

Relational Trust and Embeddedness*
in Interorganizational Networks
:An Analysis of Quality Control Manager Networks
in Japanese Buyer-Supplier Relations

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Abstract:

The reciprocity and reputation in social networks are considered as important factors to develop mutual trust in interfirm cooperation. Because of new insights gleaned from the embeddedness approach, many researchers discuss this by giving considerable attention to the special quality of ties and the structural properties of social networks that facilitate the building of interorganizational trust. In studies of Japanese buyer-supplier relations, strong and multiplex ties in social networks between managers that span organizational boundaries often facilitate the development of interorganizational trust in goodwill. However, it still remains unclear how social networks actually help the development of interorganizational trust in goodwill. In keeping with the embeddedness approach, the aim of this paper is to consider how a high level of relational embeddedness in the social networks of managers across organizations develops positive recognition of relational trust in goodwill between organizations, and how special properties of structural embeddedness also amplify this trust. To examine this phenomenon, I empirically analyze trust and embeddedness in the social networks of managers within two supplier associations of Japanese electronic manufacturers.

Keywords:

Social Embeddedness, Interorganizational Trust, Goodwill Trust, Japanese Buyer-Supplier Relations

1. Introduction

Cooperation between organizations is considered to be the source of competitive advantage. As interfirm cooperation (such as alliances) become a major strategy, the question about how they are developed arises. Some researchers suggest that firms may enjoy a high level of mutual trust in their cooperation when they have successful and evolutionary relationships (Child and Faulkner, 1998; Ring, 1997). Trust is considered to be an important relational condition for the continuity and development of cooperation between organizations, as it socially decreases transaction costs through the control of opportunism, encourages buyers and suppliers to invest in relation-specific assets and facilitates learning between them (Child & Faulkner, 1998; Lane, 1998; Uzzi, 1996). Child and Faulkner (1998: 46) stress that the evolution of interfirm alliances fundamentally necessitates high levels of mutual trust. The factors that contribute to the development of interorganizational trust have become significant issues in studies of cooperative strategy and interfirm networks. Many researchers argue that social networks of managers across organizations can facilitate the development of trust among organizations (Guralti, 1998; Ring, 1997; Rowley et al., 2000; Uzzi, 1996).

Special kinds of tie quality and structural forms of social networks are considered to assist the development of not only interpersonal but also interorganizational trust. The embeddedness approach demonstrates that special structural properties of social networks — such as the repetition, content and structure of ties — affect organizations' socio-cognition of trust (Dacin et al., 1999: 326). In particular, if social networks can develop reciprocity between directly linked organizations or serve to frequently distribute reputation among indirectly linked organizations, organizational studies show that they are likely to help trust building between organizations (De Laat, 1997; Ring, 1997). Ring (1997) points out that there is a qualitative difference between two types of trust through strong social ties, or reciprocity, and reputation. On the one hand, strong social ties increase the predictability of goodwill by sharing knowledge, values and goodwill through frequent social exchange, so that trust based on goodwill about future long-term collaboration can develop. On the other hand, reputation enhances predictability of outcome so that trust can only develop through risk-taking, estimating one's partner's competence and performance.

It is well known that Japanese *keiretsu* networks, or firm groups of affiliated companies, have relatively deep, long-term and mutual commitments to their cooperation. Dore (1988) and Sako (1992) named this trust relationship "goodwill trust." Furthermore, Sako (1992, 129) points out that the goodwill trust relationship in Japanese long-term buyer-supplier relations is developed by strong and multiplex ties between boundary spanning managers of buyer and supplier firms. Since these ties support the high performance of incremental innovation in quality improvement between buyer and supplier organizations that has been a typical competitive advantage of Japanese *keiretsu* networks, one can say that these trust relationships between the buyer and supplier organizations create this high performance (Dyer, 2000). However, it remains unclear how these strong ties and the multiplex linkage structure of social networks facilitate the development of interorganizational trust based on goodwill, because manager network structures in Japanese buyer-supplier relations (rather than dyads) have rarely been analyzed using social network methods.

The embeddedness approach provides new insight about the development of deep mutual trust and shared goodwill for future commitments. It can show us how the special quality of ties and the structure of interorganizational manager social networks may facilitate mutual expectations of stable, unlimited and shared commitments. This is exemplified by the relational trust in goodwill that is found in Japanese buyer and supplier networks, so called "vertical *keiretsu*." The aim of this paper is to examine how buyer and supplier organizations can foster mutual relational trust in goodwill, based on the embeddedness approach, when they develop reciprocal and multiplex ties between managers. To do this, I analyzed the social networks of quality control managers from both buyer companies and suppliers within their two supplier associations and focused on the effects of social cohesion and multiplex connections upon the development of interorganizational trust between

buyer and supplier organizations. I advance my argument in the following three steps. First, reviewing previous discussions about interorganizational networks and trust from the perspective of embeddedness, I argue that high levels of relational embeddedness develop relational trust in goodwill, while special properties of structural embeddedness facilitate trust in ability and performance. Second, in order to empirically examine these hypotheses, I evaluate data for two networks of supplier associations associated with two Japanese electronic companies in order to analyze the contact network structure of quality managers among buyer and suppliers organizations and consider how characteristics of embeddedness affect socio-cognition of interorganizational trust. I find that strong and cohesive ties affect the cognition of high levels of relational trust in goodwill, and multiplex ties among suppliers amplify it. Finally, I discuss the implication of these case studies, namely that this research may guide the analysis of how embeddedness and the development of relational trust in goodwill may be managed in social networks.

