The impact of supply chain relationship quality on cooperative strategy

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ARTICLE INFO

ABSTRACT

This paper focuses on the construct of supply chain relationship quality (SCRQ) and the influence of SCRQ on cooperative strategy. In this paper, we first conceptualize SCRQ from manufacturer-based perspective using interaction approach. Second, we introduce cooperative strategy as a research construct to reflect the strategies both parties took in the further development of business relationships, and use persistence, frequency, and diversity to represent three features of cooperative strategy. A conceptual model incorporating SCRQ and cooperative strategy is examined with data collected from 311 manufacturing firms in West China. The results indicate that SCRQ can be defined as a construct of communication, cooperation, trust, adaptation, and atmosphere, and SCRQ has a significant positive impact on relationship persistence, relationship frequency, and relationship diversity.

1. Introduction

There is an increasing interest in inter-firm relationships, as more firms rely on resources outside their own firm to compete successfully with the trend of globalization and technology transformation. Great many firms begin to build cooperation relationships with other firms via supply chain. The term of supply chain has been the focus of scholars and practitioners on its appearance. Many scholars have adopted different theories to explain the nature of supply chain relationship, which includes transaction cost theory, resource dependence theory, and industrial network view (Williamson, 1979, 1981; Pfeffer and Salancik, 1978; Ulrich and Barney, 1984; Håkansson and Johanson, 1988).

From the organization management perspective, most firms tend to develop close relationship with main suppliers. Especially for key components, sole or dual supplier relationships have become the norm rather than an exception. The relationships between and among manufacturer/supplier, distributor/retailer, and salesman/customer have been investigated in existing literatures. Some scholars have provided many insights into the nature and mechanism of above buyer–seller relationships. They have integrated models of business-to-business (B2B) interactions (Ulage and Eggert, 2006), and have adopted the term of "relationship quality" to investigate buyer–seller relationships. Most of these studies were conducted in the Occident or in Japan, and they focused on the dimensions of B2B relationship quality (Lages et al., 2005; Huntley, 2006; Woo and Ennew, 2004), the direct

effect of relationship quality on satisfaction, loyalty, and performance (Fynes et al., 2004, 2005a; Woo and Ennew, 2004; Rauyruen and Miller, 2007), as well as the antecedents (openness, friendship, etc) of relationship quality (Large, 2005). Because of the effect of various factors, relationship quality may behave differently in different countries (Lages et al., 2005), and the management of buyer–seller relationships may be different too.

Successful business relationships are vital for firms in supply chain. The understanding of the development and change of relationships between partners benefits successful business relationships. Few studies have focused on the development and change of business relationships. For instance, Ford (1980) has illustrated the development of buyer–seller relationship with a five-stage model, i.e., the pre-relationship stage, the early stage, the development stage, the long-term stage, and the final stage. However, Ford (1980) just described the evolutionary process of business relationships. Little is known about how to forecast the development and change of business relationships. In the development of business relationships, the parties will take different strategies. These strategies include terminating relationships, maintaining relationships or extending relationships, and these strategies determine the development and change of business relationships. In this paper, we devote our attention to how to forecast the further development and change of business relationships instead of focusing on the evolutionary process of business relationships, and we introduce cooperative strategy as a research construct to reflect the strategies both parties took in the development of business relationships. Specifically, we are concerned about the influence of the quality of partnership on the cooperative strategy in the context of supply chains. Two main questions in this study are: (1) what are the dimensions of supply

