Powell, 1990). Similar to Powell’s (1990) assertion that networks represent a separate and distinct organizational form, Uzzi (1996) refers to this alternative governance system based on trust as the logic of embeddedness. He argues that it is the product of cohesive/intensive ties. Similarly, Kale, Singh and Perlmutter (2000) find a positive relationship between relational capital – strong ties based on trust – and the degree of learning in inter-firm alliances.

Although strong ties have two primary advantages – i.e., fine-grained information exchanges and trust-based governance–Granovetter (1973)argues that strong ties tend to bond similar people to each other, and these similar people tend to cluster together such that they are all mutually connected. The information obtained through such a network tie is more likely to be redundant, and the network is therefore not a channel for innovation.

**Weak Ties**

Granovetter (1973) suggests that weak ties are more likely to connect actors to different social worlds and, as such, are ideal vehicles for access and exposure to perspectives and approaches that are not only new to the actor but also fundamentally different from each other. His argument rests on the assumption that a weak tie more often constitutes a ‘local bridge’ to parts of the social system that are otherwise disconnected, and therefore, a weak tie is likely to provide new information from disparate parts of the system. Granovetter (1973) also argues that weak ties are conduits across which an actor can access novel information. Weak ties are more likely than strong ties to be the ‘local bridges’ to distant others possessing unique information. The strength of the weak ties argument is as much about the structural embeddedness as it is about relational embeddedness. A weak tie can be beneficial, because it is more likely to embed an actor into (or provide access to) divergent regions of the network rather than to a densely connected set of actors. For example, according to Granovetter’s (1973) argument, an actor’s collection of weak ties is more likely to be a sparse structure reaching divergent regions of the surrounding network. Granovetter (1973)argues that tie strength is curvilinear with a host of dependent variables, such as dif-
fusion of new information: no tie (or an extremely weak tie) is of little consequence; a weak tie provides maximum impact and a strong tie provides a diminished impact. Strong ties tend to bond similar people to each other and the information obtained from the strong ties is likely to be redundant. Meanwhile, weak ties constitute a local bridge in order to provide new information to the network promoting innovation of the system. Baer (2010) suggests that an optimal number of weak ties fosters creativity. The optimal number of weak ties compounds two distinct features of actors’ networks: the size and the strength. It is conceivable that cultivating an optimal number of ties, irrespective of whether these ties allow the actors to tap into socially distant or proximately pockets of information, is what propels creativity to higher levels. As each tie represents a channel providing access to information, increasing the number of idea contacts up to some optimal level should increase the breadth of information available (Anderson, 2008). The greater is the availability of information, in turn, the greater number of potential creative combinations that can be derived and the greater the likelihood that creative ideas will emerge (Campbell, 1960; Mumford and Gustafson, 1988).

Despite the advantage of accessing novel information, which leads to innovation, weak ties come with potential risks due to the fact that inter-organizational collaborations do not possess the control and coordination mechanisms governing interfirm relationships. Therefore, participating firms are susceptible to the threats associated with opportunism (Williamson, 1985).

**Hypotheses**

Firms face various sources of environmental uncertainty when they make decisions on business matters. Environmental uncertainty results from the changes of external environmental conditions, faced by a firm, which are beyond its control and are difficult to anticipate (Dess and Beard, 1984), such as volatility or market unpredictability (Aldrich, 1979). Volatility refers to the rate and unpredictability of change in an environment over time, which creates uncertainty about future conditions. Since it is difficult to anticipate all possible future contingencies ex ante, ex post adjustment usually becomes necessary in volatile environments (Carson et al., 2006). Williamson (1975, 1985) points out that environmental uncertainty is created from "bounded rationality". A rational actor cannot foresee all the possible contingencies at a given point of time, thereby giving rise to uncertainty. Williamson argues that when these contingencies become numerous, they exceed the data processing capabilities of the concerned party. Under these circumstances, the complete decision tree simply cannot be generated (Williamson, 1975). As such, environmental uncertainty increases opportunistic behavior among the exchange parties, because the exchange parties take advantage of the uncertain environment. Uncertainty engenders a need to renegotiate agreements in order to avoid maladaptation to the external environment. Confrontation and non-cooperative bargaining are inherent in such renegotiations among self-interest seeking parties (Williamson, 1985).

Uncertainty also increases the opportunity for parties to shrink, cheat or otherwise engage in opportunism without being caught (Ouchi, 1980), thereby increasing its likelihood of occurrence. As a result, environmental uncertainty increases the perceived potential of opportunism among exchange partners. Thus, it is possible to propose the following hypothesis:

**H1:** Environmental uncertainty is positively related to the exchange partner’s opportunism.

Environmental uncertainty increases the exchange partners’ perceived potential of opportunism because a focal firm is unable to control and is difficult to anticipate market situation due to change in external environments. If a focal firm faces a fear of opportunistic behavior by the exchange partners, it is likely to rest on a formal enforcement mechanism, such as elaborate contract (Birnberg, 1998; Poppo and Zenger, 2002). However, a focal firm’s reliance on a formal enforcement mechanism, such as elaborate and complex contract, increases the risk of threatening the development of benevolence between exchange partners. Joshi and Stump (1999) refer to the contract-based governance that emphasizes the use of a formalized, legally binding agreement or a contract in order to govern the interfirm partnership. Given that benevolence is the belief that one party is genuinely interested in the welfare of the other party and is motivated to seek mutually beneficial gains (Doney and Cannon, 1997; Ganesan, 1994; Geyssens, Steenkamp and Kumar, 1998), exchange partners are unlikely to be apprehensive about developing benevolence with their partners under the contract-based enforcement mechanism. Feans et al. (2008) suggests that broad contracts promote, while narrow contracts hinder trust development. Based on this discourse, it is possible to propose the following hypothesis:

**H2:** Environmental uncertainty is negatively related to the exchange partner’s benevolence.

The economic actions and outcomes of firms, like all social actions and outcomes, are affected by the actors’ dyadic relations and by the structure of the overall network of relations, which is referred to as relational embeddedness and structural embeddedness, respectively (Granovetter, 1982, 1992). By bringing together relational and structural embeddedness, organizational theorists propose the terms of network embeddedness and network tie strength (Antia and Frazier, 2001; Granovetter, 1973; Rindfleisch and Moorman, 2001; Uzzi, 1996, 1997). They argue that strong ties are associated with trust and fine-grained information exchanges between partners (Uzzi, 1997; Larson, 1992; Krackhardt, 1992), while weak ties lead to innovation by enabling actors to access non-redundant and novel information exchange (Granovetter, 1973). Pool (1980) asserts that strong ties are more likely to be useful to the individual when the individual is in an insecure position. By extending this argument, Granovetter (1982) suggests that people in
insecure positions are more likely to resort to the development of strong ties for protection and uncertainty reduction. Krackhardt and Stern (1988) extend this argument from the people to the organization stating that the pattern of strong ties within the organization will be critical to an organization’s ability to deal with the crisis. Larson (1992) shows that strong ties incrementally promote and, in turn, enhance mutual gain, reciprocity and a long-term perspective, thereby serving as part of the social control mechanism. Consequently, partners maintaining strong ties are more likely to refrain from seeking opportunism; hence, they develop joint problem-solving arrangements (Powell, 1990; Uzzi, 1996). As such, strong ties are more likely to be useful to the party when the party is under an environmental uncertainty in order to control the exchange partners’ opportunistic behavior. In contrast, weak ties come with potential risks because of the fact that inter-organizational collaborations based on the sparse structure of weak ties do not possess the control and coordination mechanisms governing the exchanging partner’s opportunism. Therefore, participating firms under environmental uncertainty are susceptible to the threats associated with opportunism (Williamson, 1985). For example, firms under environmental uncertainty face opportunism of their suppliers, such as renegotiation for price increase or transferring supply of parts to the competitors who suggest a higher price. However, suppliers in strong ties are likely not to seek short-term interest, but to pursue long-term perspective thereby serving as part of the social control mechanism. Meanwhile, suppliers in weak ties are liable to behave opportunistically, as there is no control mechanism to curb opportunism. Hence, it is possible to propose the following hypothesis:

H3: Network embeddedness moderates the relationship between environmental uncertainty and exchange partners’ opportunism.

Strong ties enable the exchange partners to exchange fine-grained information and tacit knowledge (Uzzi, 1996). In the development of strong ties, inter-firm partners learn about each other’s organization, become more dependent and develop relational trust, as it has been observed in Uzzi’s (1996) study of the New York apparel industry. Based on a deep understanding of a partner’s operations, the focal firm has a belief that the exchange partner has intentions and motives beneficial to the focal firm when new conditions arise, conditions for which a commitment was not made (Ganesan, 1994). For example, focal firm facing environmental uncertainty in a purchase situation tries to find a supplier who is believed to be benevolent to the partners; i.e., the supplier who performs effectively and reliably and is genuinely interested in the welfare of the customer (Doney and Cannon, 1997). In this case, the focal firm’s participation in strong ties enables the focal firm to recognize the supplier who is benevolent to partners through the exchange of fine-grained information and via history of interactions (Powell, 1990; Larson 1992). As such, the focal firm’s participation in strong ties moderates the relationship between environmental uncertainty and benevolence. Granovetter (1973) argues that weak ties are conduits across which an actor can access novel information. Weak ties are beneficial because an embedded actor can obtain novel information through accessing divergent regions of the network. However, a focal firm cannot expect its exchange partners’ benevolence, mutual gain, reciprocity and a long-term perspective, which serve as part of the social control mechanism shown in the strong ties (Larson, 1992). An actor’s collection of weak ties based on sparse structure has no control mechanism to inhibit the partners’ opportunism when they face environmental uncertainty. As such, the following hypothesis is proposed:

H4: Network embeddedness moderates the relationship between environmental uncertainty and exchange partners’ benevolence.