2. Relational Trust and Social Networks

2.1 Interorganizational Trust and Social Embeddedness

Interfirm cooperation is often threatened by conflicts and disintegrates as a result of them. If partner organizations want to continue their cooperation and invest relation-specific assets in it, they may face far greater risk because dissolution would render these assets worthless. Trust between organizations may help cooperation because it stabilizes cooperation and makes these assets safer (Child & Falkner, 1998: ch.2). Moreover, it also enhances cooperation because it may facilitate interorganizational learning between partners. It has therefore become an important issue in cooperation management and strategy (Rosseau et al., 1998). In particular, mutual trust beyond contracts and toward future goodwill is considered as a driving factor of co-evolution in strategic alliances (Ring, 1997).

Many researchers argue for interorganizational trust as a key condition or facilitator of collaboration between organizations. Trust is defined here as an “expectation held by one trading partner about another, in which the other behaves or responds in a predictable and mutually acceptable manner”, according to Sako (1992: 37). Interorganizational trust means that organizations in cooperation share such mutual expectations. Although the development of interpersonal trust drives the development of interorganizational trust, interorganizational trust has a collective nature that necessitates major members’ sharing and legitimizing of trust in organizations (Zaheer et al., 1998: 143). If major members of all organizations share mutual expectations and willingness concerning the cooperation, then interorganizational trust develops. One important function of interorganizational trust is to restrict opportunistic behaviors and to socially reduce transaction cost (Uzzi, 1997).

Social exchanges and communication affect the development of mutual commitment and trust. In particular, many researchers in economics, organizational studies and regional studies have given substantial attention to reciprocity and reputation as two major sources of organizational trustworthiness that are derived from social networks (De Laat 1997: 161-169; Ring, 1997: 127-129). First, strong reciprocal ties between organizations increase the trustworthiness of goodwill towards future commitments because these ties are likely to develop specific mutual commitments and strengthen psychological bonding. Second, reputation increases the trustworthiness of outcomes, or organizational competence and performance. In fact, in regional industries, for example, organizations with good reputations enjoy far more transaction offers than those with poor reputations (Lane, 1998).

Reciprocity and reputation help trust building that is mainly based on interactions in social networks. Interorganizational trust is socially constituted because trust relations are actually shaped by social interactions, cultural integration between people with different backgrounds, and the support of institutional norms and sanctions (Child & Faulkner, 1998, 51-52). Lane (1998) argues that there are two main ways of developing trust: institution-based trust and interaction-based trust. The

former means that institutions provide trustworthiness, while the latter refers to trustworthiness that develops through social interaction. The discussion of trust building through reciprocity and reputation is primarily concerned with the interaction-based construction.

However, as Ring (1997) argues, reciprocity and reputation develop different notions of mutual trust: (1) the predictability of future goodwill to contribute and (2) the predictability of future outcomes based on competence and performance. On the one hand, reciprocity from strong social ties increases the predictability of goodwill. On the other hand, reputation enhances the predictability of outcomes that depend upon competence and competence. In keeping with the suggestion of Yamagishi & Yamagishi. (1994), I distinguish between trustworthiness of intention and competence. Since, as Blau (1964) argues, reciprocal ties tend to develop unspecified obligation and broad commitment in the future, they increase the trustworthiness of intentions for future commitment, that is, goodwill. Following Sako (1992), I call this type of trust "relational trust in goodwill." On the other hand, based on reputation, organizations can be confident about the high trustworthiness of outcomes from partner's competence and performance.. I call this trust "general trust in competence."

As seen in the arguments of Sako (1992) and Ring (1997), prior discussions of the interaction-based evolution of goodwill trust mainly focus on the dyad or triad dimensions of interactions, and only partially consider the structural effects of such interactions. These arguments mainly concentrate on the mechanism whereby special types of interactions in dyads build goodwill trust relationships based on the logic of accumulation. But different structures of interactions bring about different results. For example, reputation is well distributed in dense networks, but not in sparse networks. The embeddedness approach provides us with the new insight that the consequence of interaction depends on a particular relational tendency and structural property of social networks. With regard to trust, the embeddedness approach examines how properties of networks — such as the role of repeated ties and the content and structure of ties — structurally affect the socio-cognition of trustworthiness (Dacin et al., 1999: 326). Along these lines, my analysis also focuses on a process of these effects and it can identify how social networks relationally and structurally affect the development of trustworthiness about ability and goodwill. Different social networks may socially constitute different type of trust. The idea of embeddedness expresses "the fact that economic action and outcomes, like all social action and outcomes, are affected by actors' dyadic (pair wise) relations and by the structure of the overall network relations" (Granoveter, 1992:33). That is, embeddedness means the "contextualization of economic activity in on-going patterns of social relations." (Dacin et al., 1999: 319) Thus the embeddedness approach focuses on the fact that (1) whole tendencies of tie quality and (2) structural forms of social networks affect the economic performance of organizations because they impact access to business opportunities and resources (Uzzi, 1996). In organizational studies, many researchers, including those subscribing to sociological new institutionalism, regard embeddedness as an important factor in social context effects. The embeddedness approach underlines the fact that even economic organizations are influenced by the concrete shapes of social networks that convey information and resource flow. I therefore base my analysis on the embeddedness approach.

To be sure, there are many ideas about the development of trust that can be found in economics and organizational theories. However, the embeddedness approach is the only one that considers the effects of reciprocity and reputation from relational and structural viewpoints. In order to show what the embeddedness approach highlights, I will contrast it with three other major approaches: transaction cost economics, social system theory and social exchange theory. First, in economics, transaction cost economics (TCE) builds a fine model of how firms trust each other as a collaboration problem based on game theory (Milgram & Roberts, 1992). TCE pays a great deal of attention to the process wherein firms cooperate when their cooperative games reach the Nash equilibrium. However, it tends to ignore communication and social exchanges about knowledge, value and norms (Child & Faulkner, 1998: 22, 31). Second, turning to sociology, social exchange

theory (SET) attempts to explain how social exchanges build trust relationships, expanding the analysis unit from dyads to networks (Emerson, 1976). However, SET tends to use economic models such as the equilibrium model and gives less consideration to the role of social context than does the embeddedness approach. Third, social system theory (SST) tends to focus on system or institutional effects on the social cognition of trust, such as the “institutional trust” of Luhman (1968). However, SST largely concerns itself with system effects and ignores specific social effects that result from social networks and contexts.