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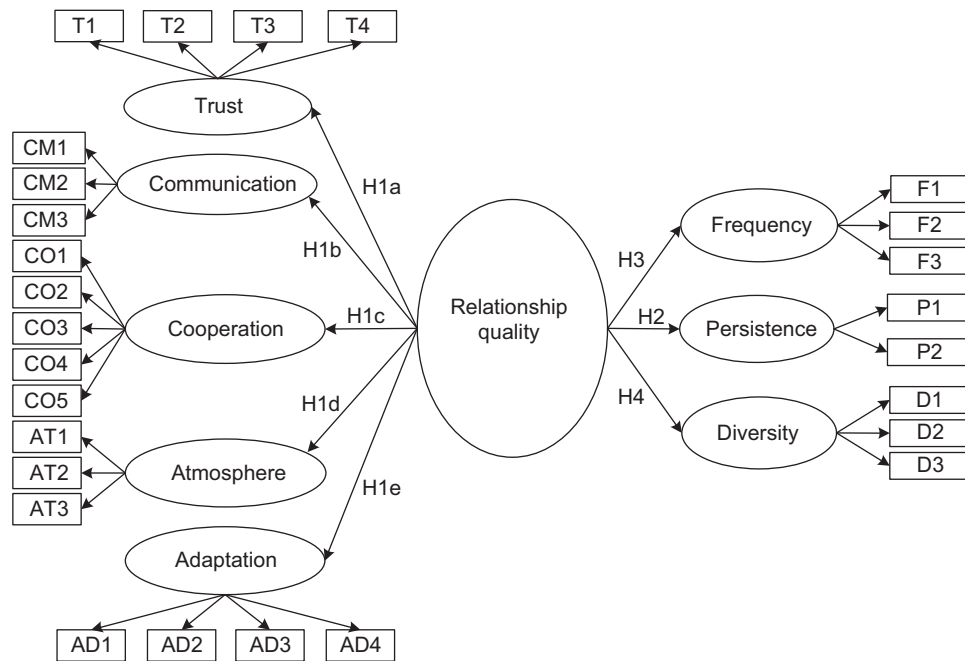E-mail address: qinsu@mail.xjtu.edu.cn (Q. Su).

Fig. 1. Conceptual model.

chain relationship quality? (2) how does supply chain relationship quality (SCRQ) influence the cooperative strategy?

In this paper, the authors analyze the features of supply chain relationship and the critical dimensions of SCRQ using interaction approach, and then develop a conceptual framework incorporating dimensions of SCRQ and cooperative strategy from manufacturer-based perspective. Following is the structure of this paper. The authors first review literatures in the fields of relationship quality and identify the relationships between SCRQ and cooperative strategy. The conceptual model (as shown in Fig. 1) and hypotheses of this paper are then presented. Third, the authors describe the study method and test the model based on questionnaire survey. Finally, the authors summarize the major findings of this research as well as their implications for theory and managerial practice, and directions for future research are presented.

2. Theory background and hypotheses

2.1. SCRQ and cooperative strategy

This section devotes to the dimensions of SCRQ and the link between SCRQ and cooperative strategy. To begin with, we will provide a brief background on supply chain relationships.

2.1.1. Supply chain relationships

Many theoretical frameworks contribute to explaining supply chain relationships, including transaction cost theory, resource dependence theory, and industrial network view. These theories interpret the nature of supply chain from different perspectives. Transaction cost approach holds the motivation for firms to build relationship with each other is to decrease the transaction cost, and Williamson (1981) defined transaction cost as the economic counterpart of friction: do the parties of the transaction operate harmoniously or are there frequent misunderstandings and conflicts that lead to delays, breakdowns, and other malfunctions? In Harrison's (2004) opinion, business relationship is a particular governance structure to efficiently manage transactions characterized by a particular combination of transaction frequency,

uncertainty, degree of asset dependencies, and various fixed human behavioral characteristics. Resource dependence theory views inter-firm governance as a strategic response to the uncertainty and dependence (Pfeffer and Salancik, 1978). This theory is based on the assumption that the resource organizational survival depended on is scarce (Ulrich and Barney, 1984), and organizations use their relationships to gain access to the resources. The industrial network view approach is concerned with understanding and explaining the dynamics of developing, maintaining, and terminating inter-organizational exchange relationships (Håkansson and Johanson, 1988). According to the industrial network approach, business relationships involve interactions between actors in long-term exchange relationships embedded with industrial networks.