Methodology

Data Collection

The empirical test was conducted with the suppliers for plant engineering company in the context of the relationship between a focal firm in environmental uncertainty and its exchange partners’ opportunism and benevolence. The survey was conducted for 6 weeks from March 5th to April 13th 2012. For this study, total 319 respondents were mailed questionnaires and 153 of them were returned. Five questionnaires were unusable as a result of missing data and, thus, 148 questionnaires were utilized for hypotheses testing for an effective response rate of 46.39 percent. The respondents’ demographic information is shown at TABLE 1. The respondents are working for purchasing department of each company and their positions in the company are directors (N=37, 25% of the total respondents), general managers (N=50, 33.8%), managers (N=37, 25%), and assistant managers and staff (N=24, 16.2%). The respondents’ work experience is classified as over 20 years (N=28, 18.8% of the total respondents), from 11 to 20 years (N=60, 40.5%), from 6 to 10 years (N=39, 26.4%), and 5 years or less (N=21, 14.2%). As such, the respondents who have more than 10 years of work experience account for 59.5% of the total. The respondent firms’ relationship period with the suppliers is classified as over 20 years (N=21, 14.2% of the total respondents’ firms), from 11 to 20 years (N=45, 30.4%), from 6 to 10 years (N=56, 37.8%), and 5 years or less (N=26, 17.6%). Total of 66 firms (or 44.6%) held more than 10 years of relationships with their suppliers.

Measurement Scale Development

The scale development was conducted through existing measures of the focal variables which were collected from the literature. Then, in-depth interviews were conducted with three purchase managers in order to assess the content validity of the measures; consequently, the wording of some of the items was modified. All items were assessed on a 7-point Likert-type scale anchored by 1 (strongly agreed) and 7 (strongly disagreed) as endpoints. Environmental

TABLE 1. Respondents' Demographic Information

<table>
<thead>
<tr>
<th>Category</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Directors</td>
<td>37</td>
<td>25%</td>
</tr>
<tr>
<td>General Managers</td>
<td>50</td>
<td>33.8%</td>
</tr>
<tr>
<td>Managers</td>
<td>37</td>
<td>25%</td>
</tr>
<tr>
<td>Assistant Managers &amp; Staff</td>
<td>24</td>
<td>16.2%</td>
</tr>
<tr>
<td>Work Experience</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;20 years</td>
<td>28</td>
<td>18.8%</td>
</tr>
<tr>
<td>11-20 years</td>
<td>60</td>
<td>40.5%</td>
</tr>
<tr>
<td>6-10 years</td>
<td>39</td>
<td>26.4%</td>
</tr>
<tr>
<td>&lt;5 years</td>
<td>21</td>
<td>14.2%</td>
</tr>
<tr>
<td>Relationship Period</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;20 years</td>
<td>21</td>
<td>14.2%</td>
</tr>
<tr>
<td>11-20 years</td>
<td>45</td>
<td>30.4%</td>
</tr>
<tr>
<td>6-10 years</td>
<td>56</td>
<td>37.8%</td>
</tr>
<tr>
<td>&lt;5 years</td>
<td>26</td>
<td>17.6%</td>
</tr>
<tr>
<td>Number of Firms</td>
<td>66</td>
<td>44.6%</td>
</tr>
</tbody>
</table>
uncertainty principally captured the focal firm’s perceived unpredictability on the supply of parts for major products, the market demand for major products, and the change of technology for major products (Duncan, 1972; Galbraith, 1973; Heide and John, 1990). Opportunism was assessed with the items adapted from John (1984). Benevolence was measured with items adapted from Doney and Cannon (1997). Network embeddedness measures the frequency, intensity and stability of interactions between exchange partners and these dimensions were most frequently occurring within the literature (Antia and Frazier, 2001; Granovetter, 1973; Rindfleisch and Moorman, 2001; Uzzi, 1996, 1997).

**Statistical Analysis**

This study processed data by using structural equation model, SPSS and AMOS software. Structural equation modeling (SEM) is a statistical technique for testing and estimating causal relations using a combination of statistical data and qualitative causal assumptions. SEM allows both confirmatory and exploratory modeling, meaning they are suited to both theory testing and theory development (Bollen and Long, 1993). Confirmatory modeling usually starts out with a hypothesis that gets represented in a causal model. The concepts used in the model must then be operationalized to allow testing of the relationships between the concepts in the model. The model is tested against the obtained measurement data to determine how well the model fits the data. The causal assumptions embedded in the model often have falsifiable implications which can be tested against the data. With an initial theory SEM can be used inductively by specifying a corresponding model and using data to estimate the values of free parameters. Often the initial hypothesis requires adjustment in light of model evidence. When SEM is used purely for exploration, this is usually in the context of exploratory factor analysis as in psychometric design (Bollen and Long, 1993). The strength of SEM is the ability to construct latent variables: variables which are not measured directly, but are estimated in the model from several measured variables each of which is predicted to ‘tap into’ the latent variables. This allows the modeler to explicitly capture the unreliability of measurement in the model, which in theory allows the structural relations between latent variables to be accurately estimated. Factor analysis, path analysis and regression all represent special cases of SEM. In SEM, the qualitative causal assumptions are represented by the missing variables in each equation, as well as vanishing covariances among some error terms. These assumptions are testable in experimental studies and must be confirmed judgmentally in observational studies (Bollen and Long, 1993). SPSS 19.0 and AMOS 18.0 program used in this study are powerful social science statistical software and structural equation model modeling tool. Through the expansion of traditional multivariate data analysis such as regression analysis, factor analysis, correlation analysis and variance analysis, the model can be specified, evaluated,