Although these three earlier approaches in other fields mainly focus on the micro or macro level and overlook the structural effects of interactions on trust building, the embeddedness approach provides us with two insights on this process. First, it examines how social networks facilitate the sharing of information, values and norms while considering the content of ties and the structure of flows in a similar fashion as the sociological new institutionalism. Second, it further considers how social interactions in the form of reciprocal exchanges and reputation distribution structurally shape socio-cognitive conditions for trust as a whole.

2.2 Development of Relational Trust and the Effects of Social Networks

There are differences between the effects of reciprocity and the effects of reputation on trustworthiness. According to the embeddedness approach, they basically affect trust-building in two different dimensions. While the distribution of reputation in social networks differs from structure to structure, reciprocity makes a strong linkage in a particular relation.

Two dimensions of networks can be identified as relational and structural, and as Uzzi (1997) stresses, the embeddedness approach focuses a great deal of attention on the “quality” and “structure” of ties. Granovetter (1985) expressed these as the analytical concepts of relational and structural embeddedness. First, relational embeddedness is the dimensional extent of the quality of ties. Relational embeddedness that concretely includes the strength or content of ties indicates how actors connect in dyads or triads and how much these ties affect economic performance.¹ In this regard, strength, content of ties and cohesion are mainly studied in order to seek strong ties or reciprocal linkages. The strength of ties shows how two actors strongly link. Cohesive subgroups are likely to develop a high degree of specific homogeneity, because cohesive subgroups refer to “subsets of actors among whom there are relatively strong, direct, intense or positive ties” and which tend to have high mutuality and reciprocity of ties (Wasserman & Faust, 1994: 249-252).

Second, structural embeddedness is an analytical concept that applies to the structural dimensions of networks. It is primarily used to examine how the structure of ties organizes flows of resource or information among organizations and affects economic performance (Uzzi, 1996). The positions of actors in the structure are also important units of analysis, because a position refers to a role in the distribution and mobilization of information and resources in a social network. In the analysis of structural embeddedness, density of structure, bridges and block modeling are generally explored. Density tells us how thick ties are connected in a network. In network analysis, bridges are regarded as playing the important role of gatekeeper (in studies of innovation for example (Burt, 2001)) and finding them involves looking for broker ties between separate subnetworks. Block modeling involves sorting out actors with similar positioning in a network structure and identifying similar roles in access or distribution within that network, so it is typically used to analyze roles in a network (Wasserman & Faust, 1994: ch.10).

However, based on the perspectives of these two types of embeddedness, reciprocity and reputation are considered to develop different types of trust in different embeddedness dimensions (Rowley et al., 2000: 372).

First, in the relational dimension, reciprocity that implies strong social ties between particular actors in dyads or triads is likely to facilitate relational trust in goodwill (Rowley et al.,

¹ Uzzi (1996) suggests that since the overall tendencies of relational embeddedness may affect the overall flow of information and resources in social networks, they can be regarded as parts of the total structure’s properties.

2000: 372). As Blau (1964) argues, when actors reciprocally continue social exchanges they tend to create unspecified obligations and share relatively unlimited and particular mutual commitments. They are very likely to recognize the goodwill of others to commit to their current reciprocal relations in the future as well. Thus, reciprocal or strong social ties are likely to develop relational trust in goodwill.

Second, in the structural dimension, a network structure with high density or the existence of many intermediaries which may link many actors and frequently distribute reputation among them is very likely to facilitate the development of general trust in competences and performances (Rowley et al., 2000: 372). As Coleman (1990: 186-188) argues, dense and multiple-linked networks can frequently mediate the reputation of some actor among many other actors and help them to be constantly well informed about that actor's actual state of ability and performance. This facilitates trust in the ability and performance of that actor. Since a great deal of reputation enhances the predictability of outcomes among actors, they can accurately calculate the ability levels and performance of reputed actors. Rowley et al. (2000: 372) argue that a social network with high density or many intermediaries allows actors to enjoy lots of information about reputation so that it functions as a monitoring and sanctioning device.

One can summarize the foregoing arguments about trustworthiness and embeddedness in the two hypotheses below:

Hypothesis 1: An abundance of reciprocal ties among organizations facilitates the development of relational trust in goodwill by enhancing the predictability of goodwill.

Hypothesis 2: Such structural properties as high density or many intermediaries are likely to facilitate the development of general trust in ability and performance by enhancing the predictability of outcomes through an abundance of reputation.

It is worth mentioning that reciprocity sometimes affects and is affected by a reputation effect. On the one hand, reciprocity may amplify reputation with closure. Strong ties amplify the valuation of reputation in a social network if it is relatively closed (Burt, 2001). On the other hand, if, with multiplex channels of reputation, an organization gets a great deal of positive reputation from many channels about maintaining goodwill, then that organization sees much more trustworthiness in their partner's ability to maintain goodwill. Thus it is likely to positively enhance reciprocity. Burt (2001) called this "the bandwidth effect."