As we know, when both parties in supply chain interact, supply chain relationship occurs. The process of interaction includes short-term exchanges and long-term relationship behaviors. Long-term relationship behaviors are essential for maintaining long-term cooperation, and supply chain relationship tends to be considered as a long-term relationship. Keller (2002) found that supply chain may be strengthened through the long-term, mutually beneficial relationships among supply chain members. Lages et al. (2005) considered long-term orientation as the key dimension of relationship quality in their study on the relationship quality in exporter and importer. Saad et al. (2001) also identified long-term and steady relationship intra- and inter-organizations as the key feature of supply chain management. Fynes et al. (2004) stressed that one of the most significant uncertainties in supply chain comes from behavioral uncertainty, which includes opportunism and bounded rationality, and they stressed that the formation of close long-term relationship is an effective means to reduce uncertainty. Moreover, the existing close long-term relationships between buying and selling companies in supply chain are a powerful barrier to the entry of another company.

2.1.2. The IMP interaction approach

As an important interaction model in B2B marketing, Industrial Marketing and Purchasing (IMP) Group interaction model

identifies and explains the nature and processes of buyer–seller interaction. The IMP model is based upon data from a large number of case studies of buyer–supplier relationships in five European countries. The theoretical basis is inter-organizational theory and transaction cost analysis (Olsen and Ellram, 1997). The IMP model identified four groups of variables that describe and influence the interaction between buyer and seller. These include the interaction process which embraces short-term exchange episodes (e.g. product/service exchange, information exchange, financial exchange, and social exchange) and long-term relationship behaviors (e.g. institutionalization/cooperation and adaptation), the atmosphere affecting/affected by the interaction (such as power, dependence, and social distance), the participants in the interaction process, and the environment in which the interaction takes place (such as economic and social variables) (Olsen and Ellram, 1997; Woo and Ennew, 2004). These elements of IMP interaction model are vital for successful partnership in supply chain. IMP interaction approach provides an ideal framework for this research. The interaction approach sees buyer–seller relationships taking place between two active parities. Interaction emphasizes that the processes that occur between organizations are beyond the complete control of any individual actor (Ford and Håkansson, 2006). In the light of this framework, most business purchases or sales do not exist as individual events and hence cannot be fully understood, if each one is examined in isolation (Turnbull et al., 1996). This interaction approach focuses at the level of the dyad, the relationship itself rather than the business unit. We cannot characterize the business purchases or sales as a process of action or reaction by any party, but we should stress the simultaneous participation of both parties. In the IMP interaction approach, the basic unit of analysis is the relationship rather than the individual transaction.

2.1.3. Supply chain relationship quality

Relationship quality is an overall assessment of the strength of a relationship and the extent to which it meets the needs and expectations of the parties based on a history of successful or unsuccessful encounters or events (Crosby et al., 1990). Although the term of "relationship quality" has been used in buyer–seller literatures, in reality, few scholars and practitioners share a common definition of relationship quality. The definition of relationship quality lacks systemic theory framework (Huntley, 2006). From customer-based perspective, Crosby et al. (1990) defined relationship quality as "the customer is able to rely on the salesperson's integrity and has confidence in the salesperson's future performance because the level of past performance has been consistently satisfactory". Henning-Thurau and Klee (1997) stated that relationship quality can be seen as the degree of appropriateness of a relationship to fulfill the needs of the customer associated with that relationship. Woo and Ennew (2004) suggested that the main reason for this lack of consensus lies in the variety of different types of relationship which can be observed across a range of different consumers and business markets. In Table 1, we present a summary of B2B relationship quality and the research context.

Just because there are different types of relationships in different consumer and business markets, it is critical to emphasize the industrial features and object features in different studies of relationship quality. The IMP interaction model provides an ideal framework for B2B relationship quality. According to IMP interaction model, relationship quality represents an overall evaluation on the nature of the relationship, so short-term exchanges are not sufficient for its conceptualization, and long-term relationship behaviors are clearly relevant to the conceptualization of relationship quality (Woo and Ennew, 2004).