<table>
<thead>
<tr>
<th>TABLE 1 Measurement Items Validity Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Environmental Uncertainty</strong> (Cronbach’s α =.866)</td>
</tr>
<tr>
<td>The supply of parts for major products in the market is highly volatile.</td>
</tr>
<tr>
<td>It is very difficult to estimate the demands for our major products in the market.</td>
</tr>
<tr>
<td>It is very difficult to estimate the change of technology for our major products.</td>
</tr>
<tr>
<td><strong>Opportunism</strong> (Cronbach’s α =.867)</td>
</tr>
<tr>
<td>Our major supplier sometimes made promises that could not be kept later.</td>
</tr>
<tr>
<td>Our major supplier sometimes altered facts to get what it wanted.</td>
</tr>
<tr>
<td>Our major supplier sometimes deceived us to get what it wanted.</td>
</tr>
<tr>
<td><strong>Benevolence</strong> (Cronbach’s α =.820)</td>
</tr>
<tr>
<td>Our major supplier believed that our prosperity was as important as its prosperity.</td>
</tr>
<tr>
<td>Our major supplier considered our firm’s interest when it made an important decision.</td>
</tr>
<tr>
<td>Our major supplier was concerned about our firm’s growth when it made a business decision.</td>
</tr>
<tr>
<td><strong>Network Embeddedness</strong> (Cronbach’s α =.857)</td>
</tr>
<tr>
<td>Our firm maintained very cooperative relationships with our exchange partners.</td>
</tr>
<tr>
<td>Our firm maintained very amicable relationships with our exchange partners.</td>
</tr>
<tr>
<td>Our firm had enough relational exchanges with our exchange partners.</td>
</tr>
</tbody>
</table>
tested and developed in the intuitive path diagram. Then, hypothesized relationships among different variables can be verified in the path diagram. Reliability refers to the consistency and stability of measurements. The higher the reliability of questionnaire is, the more credible the results get. Reliability test usually uses the method of Cronbach’s α. Generally believed, the value of Cronbach’s α is greater than 0.7 means the questionnaire is of reliability (Nunnally, 1978). The observed variables which are used to measure the latent variables are reflective to be expected to secure internal consistency. The internal consistency was measured by Cronbach’s α which was calculated by using SPSS19.0 program. Cronbach’s α has value from 0 to 1. In general, the coefficient value of greater than 0.8 is regarded as ideal standard value, the value from 0.6 to 0.7 is regarded as acceptable and the value less than 0.6 is regarded as the deficiency of internal consistency (Nunnally, 1978). According to the reliability analysis result by using SPSS19.0 program, all of the Cronbach’s α coefficients turned out to be greater than 0.82 and the internal consistency of the observed variables was secured. It indicated that the questionnaire is of good reliability (TABLE 2).

In statistics, dependence refers to any statistical relationship between two random variables or two sets of data. Correlation refers to any of a broad class of statistical relationships involving dependence. Correlations are useful because they can indicate a predictive relationship that can be exploited in practice. For example, an electrical utility may produce less power on a mild day based on the correlation between electricity demand and weather. In this example there is a causal relationship, because extreme weather causes people to use more electricity for heating or cooling; however, statistical dependence is not sufficient to demonstrate the presence of such a causal relationship. Correlation does not imply causation (Croxton et al., 1968; Dietrich, 1991; Aiken, 1957). There are several correlation coefficients, often denoted ρ or r, measuring the degree of correlation. The most common of these is the Pearson correlation coefficient, which is sensitive only to a linear relationship between two variables (which may exist even if one is a nonlinear function of the other). Other correlation coefficients have been developed to be more robust than the Pearson correlation–that is, more sensitive to nonlinear relationships. The most familiar measure of dependence between two quantities is the Pearson product-moment correlation coefficient, or “Pearson’s correlation.” It is obtained by dividing the covariance of the two variables by the product of their standard deviations (Croxton et al., 1968; Dietrich, 1991; Aiken, 1957). The Pearson correlation is +1 in the case of a perfect positive linear relationship (correlation), −1 in the case of a perfect negative linear relationship (anticorrelation), and some value between −1 and 1 in all other cases, indicating the degree of linear dependence between the variables. As it approaches zero there is less of a relationship (closer to uncorrelated). The closer the coefficient is to either −1 or 1, the stronger the correlation