2.3 Relational Trust and Japanese Buyer-Supplier Relations

Japanese buyer-supplier relations, especially in vertical keiretsu, provide a typical example of interactions in which social networks develop a long-term and deep mutual commitment that is relational trust in goodwill.² Managers of buyer and supplier companies have frequent communication and contacts concerning research & development, joint production, quality control and so on. Based on her comparative studies, Sako (1992) argues that with such strong social ties, most Japanese buyer-supplier relations have much more particular and unlimited commitment than British contractual relations, and they have a "goodwill trust" relationship. However, few have explored how Japanese companies develop such mutual commitments through social networking. On the contrary, some large Japanese firms have regarded such deep and stable commitments with suppliers as obstacles to radical innovation and started to break them in the 1990s. Such firms appear to face overembeddedness problems. However, they still manage their social networks to restructure buyer-supplier relations. Therefore, the analysis of Japanese social network management

² There are two kinds of keiretsu: horizontal and vertical. Here I mainly discuss the vertical type, such as the Toyota group or the NEC group that consist of a core manufacturing company and its numerous subcontractors, subsidiaries and affiliates for joint production (Hsu, 1994: 199-200)

in long-term buyer-supplier relations still reveals clues about the management of embeddedness.

In the automobile and consumer-electronic industries, Japanese buyer-supplier relations are typically characterized by deep mutual commitment. In comparison to arm's length relations (ALR) wherein buyers and suppliers in a market, and tend to take opportunities, Sako (1992) expressed such a mutual committed relationship like the Japanese buyer-supplier relations as obligation contractual relations (OCR) wherein buyers and suppliers share an obligation to cooperate for common future over the written contract. She points out that OCR is supported by goodwill trust, while cooperation on ALR is based on competence or contractual trust. This comparison indicates differences in the width and depth of mutual commitment in each relationship. Goodwill trust is the relation that includes mutual expectations of a willingness to contribute more than the contract demands, while contractual trust mainly implies mutual expectations of contractual compliance.

Goodwill trust is developed through special properties in the social networks of managers that span buyers and suppliers. Sako (1992, 129) argues that frequent mutual contacts and multiplex linkages between boundary spanning managers across organizations deepen mutual commitments and interorganizational learning. In particular, the supplier association is a key institutional setting for such development. A supplier association (*kyōryoku-kai*) is a firm group in which a major buyer firm organizes main supplier firms for the improvement of productivity, technology, quality and management. This association has two main functions. First, thereby creating strong ties with suppliers, a large buyer encourages them to share information about their technology, production plans, management know-how and quality control methods. Second, the association also encourages suppliers to learn the best practices from not only the buyer but also from other suppliers in order to improve their technology and management. In the discussion of supplier associations, many researchers assume that suppliers also share many horizontal, strong, reciprocal and multiplex ties and thus uniformly share homogeneous information with each other (Sako, 1992; Cusmano & Takeishi, 1991). However many researchers mainly concentrate upon the analysis of dyads between buyers and suppliers and only partially examine horizontal ties among suppliers.

In particular, collaboration and learning about quality control and improvement between a buyer and supplier organization constitute a typical case of this networking and trust building. Supplier quality control (SQC) means the special quality control management in which a buyer encourages suppliers to collaborate in order to economically and effectively produce goods of the quality which a buyer requires (Sasaki eds. 1991^{2e}: 9). In supplier quality control, it is essential that a buyer company receives continuous contributions from their major suppliers and encourages them to engage in continuous organizational learning for quality control and improvement. Thus, as Parker & Edwards (2002) suggest, it is very important for a buyer to build a mutual trust in quality management with their major suppliers. Goodwill trust is an especially effective relational condition for this (Sako, 1992). A supplier association often facilitates its development with dense networking among quality control managers of buyer and suppliers.

However, because they largely fail to use the embeddedness perspective to examine the qualities and structure of networks in Japanese buyer-supplier relations, the main conventional arguments about these relations suffer from two basic problems. First, they tend to focus on dyad exchanges between a buyer and suppliers and fail to examine the shaping effects of social networks among them, so they miss structural effects of ties. Second, they tend to regard all buyer-supplier relations as relatively uniform, so they ignore differences in the content of ties and their effects among subgroups or subnetworks. We therefore need to pay much more attention to the effects that the quality and structure of ties have on the development of trust.

From the embeddedness approach, the network characteristics of Japanese buyer-supplier relations can be considered in two ways. First, in terms of relational embeddedness, reciprocal ties among buyer and supplier organizations facilitate the development of relational trust in goodwill. Second, the multiplex tie structure between a buyer and its suppliers further amplifies this trust, because reputation from many channels reinforces the reputation of maintaining goodwill. I will

examine these points with a network analysis of social networks in two supplier associations of two Japanese electronic companies in Japan. In doing so, I will also examine how a buyer company shapes social networks in its supplier associations in order to manage embeddedness and trust.

3. The Empirical Research concerning Social Embeddedness and Trustworthiness in Supplier Associations

3.1 Social Networks in Supplier Associations.

I have empirically conducted primarily survey, and additionally interview, research about social networks in two supplier associations of Japanese electronics manufacturers in order to examine how social networks affect suppliers' cognition of trustworthiness about buyers' goodwill. I have focused on the investigation of how relational and structural embeddedness affects the cognition of relational trust in goodwill.

I investigated two supplier associations of two electronic manufacturers: Tohoku Ricoh Co. Ltd. (Tohoku Ricoh), the subsidiary production company of Ricoh Co. Ltd., and Tohoku Pioneer Corporation (Tohoku Pioneer), the subsidiary production company of Pioneer Corporation (See Tab. 1).

These two companies have their own supplier associations. Tohoku Ricoh's supplier association has 30 supplier firms, while Tohoku Pioneer's has 48 suppliers. Many suppliers in both associations are small-medium sized enterprises (SMEs) in electronic and machinery manufacturing that are located near buyer companies and have histories of continuous transactions that are more than twenty years long (See table 2). However, they do not depend on one buyer and instead trade with more than 150 companies. Most of them are not done capital participation not do receive any managers from buyers. Both buyers organized supplier associations in order to encourage their main suppliers to share information about their production plans, quality control methods and basic production technology with not only buyers but also other suppliers.