Table 1
Summary of business-to-business relationship quality dimensions

Authors	Key dimensions	Relationship context
Fynes et al. (2004)	Trust, adaptation, cooperation, and communication	Channel members
Woo and Ennew (2004)	Cooperation, adaptation, and atmosphere	Channel members
Lages et al. (2005)	Information sharing, communication, long-term relationship oriented, and satisfaction with relationship	Exporter and importer
Fynes et al. (2005a)	Communication, cooperation, interdependence commitment, and adaptation	Channel members
Rauyruen and Miller (2007)	Trust, satisfaction, commitment, and service quality	Channel members

Therefore, we define SCRQ as: the degree to which both parties in a relationship are engaged in an active, long-term working relationship. Huntley (2006) suggested that the definition of relationship quality cannot be limited only in the relational processes of the relationship. From an executive perspective, a relationship quality construct must be comprehensive, and includes all aspects of the relationship, i.e., both the economic and social components. In this paper, we state that communication, trust, institutionalization/cooperation, adaptation, and atmosphere describe all aspects of relationship and they construct SCRQ. Communication and trust represent the relationship between and among persons (firms), institutionalization/cooperation represents the relational activities of relationship, moreover, adaptation and atmosphere represent the economic and social components of relationship. Details about communication, trust, institutionalization/cooperation, adaptation, and atmosphere are discussed in Section 2.2.

2.1.4. The relationship between SCRQ and cooperative strategy

In this paper, cooperative strategy means the strategies both parties took in the further development of business relationships, i.e., terminating relationship, maintaining relationship or extending relationship, and these strategies determine the further development of business relationships. In supply chains, cooperative strategy has three features. First, because of different degree and means engaging cooperation or transaction, cooperation or transaction may be one-off or long-term, which reflects the will of sustaining long-term cooperation. Second, the cooperation or transaction may be limited in a fixed field or multi-field, which reflects the expectation of developing business relationship deeply or in multi-field. Third, both parties in a relationship may cooperate or transact one-time, occasionally, or recurrently in a fixed period of time, which reflects the times that both parties cooperate or transact in a fixed period of time. These three features of cooperative strategy are associated with the development and change of business relationships. The attention on these three features will bring a better comprehension of the development of business relationship. In this study, we use persistence, diversity, and frequency to represent these three features of cooperative strategy separately. Relationship persistence, which is defined as the perception of the firms that both parties expect the relationship to continue into the future, involves anticipated duration into the future rather than the historical duration to date. Several researchers have described persistence as a key aspect of shifts toward closer purchasing relationships (Gummesson, 1987; Kalwani and Narayandas, 1995). Relationship diversity, which is defined as the perception of the extent and scope of future

interaction, describes the complexity, extent and scope of the collaborative activities (Young, 2000). Relationship frequency is defined as the times that both parties in a relationship cooperate/interact in a fixed period of time. These three constructs are important and will be discussed further in developing the hypotheses.

There is a basic logic that only when a firm considers the partnership to be good, it will cooperate with the partner further. The development of relationships between buyer and seller depends on the actions of either party in the foregoing stages. The behaviors of seller and buyer in the future will be influenced by their initial assessment of the partnerships. In another words, the strategies buyer and seller took in the future lie on both parties' perception of partnership. Therefore, we can forecast the strategies manufacturers and suppliers took in future, using relationship quality. In this study, we will investigate the influence of SCRQ on cooperative strategy through the test of the effect of SCRQ on persistence, diversity, and frequency.

2.2. Hypotheses and model

The conceptual model incorporating the research hypotheses is shown in Fig. 1.

2.2.1. Communication

Communication difficulties are identified as a major cause of problems among relationship parties (Lages et al., 2005). Anderson and Narus (1990) defined communication as "the formal as well as informal sharing of meaningful and timely information between firms". Communication among firms involves communication and understanding of common goal, and conflict resolution. Inefficient communication may cause conflicting behaviors because of mutual misunderstanding and dissatisfaction. On the contrary, timely and frequent communication can resolve disputes and rectify perceptions of cooperative behaviors. In the research of relationship quality on exporter and importer, Large (2005) proposed efficient communication has positive effect on successful supply chain management. Therefore, successful relationships are based on efficient communication, and communication is absolutely necessary for supply chain partners to develop relationship (Luc, 2006).