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>EnvUnc</td>
<td>Pearson Coefficient</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Significant Level</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Opportunism</td>
<td>Pearson Coefficient</td>
<td>.398**</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Significant Level</td>
<td></td>
<td>.000</td>
<td></td>
</tr>
<tr>
<td>Benevolence</td>
<td>Pearson Coefficient</td>
<td>-2.21**</td>
<td>-3.98**</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Significant Level</td>
<td></td>
<td>.007</td>
<td>.000</td>
</tr>
<tr>
<td>NetworkEmb</td>
<td>Pearson Coefficient</td>
<td>-0.79**</td>
<td>-3.41**</td>
<td>0.583**</td>
</tr>
<tr>
<td></td>
<td>Significant Level</td>
<td></td>
<td>.008</td>
<td>.000</td>
</tr>
<tr>
<td>Mean</td>
<td>4.30</td>
<td>5.70</td>
<td>2.05</td>
<td>2.33</td>
</tr>
<tr>
<td>S D</td>
<td>1.49</td>
<td>1.35</td>
<td>0.96</td>
<td>1.11</td>
</tr>
</tbody>
</table>
between the variables (Croxton et al., 1968; Dietrich, 1991; Aiken, 1957). If the variables are independent, Pearson’s correlation coefficient is 0, but the converse is not true because the correlation coefficient detects only linear dependencies between two variables. For example, suppose the random variable X is symmetrically distributed about zero, and Y = X^2. Then, Y is completely determined by X, so that X and Y are perfectly dependent, but their correlation is zero; they are uncorrelated. However, in the special case when X and Y are jointly normal, uncorrelatedness is equivalent to independence (Croxton et al., 1968; Dietrich, 1991; Aiken, 1957). In preparation for structural equation model analysis with AMOS 18.0 program, correlation analysis was conducted to check out correlation between variables using SPSS 19.0 program. The result using SPSS 19.0 program showed that Pearson correlation coefficient showed statistically significant relations between independent variable and dependent variables (indicated by **, TABLE 3). Multicollinearity must be checked out before testing the hypotheses with structural equation model using AMOS 18.0 program. The result showed that multicollinearity was not appeared as Pearson’s coefficients were smaller than .538. If the Pearson’s coefficient is larger than .8, the multicollinearity is a matter of question.

Confirmatory factor analysis (CFA) is a special form of factor analysis, most commonly used in social research. It is used to test whether measures of a construct are consistent with a researcher’s understanding of the nature of that construct (or factor). As such, the objective of confirmatory factor analysis is to test whether the data fit a hypothesized measurement model. This hypothesized model is based on theory and previous analytic research (Klein, 2010). CFA evaluates a priori hypotheses and is largely driven by theory. CFA analyses require the researcher to hypothesize, in advance, the number of factors, whether or not these factors are correlated, and which items/measures load onto and reflect which factors. As such, one can, in contrast to exploratory factor analysis, where all loadings are free to vary, CFA allows for the explicit constraint of certain loadings to be zero (Thompson, 2004). CFA is also frequently used as a first step to assess the proposed measurement model in a structural equation model. Many of the rules of interpretation regarding assessment of model fit and model modification in structural equation modeling apply equally to CFA. CFA is distinguished from structural equation modeling by the fact that in CFA, there are no directed arrows between latent factors. In other words, while in CFA factors are not presumed to directly cause one another, SEM often does specify particular factors and variables to be causal in nature. In the context of SEM, the CFA is often called the measurement model, while the relations between the latent variables (with directed arrows) are called the structural model (Thompson, 2004). Most statistical methods only require one statistical test to determine the significance of the analyses. However, in CFA, several statistical tests are used to determine how well the model fits to the data (Suhr, 2006). Note that a good fit between the model and the data does not mean that the model is correct, or even that it explains a large proportion of the covariance. A good model fit only indicates that the model is plausible (Schemmelle Engel et al, 2003). With regard to selecting model fit statistics to report, one should not simply report the statistics that estimate the best fit, though this may be tempting. Though several varying opinions exist, Kline (2010) recommends reporting the Chi-squared test, the RMSEA, the CFI, and the SRMR. Absolute fit indices determine how well the a priori model fits, or reproduces the data (McDonald and Ho, 2002). Absolute fit indices include, but are not limited to, the Chi-squared test, RMSEA, GFI, AGFI, RMR, and SRMR (Hooper and Mullen, 2008). The chi-squared test indicates the difference between observed and expected covariance matrices. Values closer to zero indicate a better fit; smaller difference between expected and observed covariance matrices. Chi-squared statistics can also be used to directly compare the fit of nested models to the data. One difficulty with the chi-squared test of model fit, however, is that researchers may fail to reject the hypothesis (or accept the model) due to a lack of statistical power and due to small sample sizes (Type I error). Likewise, when a large sample size is used, one may fail to find a model that fits (Type II error). As a result, other measures of fit have been developed (Gatignon, 2010). The root mean square error of approximation (RMSEA) avoids issues of sample size by analyzing the discrepancy between the hypothesized model, with optimally chosen parameter estimates, and the population covariance matrix (Hooper and Mullen, 2008). The RMSEA ranges from 0 to 1, with smaller values indicating better model fit. A value of .06 or less is indicative of acceptable model fit (Hu and Bentler, 1999). The root mean square residual (RMR) and standardized root mean square residual (SRMR) are the square root of the discrepancy between the sample covariance matrix and the model covariance matrix (Hooper and Mullen, 2008). The RMR may be somewhat difficult to interpret, however, as its range is based on the scales of the indicators in the model (this becomes trickier when you have multiple indicators with varying scales; e.g., two questionnaires, one on a 0-10 scale, the other on a 1-3 scale) (Kline, 2010). The

<table>
<thead>
<tr>
<th>TABLE 3</th>
<th>Results of AMOS Analysis for H1 and H2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hypotheses</td>
</tr>
<tr>
<td>EnvUnc →Opportunism</td>
<td>H1</td>
</tr>
<tr>
<td>EnvUnc → Benevolence</td>
<td>H2</td>
</tr>
<tr>
<td>Model Fit</td>
<td>χ²=56.531, df=26, p=.000, GFI=.929, CFI=.981, NFI=.966, AGFI=.877, IFI=.982</td>
</tr>
</tbody>
</table>
standardized root mean square residual removes this difficulty in interpretation, and ranges from 0 to 1, with a value of .08 or less being indicative of an acceptable model (Hu and Bentler, 1999). The goodness of fit index (GFI) is a measure of fit between the hypothesized model and the observed covariance matrix. The adjusted goodness of fit index (AGFI) corrects the GFI, which is affected by the number of indicators of each latent variable. The GFI and AGFI range between 0 and 1, with a cutoff value of .9 generally indicating acceptable model fit (Bentler, 1999).