3.2 Data and method

I gathered data about supplier quality control (SQC) related manager contact networks comprised of buyers and suppliers in both supplier associations, and examined this data to see if such networks affected suppliers' cognition of buyers' trustworthiness. These SQC-related managers include managers of quality control and purchasing in the buyer firm, and managers of quality assurance and sales and sometimes even general managers in supplier firms. In both associations, SQC-related engineers and managers of buyers and suppliers frequently exchange information about basic production technology and quality control. In other words, they have contact networks. I examined these interorganizational ties primarily through the use of mailed surveys sent to all suppliers in both supplier associations concerning contact ties, the trustworthiness of buyer firms and their QC performance. I also interviewed SQC-related managers of two buyer companies and four main suppliers during 2000 to 2001.³ From these ties, I have constructed two social networks of two supplier associations.

Using the survey data, I first used the network analysis method to analyze the tie strength and structural form of SQC-related managers' social networks among buyers and suppliers. In the questionnaire survey, I asked for information on five points: (1) years and share of transactions between buyers and suppliers, (2) organization and activities concerning quality control, (3) contacts per year among buyers and suppliers, (4) buyer's trustworthiness in goodwill and competence, and (5) suppliers' performance of quality control. Following this analysis, I then added interview data and focused on examining how relational and structural properties of networks affect trustworthiness and the performance of quality control.

³ The return rate of questionnaire is 88.5 % (69 returns from 78 suppliers).

Table 1. Profiles of Tohoku Ricoh and Tohoku Pioneer (2002)

Items / Companies	Tohoku Ricoh Co. Ltd. (Tohoku Ricoh)	Tohoku Pioneer Corporation. (Tohoku Pioneer)
Main Products	Printing machines, related parts	Speakers, Car audio system
Established year	1967	1966
Capital	18.95 Million USD	90.07 Million USD
Sales	619.68 Million USD	459.43 Million USD
Employees	1404	1289
Parent Company	Ricoh Co. Ltd.	Pioneer Corporation
Location	Yamagata Pref, Japan	Miyagi Pref. Japan
Suppliers	396 suppliers	117 suppliers
Supplier Association (SA)	Have	Have
No. of Suppliers in SA	30 suppliers	48 suppliers

*Exchange Rate 1 USD = 119.90 JPY (Dec, 2002)

Table 2. Average Profiles of Suppliers in Supplier Associations

Items	Average
Employees	175.04 people
Capital	58.89 Thousands USD
Operation Years	38.46 years
Location	63.8% are in 3 pref. near buyers
Products	23.9%: Machining-Metal Processing 2.9 %: Electronic devices
No. of Customers	153.75 companies
Share of Tohoku Ricoh or Pioneer in Whole Sales	75.1% of suppliers have share under 50%
Years of Transaction with both buyers	24.26 years

(a) Independent Variables

As unidirectional ties between organizations, I asked about and counted communication contacts of SQC-related managers not only between a buyer and supplier but also among suppliers in both supplier associations (See fig 1). These contacts concern the exchange of information and advice that is mainly related to quality management. With these ties, I constructed two social networks between a buyer and its suppliers in two supplier associations. These networks do not overlap.

The independent variables are variables of embeddedness. Using several methods of social network analysis, I identified and compared groups of supplier organizations with high and low embeddedness. In the relational one, I used strength of ties and social cohesion. On the other hand, for the structural one, I identified structurally equivalent groups with the block model analysis, and calculated the information centrality of each supplier as an indicator of positioning in information flows.

(b) Dependent Variables

The dependent variables are four aspects of buyer trustworthiness in the senses of goodwill and competence (Appendix A). In terms of relational trustworthiness of goodwill, I asked suppliers if they expect a buyer to have goodwill towards continuous collaboration with suppliers (G-1) and long-term support for them (G-2). I averaged the sum of both to the “average index of trustworthiness of goodwill (G-M).” In terms of general trustworthiness of competences, I asked suppliers how they evaluate a buyer’s level of quality control capability (A-1) and the effects of advice received from that buyer (A-2). I also averaged the sum of both to the “average index of trustworthiness of competence (A-M).” In each aspect, I measured four grades of trustworthiness.⁴

I also asked suppliers about their performance of quality improvement as an independent variable. I asked them if the ratio of rejected goods over the past three years has increased or decreased (P-1), and I also inquired about the number of claims in the past three months (P-2).

3.3 Results

(a) Tie Quality and Network Structure

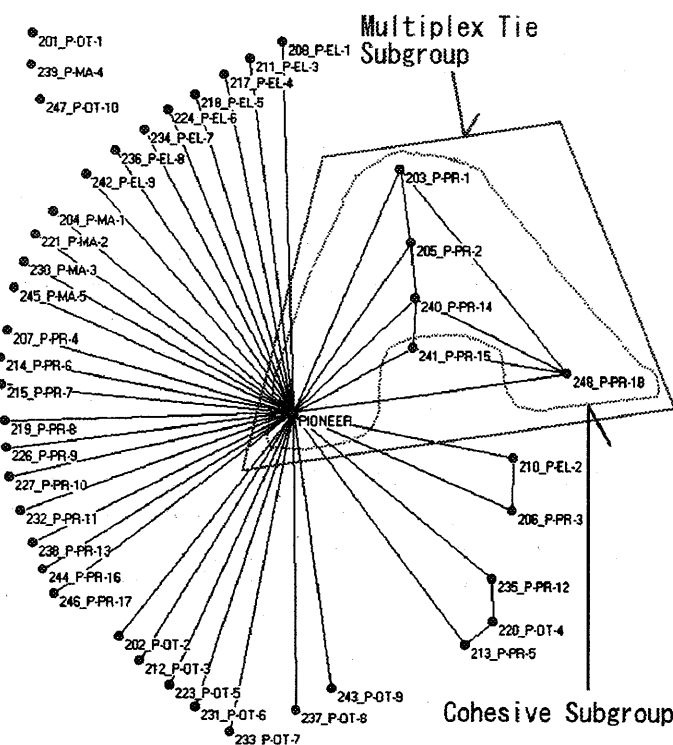
First of all, I examined the properties of social networks’ embeddedness in both supplier associations, jointly analyzing the data of contact ties of SQC-related managers in both supplier associations. I identified similar embeddedness in both supplier associations, regarding to relational and structural dimensions