2.2.2. Trust

An important reason for unsuccessful relationships is the lack of trust between the partners. The establishment of trust is considered as the basic reason for the long-term successful relationships by both researchers and practitioners (Walter et al., 2002). In the research of customer–supplier relationships, Ryssel and Ritter (2000) defined customer's trust as the extent to which a customer believes that the supplier is honest, benevolent, and competent. We know that based on the definition of trust, trust implies an expectation or an attitude, it occurs gradually in the interaction of both parties. Sako and Helper (1998) also considered trust as an expectation held by an agent that its trading partner will behave in a mutually acceptable manner in the research on relationships between customer and supplier. In their opinions, this expectation narrows the set of possible actions, thus reducing the uncertainty surrounding the partner's actions. In B2B relationships, trust can influence the behaviors of both parties involved in a relationship. Partnership will be further developed only when trust is sufficient. The higher the degree of trust, the easier the development and maintenance of the partnership will be.

2.2.3. Institutionalization/cooperation

Ford (1980) has noted that the most significant aspect of long-term relationship is the problem of institutionalization. Halinen (1997) considered institutionalization as a dimension of the coordination process. According to Halinen (1997), institutionalization refers to the emergence of "various rules, customs, and standard operating procedures in a business relationship". These rules, customs, and procedures can solve economic, technical, and strategic problems for both parties (Osborn and Hagedoorn, 1997). Many other researchers use the term cooperation instead of institutionalization for similar activities (Young and Wilkinson, 1997; Woo and Ennew, 2004). This can be proved by the definition of cooperation by Young and Wilkinson (1997) and IMP interaction model. According to Young and Wilkinson (1997), cooperation can be defined as "all activities undertaken jointly or in collaboration with others which is directed towards common interests or achieving rewards", and it contains sentiments and expectations of future behavior as well as behavioral elements. In the IMP interaction model, cooperation is a product of the exchange episodes that take place between buyer and seller, and it refers to the extent that the work of buyer and seller is coordinated (Ford and Håkansson, 2006). Contrasting the meanings of institutionalization and cooperation, we can conclude that cooperation embodies institutionalization but not limited to institutionalization, and it transcends the confines of institutionalization. Therefore, we use the term cooperation to represent the relevant activities of the coordination process in this paper. The main feature of supply chain relationship, which is distinctive with the relationship involved in business-to-customer (B2C) relationship quality, is cooperation of both parties in supply chains. Close long-term cooperative relationship is appropriate in supply chains, because of the dependence on external resource and the uncertainty of supply and demand. The closer both parties cooperate, the higher relationship quality will be. Although cooperation has a significant influence on B2B relationship, especially on the long-term relationship behaviors in supply chain, scholars have not paid much attention on cooperation in existing literature of B2B relationship quality.

2.2.4. Adaptation

In Williamson's (1981) opinion, asset specificity is the most important dimension of a transaction, because once an investment has been made, buyer and seller are effectively operating in a bilateral exchange relation for a considerable period thereafter. Adaptation refers to the extent to which the buyer and seller make substantial investments in the relationship (Ford and Håkansson, 2006), and the exchange of specific investment is the adaptation of both parties. Adaptation is another presentation of long-term relationship, because: first, adaptation of parties indicates one party or both parties have invested specific assets to build relationship; second, the investment of specific assets has significant influence on the business in supply chain firm, and it limits its choice of partner and customer. Because of this, adaptation can enhance the cooperation of parties and promote the trust in each party. When the extent of adaptation is great, both buyer and seller will make a particular effort to ensure the continuity of the relationship. For B2B relationships, an important feature is interaction that aims to increase the overall efficiency through adaptation and activities that the respective actors are involved in (Ståhl, 2002). It is known that adaptation involves product and process design, value analysis, cost targeting and quality control, and delivery system. Although little is known about the process of adaptation or the motivation for adaptation, it has been argued that the extent of adaptation is a basis for relationship benchmarking (Woo and Ennew, 2004). Where the

extent of adaptation is great, both buyer and seller will make a particular effort to ensure the continuity of the relationship.