The comparative fit index (CFI) analyzes the model fit by examining the discrepancy between the data and the hypothesized model, while adjusting for the issues of sample size (Bentler, 1990). Values for both the NFI and NNFI may sometimes erroneously fall beyond the 0 to 1 range (Bentler, 1990). However, this NFI was found to be very susceptible to sample size (Bearden et al., 1982). The non-normed fit index (NNFI; also known as the Tucker-Lewis index, as it was built on an index formed by Tucker and Lewis (1973) resolves some of the issues of sample size, though NNFI values may sometimes erroneously fall beyond the 0 to 1 range (Bentler, 1990). Values for both the NFI and NNFI should range between 0 and 1, with a cutoff of .95 or greater indicating a good model fit (Hu and Bentler, 1999). The comparative fit index (CFI) analyzes the model fit by examining the discrepancy between the data and the hypothesized model, while adjusting for the issues of sample size inherent in the Chi-squared test of model fit (Gatignon, 2010), and the normed fit index (Bentler, 1990). CFI values range from 0 to 1, with larger values indicating better fit; a CFI value of .90 or larger is generally considered to indicate acceptable model fit (Hu and Bentler, 1999). The focal variables were subjected to confirmatory factor analysis (CFA) using AMOS 18.0 program and each of observed variables was filtered. All of the focal variables such as environmental uncertainty, opportunism, benevolence and network embeddedness are the subject of CFA. After this step, a measurement model with acceptable fit indexes was identified ($\chi^2 = 67.11$, df = 48, $p = .04$, GFI = .93, AGFI = .89, CFI = .99, NFI = .97, IFI = .99, RMSEA = .05, RMR = .07) (Segars and Grover, 1993; Bentler and Bonett, 1980; Byrne, 1998). AMOS graphic’s estimate and model fit summary are indicated TABLE 4. In order to assess reliability of measured model, composite reliability and average variance extracted (AVE) are generally utilized. Composite reliability measures internal consistency of construct and is called as construct reliability. High reliability means high internal consistency and the value of construct reliability should be larger than 0.6 (Bagozzi and Yi, 1988) or 0.7 (Hair et al., 1998). In this study, all of the construct reliability appeared larger than 0.84 and all construct showed high level of internal consistency.

Construct Reliability = $(\Sigma$ Standard Factor Loading)$^2/[(\Sigma$ Standard Factor Loading)$^2 + \Sigma$ Standard Error]

Standard Factor Loading: Estimate in Standardized Regression Weight from AMOS 18.0 Output

Standard Error: Estimate in Variances from AMOS 18.0 Output

AVE means the size of variances how much latent variables can be explained by measured variables and the figure should be larger than 0.5 to be regarded as reliable (Fornell and Larcker, 1981). In this study, all of the AVE values showed larger than 0.63 and all of the latent variables were well explained by measured variables (see Table 5).

### TABLE 4

Result for AMOS Analysis for H3 and H4

<table>
<thead>
<tr>
<th>Hypotheses</th>
<th>Coefficient (t-value)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Strong Tie</td>
</tr>
<tr>
<td>EnvUnc→</td>
<td></td>
</tr>
<tr>
<td>Opportunism</td>
<td>H3</td>
</tr>
<tr>
<td>EnvUnc→</td>
<td></td>
</tr>
<tr>
<td>Benevolence</td>
<td>H4</td>
</tr>
<tr>
<td>Free Model</td>
<td>$\chi^2=91.341$, df=52, p=.001, GFI=.888, CFI=.974, AGFI=.806, IFI=.975, RMSEA=.072</td>
</tr>
<tr>
<td>Constraint</td>
<td></td>
</tr>
<tr>
<td>Model (A)</td>
<td>H3</td>
</tr>
<tr>
<td>(Unc→Op)</td>
<td></td>
</tr>
<tr>
<td>H4</td>
<td>$\Delta\chi^2(97.081-91.341)=5.741 &gt; \chi(2.05(1)=3.84: Support (moderating)</td>
</tr>
</tbody>
</table>
Construct reliability and AVE are used to measure convergent validity. Convergent validity refers to the degree to which two different measures are related in measuring the same construct. The larger the value of construct reliability or AVE means the higher the convergent validity is secured (Fornell and Larcker, 1996). Discriminant validity refers to the degree to which one construct is different from the other construct. Discriminant validity is measured by comparing the value between the AVE value of the two constructs and the

( ): t-value, **: significant at 0.05 level

AVE = \[\sum(\text{Standard Factor Loading}^2) / \left[ \sum(\text{Standard Factor Loading}^2) + \sum \text{Standard Error} \right] \]

Standard Factor Loading: Estimate in Standardized Regression Weight from AMOS 18.0 Output

Standard Error: Estimate in Variances from AMOS 18.0 Output

FIGURE 2
Hypothesis Test: H1 and H2 using AMOS 18.0

FIGURE 3
Hypothesis Test: H3 and H4 using AMOS 18.0 (Free Model, Strong Ties)
squared value of correlation coefficient of the two constructs (Fornell and Larcker, 1981; Spreng et al., 1996). According to the results, any squared value of correlation coefficient between the constructs is not larger than AVE value of each construct. As such discriminant validity is secured for all constructs used in this study.