In terms of relational embeddedness, buyers and suppliers on average have strong ties with great variances in the strength indicator (contact frequency), and form cohesive subgroups. In terms of tie strength, SQC-related managers from a buyer and its suppliers make contact on average 11.50 times per a year. Among suppliers, SQC managers (mainly general managers charged with QC) make contact an average of 7.81 times per a year. Taking ties between a buyer and suppliers and dividing supplier organizations by the median number of contacts (20 times per year),⁵ I distinguished two groups as a “strong tie subgroup” and “weak tie subgroup.” In terms of social cohesion, I also identified cohesive subgroups by a clique finding method: following standards from Barnes (1969: 64), I chose a set of cliques more than five nodes in number and 0.7 in density. I distinguish “cohesive subgroups” as very reciprocal subgroups. Suppliers in cohesive subgroups have more frequent contacts (an average of 29.13 times) with a buyer than the other suppliers (8.90 times), and this gap is statistically significant. A characteristic of suppliers in cohesive subgroup is to have far fewer customers (an average of 11.63 customers) than the other suppliers (173.70 customers on average). For cohesive subgroups, transactions with Tohoku Ricoh or Pioneer are more valuable than those with others. Furthermore, from interviews with suppliers and buyers, buyers are willing to give far more advice, resources and help to core suppliers, because these

⁴ I gave four grades from “we feel it very much (4 points: max)”, to “we feel it (3)”, “we don’t feel it much (2)”, and “we never feel it (1).”

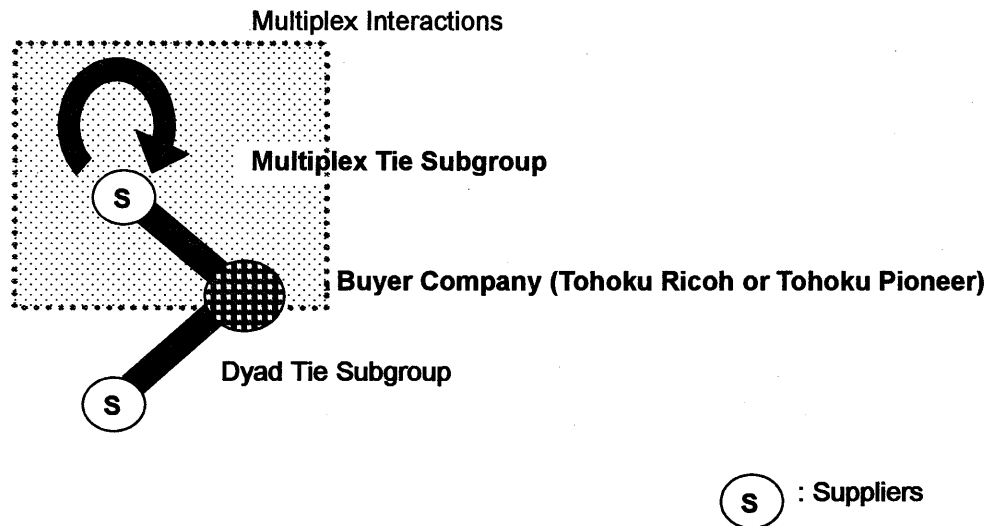
⁵ Because the variance of contacts is very large, dividing by average value is meaningless.

(b) Communication Networks in Tohoku Pioneer's Supplier Association



* Notes: Each of Nodes mean buyer and supplier firms. "Ricoh" and "Pioneer" are buyers and others are suppliers.

Fig. 2 Multiplex Tie and Dyad Tie Subgroup in Supplier Associations



Next, in terms of structural embeddedness, I sought out multiplex tie subgroups and suppliers with advantageous positions in information flow. First, in examining the structural equivalence of linkages using the block model analysis (Wasserman & Faust, 1994: ch.10), I was able to extract two subgroups -- a "multiplex tie subgroup" and a "dyad tie subgroup" -- that exist only between a buyer and a supplier (See fig.1 & 2). The former has multiplex linkages between a buyer and suppliers, including horizontal ties between suppliers in particular. The latter has only dyad ties between a buyer and a supplier and no horizontal ties between suppliers. A characteristic of suppliers in multiplex tie subgroups is to have far fewer customers (an average of 28.40 customers) than the other suppliers (176.55 customers, on average). Multiplex tie groups have slightly stronger transactions. Suppliers in them locate in the same prefecture as or ones adjacent to the buyer's, and much closer to a buyer than other suppliers. Second, as I calculated the information centrality index to be an average of 0.4074 (variance = .0008), I had more than ten suppliers with positioning in information flows from more than two organizations.

(b) Network Effects on Buyer's Trustworthiness

I modeled the hypothesis that relationally embedded (i.e. strong and cohesive) ties are likely to let suppliers with such ties perceive a higher relational trustworthiness of goodwill than those without them.

The average recognition of trustworthiness in every aspect is high (See fig.3). However, a higher level of relational embeddedness is likely to increase the cognitive level of the trustworthiness of a buyer's goodwill (See Tab.3). Strong tie groups see higher relational trustworthiness in a buyer than those with weak ties, in terms of the average trustworthiness of goodwill. Suppliers in cohesive subgroups tend to see a buyer's goodwill towards continuous collaboration as being more trustworthy than do other suppliers. Although differences in scores are not very large in all the indexes of goodwill trust, I can nevertheless confirm the positive effects of relational embeddedness on the cognition of goodwill trustworthiness.