In supply chains, suppliers adapt to the needs of specific important customers as well as that customers adapt to the capabilities of specific suppliers, Hallén et al. (1991) considered this adaptation as a central feature of working business relationships. If both parties are to interact for long periods, they must continue to adapt to each other's needs. Fynes et al. (2004) also found mutual adaptation is central to a more enlightened approach to managing SCRQ.

2.2.5. Atmosphere

Atmosphere is an important construct in IMP interaction model, Woo and Ennew (2004) described atmosphere as the outcome of relationship, and indicator of closeness of a relationship. They stated that like the environment, atmosphere is technically external to the firm, unlike the environment, it is a very immediate outcome and symbol of the nature of the relationship. To summarize then, atmosphere exists in the process where both parties interact. The original IMP work described atmosphere in terms of the power–dependence relationship, the state of conflict or cooperation, overall closeness or distance of the relationship, and the mutual expectation between both parties (Håkansson, 1982). The tendency is to consider that good relationship corresponds inevitably to relationships with a strong, positive relationship atmosphere (Roehrich et al., 2002). Atmosphere exceeds trust and commitment, and it gives a wider perspective to understand relationship quality from partner-based view. The atmosphere surrounding the buyer–seller relationship is also of relevancy to the conceptualization of relationship quality. Therefore, the following hypothesis is proposed.

H1. SCRQ is defined as a higher-order construct which represents (a) communication, (b) cooperation, (c) trust, (d) adaptation, and (e) atmosphere.

2.2.6. Features of cooperative strategy—persistence, frequency, and diversity

The major feature of relationship persistence is long-term oriented. Persistence can be explained by the satisfaction with existing relationship and the expectation of developing long-term partnership. In B2B relationship marketing, long-term relationship oriented has become the core of the relationships between manufacturers and suppliers. Keeping long-term relationship with selected suppliers can be seen as a source of strong competitive advantage. Long-term durable relationships enable firms to be more efficient in production as well as more effective in delivering quality and/or in reducing transaction costs (Walter et al., 2003). Crosby et al. (1990) further suggest that the quality of the relationship determines the probability of continued exchange between buyers and sellers. Gummesson (1987) suggested that "skilled handing of relations between buyer and seller is part of customer's perceived quality; high relationship quality contributes to positive customer perceived quality and, thus, enhances the chances for a long-term business relationship". For firms in supply chains, there is also perception of partnership, and firms would like to keep long-term relationship when they feel the relationship quality is good. Therefore, the following hypothesis is proposed.

H2. SCRQ will positively influence relationship persistence directly.

Persistence reflects both parties' satisfaction with existing relationship and expectation of developing long-term partnership, and relationship frequency describes the times the cooperations

or transactions recur in a fixed period of time, it refers strictly to both parties' activity in the market. Crosby et al. (1990) suggested the frequency of service between a buyer and a salesperson enhances customer's trust in a service provider. However, based on customer's perception, for both parties involved in a no switching barrier transaction, only when they satisfy with existing relationship, they will keep business with each other further. For firms, only when they consider the relationship quality is good, they will continue to cooperate with this partner recurrently or frequently. So, for supply chain firms, both parties' satisfaction with existing relationships is the precondition of frequent cooperation. Thus, we propose the hypothesis H3 as follows.

H3. SCRQ will positively influence relationship frequency directly.

Generally speaking, firms may cooperate or interact in a fixed field or in several relevant or irrelevant fields. It is evident that the diversity of relationships reflects the state of relationship quality. As the extent and scope of cooperative activities increase, the firms effectively become close partners in a relationship. The better the relationship quality is, the deeper the extent and the more extensive the scopes will be. At the beginning, cooperation will be in a fixed field, and the diversity is bad. With the increase of cooperation time and relationship quality, the relationships will show the feature of diversity. On the one hand, high relationship quality will promote diversity; on the other hand, diversity of relationships will enhance high relationship quality. Formally, this gives

H4. SCRQ will positively influence relationship diversity directly.