**Test of Hypotheses**
The test of hypotheses was carried out using the structural equation model and AMOS 18.0 was used to perform the analysis. Environmental uncertainty was employed as the exogenous variable, and opportunism and benevolence were utilized as the endogenous variables. The overall model fit indexes show that the model proposed by this study resulted in good results at the $\chi^2$/df, GFI, CFI, NFI, AGFI and IFI. As such, it can be concluded that the model reached an acceptable level and could be used to explain the hypothesis. Environmental uncertainty is positively related to the exchange partner’s opportunism (path coefficient =0.33, $t$=4.80), which supports H1. Meanwhile, envi-

**FIGURE 4**
Hypothesis Test: H3 and H4 using AMOS 18.0 (Free Model, Weak Ties)

( ): t-value, **: significant at 0.05 level

**FIGURE 5**
Hypothesis Test: H3 and H4 using AMOS 18.0 (Constraint Model, Uncertainty-Opportunism)

( ): t-value, **: significant at 0.05 level
Environmental uncertainty is negatively related to the exchange partner’s benevolence (path coefficient = -0.14, t=-2.58), supporting H2 (FIGURE 2).

To assess the moderating effect of network embeddedness (i.e., H3, H4), the sample was split into two groups (strong tie group (N=92) and weak tie group (N=56)) at the median value of network embeddedness and the two subgroups were run in the structural model in which environmental uncertainty was the exogenous variable and opportunism and benevolence were the endogenous variables. To analyze the moderating effect of network embeddedness on the positive relationship between environmental uncertainty and opportunism, two times of structural equation model analysis has to be conducted. The one analysis is free model analysis which does not constrain the relationship between environmental uncertainty and opportunism. The other analysis is constraint model analysis which constrains the relationship between environmental uncertainty and opportunism. Free model analysis showed that the positive relationship between environmental uncertainty and opportunism was consistent with H1 but the path coefficient was divided into low (0.24) in strong tie group and high (0.56) in weak tie group. As the positive sign of path coefficient is consistent with H1 and supported by t-value in both groups, constraint model analysis was conducted to compare the difference in Chi-square value. The Chi-square value difference between the free model and the constraint model (Δχ²: 95.709-91.341=4.368) was larger than 3.84 (significant level of 0.05) and supports the moderating effect of H3 (FIGURE 3, FIGURE 4, FIGURE 5).

\begin{align*}
\text{Free Model: } \chi^2 &= 91.341, \text{ df}=52, p=0.001, \\
\text{Constraint Model: } \chi^2 &= 95.709, \text{ df}=53, p=0.000
\end{align*}

Meanwhile, free model analysis on relationship between environmental uncertainty and benevolence showed the negative sign which was consistent with H2. The value of path coefficient was divided into high(-0.02) in strong tie group and low(-0.36) in weak tie group, even though t-value was supportive only in the weak tie group. However, the Chi-square value difference between the free model and the constraint model (Δχ²: 97.081-91.341=5.74) was also larger than 3.84 (significant level of 0.05) and supports the moderating effect of H4 (FIGURE 3, FIGURE 4, FIGURE 6).

\begin{align*}
\text{Free Model: } \chi^2 &= 91.341, \text{ df}=52, p=0.001, \\
\text{Constraint Model: } \chi^2 &= 97.081, \text{ df}=53, p=0.000
\end{align*}

As a result, the network embeddedness turns out to be a moderator in environmental uncertainty-opportunism link and environmental uncertainty-benevolence link.

**Discussion**

The purpose of this study is to explain the influence of network embeddedness on inter-firm relationship. This study hypothesizes that the relationship between environmental uncertainty and opportunism and the relationship between environmental uncertainty and benevolence are moderated by network embeddedness.