Fig. 3 Average Scores of Buyers' Trustworthiness

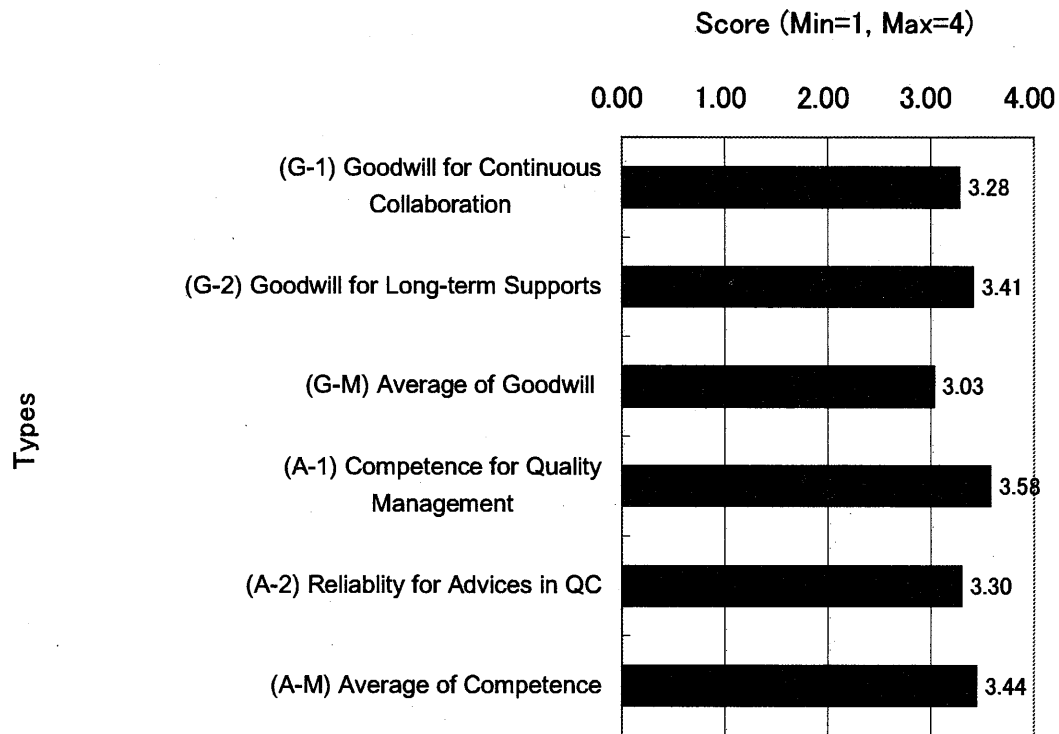


Table 3. Embeddedness Effects on Average Score Trustworthiness of Buyers

Types of Embeddedness	Analysis Method	Index	Types of Trustworthiness	Groups	Average Score of Trustworthiness	Significance Of Gap
(A) Relational (Dyad)	Strength of Ties	Annual Average of Contacts	(G-M) Average of Trustworthiness of Goodwill	Strong Tie Subgroup	3.28	***
				Weak Tie Subgroup	2.78	
			(A-M) Average of Trustworthiness of Competence	Strong Tie Subgroup	3.61	***
				Weak Tie Subgroup	3.27	
	Cohesive Subgroups	Cohesive Cliques	(G-1) Goodwill in Continuous Collaboration	Cohesive Subgroup	3.83	**
				Rests	3.22	
(B) Structural (Role)	Structural Equivalence	Multiplex of Ties	(G-1) Goodwill in Continuous Collaboration	Multiplex Tie Group	3.78	**
				Dyad Tie Group	3.20	
			(G-2) Goodwill in Long-term Supports	Multiplex Tie Group	3.78	**
				Dyad Tie Group	3.35	

*1: Range of Score is from 1 (Min) to 4 (Max).

*2: (**): p-value < 0.05; (***): p-value < 0.01.

*3: (G-M) is average score of trustworthiness of goodwill: average of sum of (G-1) and (G-2). (A-M) is also average score of trustworthiness of competence: average of sum of (A-1) and (A-2).

Table 4. Correlation between Information Centrality (C_i) and Trustworthiness Score

Types of Trustworthiness	correlation coefficient with C_i
(G-1) Goodwill in Continuous Collaboration	0.39 ***
(G-2) Goodwill in Long-term Supports	0.41 ***
(G-M) Average of Trustworthiness of Goodwill	0.42 ***

*: (**): p-value < 0.05; (***): p-value < 0.01.

Table 5. Relational Embeddedness and QC Performance

(1) Strength of Ties and No. of Claims in Recent 3 Months

Strength of Ties / No. of Claims	Strong Tie Group	Weak Tie Group	Sum
Less than 2 times	19	29	48
More than 3 times	13	3	16
Sum	32	32	64

*: Chi Square = 8.333 (p -value < 0.01)

(2) Cohesive Subgroups and No. of Claims in Recent 3 Months

Cohesive Subgroups / No. of Claims	Cohesive Subgroups	Rest of All	Sum
Less than 2 times	4	48	52
More than 3 times	4	13	17
Sum	8	61	69

*: Chi Square = 3.133 (p -value < 0.1)

Next we move to an examination of structural embeddedness. With structural equivalence analysis, if suppliers are positioned in multiplex ties between a buyer and suppliers, they tend to view more trustworthiness in goodwill than suppliers that are only in a dyad with a buyer. In addition, multiplex tie subgroups in the two networks mostly overlap with cohesive subgroups; however, they show high levels in both goodwill scores. This shows that multiplex ties apparently enhance the trustworthiness of goodwill. Next, in terms of an actor's power to control information flow, Information Centrality (IC) expresses the value of a position in a network. The information centrality index⁶ focuses on "information contained in all the paths originating with a specific actor" (Wasserman & Faust, 1994: 194). The information centrality of suppliers and the trustworthiness of goodwill positively and statistically significantly correlate by the Spearman correlation index (See Table 4). This shows that suppliers that are in the central positions of information flows are likely to view a buyer's goodwill as trustworthy.

⁶ The information centrality index $CI(n_i)$ (an actor n_i) can be calculated using the following formula (Wasserman & Faust, 1994: 194-196): $CI(n_i) = 1/(c_{ii} + (T - 2R)/g)$ where T is the sum of the diagonal entries of the matrix and R is any one of the row sum. c_{ij} is the element of the inverse matrix of the graph matrix N .

(c) Network Effects on SQC Performance

In terms of a decrease in rejected products and claims, I tried to examine network effects on quality management performance. However, I discovered few effects (See Tab. 5). High levels of relational embeddedness variables affect only the number of claims in the most recent three months. Buyers find it easier to make claims against suppliers with strong ties than those with weak ties, and cohesive subgroups tend to have slightly more than the rest of the suppliers. Thus, suppliers that have more relationally embedded ties with a buyer are likely to get more claims about quality problems, probably because of the frequent communication between them.

4. Discussion

This research suggests that 1) a high level of relational embeddedness promotes a positive evaluation of the trustworthiness of a buyer's goodwill through reciprocity, and 2) the special properties of structural embeddedness amplify this. These implications suggest that, even in core supplier groups, the level of trust building between buyers and suppliers depends on differences in tie quality and the structural form of interorganizational networks. Thus, the mechanism of embedding and trust building requires further clarification.

As I discuss above, the level of embeddedness affects trust building in two ways. First, in the dyad relational dimension, reciprocal exchanges enhance the predictability of goodwill because they make unspecified obligations and increase mutual expectations of future commitments. Second, in the structural dimension of social networks, if organizations can enjoy multi-channeled distribution of reputation through densely connected linkages or intermediaries, it such organizations feel a high level of predictability about the ability and performance of their partners. My empirical examination of two social networks of QC-related managers in two supplier associations certainly acknowledges these embeddedness effects. In terms of relational embeddedness, strong tie subgroups and cohesive subgroups tend to see more trustworthiness in a buyer's goodwill towards continuous collaboration and long-term support. Positioning in multiplex ties also amplifies the trustworthiness of goodwill because the frequent and wide distribution of a buyer's reputation for maintaining goodwill makes suppliers in such positions easily reassured about the buyer's goodwill.

Although structural viewpoints suggest that mutuality in tie quality and multiplex in structural properties in social networks can facilitate relational trust in goodwill in Japanese buyer-supplier relations, conventional discussions of manager networks in these relations tend to neglect structural perspectives. Structural viewpoints also clarify the fact that supplier associations are effective institutional settings for building trust in goodwill. Conventional discussions also tend to regard all interorganizational network ties as homogeneous, meaning strong and equally dense. But from the structural viewpoint of the embeddedness approach, tie quality, network structure and levels of trustworthiness differ from area to area in networks. Characteristics of embeddedness in each subnetwork affect the positive recognition of trustworthiness in goodwill. Moreover, positioning in multiplex ties amplifies this trustworthiness, although complex effects between relational and structural embeddedness remain unclear and require further investigation.

My research suggests that networking may be used to actively manage embeddedness and trustworthiness. In the interview data, a buyer intentionally builds networking with core suppliers in order to give a great deal of information, technological advice and human- and machinery resources. Since, as Dacin et al. (1999) argue, the management of embeddedness is still a green field of research, however, there may be several other ways to accomplish the same ends, by investing in relationships for example. The embeddedness approach can suggest how to manage embeddedness and trustworthiness by building special networks.

The recent phenomenon of keiretsu disorganization -- as seen in the reform of Nissan's keiretsu supplier networks by Carlos Ghosn, the Nissan CEO from Renault -- seems to break trust between a buyer and its suppliers. However, based on the embeddedness approach, we can still recognize these structural reforms as a way of managing embeddedness and trustworthiness.

Because overembeddedness makes networks inflexible and less innovative (Uzzi, 1996), it seems to bring about the disorganization of keiretsu networks. However, the embeddedness approach shows us that the organization and restructuring of current Japanese buyer-supplier relations is actually located on the same continuum as the management of embeddedness in interorganizational networks. Nevertheless, we need more empirical research concerning the management of embeddedness and trustworthiness through interorganizational networking in order to understand how the interorganizational learning mode changes.

Appendix A. Questions about Networks and Trustworthiness

I used the following questions as measurements.

- (1) Measurement of Trustworthiness (4 grade evaluation)
 - (G-1) Our collaborative relation with the buyer (Tohoku Ricoh or Pioneer) will continue for a long time.
 - (G-2) We think that the buyer's support for our QC includes long-term support for our growth.
 - (A-1) We think the QC capability of the buyer is very high.
 - (A-2) We think that the buyer's advice regarding our QC management is very helpful.
- (2) Contacts with a Buyer

How many times in a year do you make contact with each of following managers of the buyer?

 - (a) Quality control or assurance managers
 - (b) Purchasing managers
- (3) Contacts with Other Suppliers

Have you contacted any manager of any other supplier in your supplier association?

 - (a) What supplier
 - (b) With which manager of this supplier
 - (c) How many times in a year
- (4) Performance of Quality Management
 - (a) Your company's ratio of rejected goods has decreased in the past three years of production for the buyer.
 - (b) How many claims have you received from the buyer in the past three months?

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