The analytical results support the hypotheses; moreover, this study presents two theoretical implications. First, this study introduces the network embeddedness as the most critical contextual factor to explain the way of manag-
ing opportunism of the exchange partners. In the discussions of managing opportunism, TCA literatures identified several strategies that appear to be capable of solving opportunism problems. The early TCA literatures emphasize the use of monitoring efforts and the incentive structure. In fact, the rationale for vertical integration, as a governance strategy, rests on the ability to control opportunism through monitoring and incentive schemes (Williamson, 1975). The subsequent transaction cost literature has demonstrated that opportunism can be managed through selection and socialization efforts (Ouchi, 1980; Stump and Heide, 1996). The main objectives of these TCA strategies for managing opportunism are reducing information asymmetry as well as reducing payoffs from opportunism (Watne and Heide, 2000). With regard to these TCA prescriptions to manage opportunism, Blois (1990) suggests that firms should look beyond the transaction costs and determine the level of value that may be created by forming networks of relationship. Granovetter (1985) argues that the transaction cost theory has failed to recognize the notion that economic transactions are embedded in social relationships that mitigate the risk of opportunism. Specifically, firms which are embedded in the network of strong ties with the exchange partners are more likely to refrain from seeking opportunism and therefore, develop joint problem solving arrangements (Powell, 1990; Uzzi, 1996). Larson (1992) argues that strong ties incrementally promote and, in turn, enhance mutual gain, reciprocity and a long-term perspective, thereby serving as part of the social control mechanism. In this context, this study introduces and demonstrates the network embeddedness as a critical contextual factor to manage opportunism when firms face environmental uncertainty.

Second, this study attempts to extend the dyadic relationship perspective of the social exchange theory (SET) to the social network theory in explaining the way to promote the benevolence of exchange partners under uncertain environments. SET (Blau, 1964; Thibaut and Kelley, 1959) suggests that the behavior of parties in an exchange relationship cannot be explained only through economic exchanges. They can also be explained through social interactions entailing repeated exchanges, future obligations, and the belief that each party will discharge his or her obligations in the long-run. As such, the main sources of trust are shared values and length of attachment, which ensure effective communication and understanding between parties. This study extends the SET’s perspective on promoting trust through the social exchange relationship to the social network theory by adopting Granovetter’s (1985, 1992) view on network embeddedness. According to Granovetter (1992), economic actions and outcomes, like all social action and outcomes, are affected by the actors’ dyadic relations and by the structure of the overall network of relations. Specifically, strong tie networks are associated with the exchange of high-quality information and tacit knowledge (Uzzi, 1996). In the development of strong ties, inter-firm partners learn about each other’s partnering firms, become more dependent on one another and develop benevolence (Larson, 1992). By adopting the firm’s network embeddedness as contextual factor in promoting benevolence among exchange partners, this study attempts to extend the SET’s dyadic perspective to the social network theory.

Managerial Implications
This study has some managerial implications for the firms to conduct business activities under environmental uncertainty. First, the firms facing environmental uncertainty are likely to be exposed to the opportunistic behaviors of the exchange partners. However, how strongly or weakly firms are embedded in the network of their exchange partners influences the degree of opportunism that they are exposed to. For example, if the supply of parts is volatile due to the lack of inventory in the market, suppliers may act opportunistically by calling a higher price above the market price or by switching the supply of parts to the competing buyer who suggests to pay a higher price than the existing buyer. However, as it is supported by the analytical results of this study, the suppliers participating strong tie networks with the exchange partners are less likely to seek short-term interest, but more likely to pursue long-term perspective (Larson, 1992). Meanwhile, the suppliers participating weak tie networks with the exchange partners are more likely to behave opportunistically because there is no control mechanism to curb the opportunistic behavior of the suppliers (Rowley, 2000). Therefore, the firms facing environmental uncertainty should consider how they are embedded in the network with the exchange partners when they attempt to create measures to control the opportunistic behaviors of the exchange partners.

Second, firms’ participating network embeddedness reduces information asymmetry and promotes the benevolence of the exchange partners under environmental uncertainty. For example, if firms estimate technological changes of their major products, such information should be shared with the suppliers of parts in order to reflect the technological changes to the parts production in the future. Meanwhile, the suppliers would hesitate to invest their capitals for the production of new parts reflecting the technological changes if they have no belief that they can continue to supply the parts to the buyers. In this case, firms’ participation of strong tie networks enables them to recognize the exchange partners who are benevolent to them i.e., the suppliers or the buyers who are to perform effectively and reliably and are genuinely interested in the welfare of the partners (Doney and Cannon, 1997) through the exchange of fine-grained information and the history of interactions (Powell, 1990; Larson, 1992).

Limitations and Future Research
This study has some limitations and future research suggestions. First, the scope of this study is restricted to the suppliers of a construction engineering company, and the firms surveyed represented the first-order vendors between a large construction company and the second-order vendors. As such, generalization of this research results is needed in other industries for cross-validation purposes. Second, this study narrowly focuses on the moderating role of network embeddedness in order to control opportunism and to pro-
mote benevolence. Specifically, the strengths of strong ties are emphasized, such as fine-grained information exchange and social control mechanism, when firms face environmental uncertainty. However, the information obtained from strong ties is likely to be redundant. Granovetter (1973) argues that strong ties tend to bond similar people to each other, and these similar people tend to cluster together such that they are all mutually connected. As such, firms under uncertain environment need to consider which factor is more important for the firms between controlling opportunism and avoiding redundant information. For example, if the samples are classified into traditional manufacturing industry and fast growing IT industry, the moderating effects of network embeddedness in the IT industry may appear to be less significant in comparison with the results of the traditional manufacturing industry. Avoiding redundant information is deemed to be more critical than controlling opportunism in the fast growing IT industry in spite of confronting threats from uncertain environments. For future research, the efficiency of network embeddedness under environmental uncertainty should be conducted in other industries that possess various types of industrial-specific factors.

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