3. Methodology

3.1. Survey instrument

To test the hypotheses, a questionnaire survey method was used. The authors collaborated with Northwest Audit Centre (Xi'an) of China Quality Certification Centre (CQC) and chose firms in Shaanxi, Gansu, and Xinjiang provinces of China to make a two-round survey. All these firms have obtained third-party certification, and they all have good management infrastructure and plentiful management practice. All measurement items were from existing literatures, and the authors modified them according to the actual conditions of China. Wording and sentence changes were made to understand Chinese context. All multi-item scales were measured on a five-point Likert scales (1 = "strongly disagree" to 5 = "strongly agree"), and are shown in Appendix A. With the help of Northwest Audit Centre (Xi'an) of CQC, preliminary test was conducted with 45 manufacturing firms in Shaanxi province, they were asked to provide comments on the wording of the measurement items. In the first round survey, the authors made spot interviews and questionnaire survey with the senior managers responsible for outsourcing or quality management.

Table 2 provides a summary of descriptive statistics for the preliminary survey.

As can be seen from Table 2, the Cronbach's alpha coefficient of communication is only 0.457, which is very low. It is surprised that the analysis indicates the Cronbach's alpha coefficient of communication will increase to 0.771 when the second item of communication is deleted. So we analyze this item and interview with the respondents, the finding is that the second item of communication had been misunderstood (respondents were misunderstood about "informal channel"), and it is unseemly.

Table 2
Summary statistics of preliminary survey

Construct	Mean	SD	α	Scale source
Communication	3.9481	0.6112	0.457	Fynes et al. (2005a); Fynes et al. (2005c)
Cooperation	3.8578	0.6376	0.925	Fynes et al. (2005a); Fynes et al. (2005b) Woo and Ennew (2004)
Adaptation	2.7167	0.8302	0.875	Fynes et al. (2005a); Fynes et al. (2005c)
Trust	3.7778	0.6995	0.928	Fynes et al. (2005a); Fynes et al. (2005c)
Atmosphere	4.0519	0.6550	0.913	Woo and Ennew (2004)
Persistence	4.1222	0.6585	0.916	Young (2000)
Frequency	3.9259	0.7683	0.896	Young (2000)
Diversity	3.2148	0.6969	0.693	Young (2000)
Overall α: 0.894.				

SD = standard deviation; α = coefficient alpha.

Considering respondents' understanding, we delete this item in the second round survey (formal survey).

3.2. Sample

The formal survey was conducted based on the preliminary survey and the duration is approximately six months, from September 2006 to March 2007. In the formal survey, spot survey and fax were adopted to seek samples from manufacturing firms in Shaanxi, Gansu, and Xinjiang. Copies of questionnaire were randomly sent to senior managers who are responsible for outsourcing or quality management. And 354 responses were received, of which 311 were complete and usable (the effective rate is 87.85%). All the firms in our survey are large firms (the number of employees is more than 500) or medium firms (the number of employees is between 150 and 500).

The summary statistics of formal survey are shown in Table 3. The internal consistency of the measures of the questionnaire is 0.889 ($\alpha = 0.889$), and the Cronbach's alpha reliability of all the eight latent variables are more than 0.6 ($\alpha > 0.6$), which indicates all scales demonstrate good reliability.

Our survey design is intended to minimize the impact of common method bias. Podsakoff et al. (2003) suggest there are two primary ways to control for method biases: (1) the design of the research design's procedures and (2) statistical controls. In our survey, we adopted two procedures to reduce common method biases. First, we allow the respondent's answer to be anonymous; second, we assure respondents that there is no right or wrong answers and they should answer questions as honestly as possible.

Besides procedural control, we also used Harman's one-factor test to address the concern about common method biases raised by the nature of measures we employed. The logic underlying this approach is that if method bias is largely responsible for the covariation among the measures, a factor analysis should yield a single factor (Harris and Mossholder, 1996). The goodness of fit statistics for the one-factor model is: chi-square (χ^2) = 1544.31, degrees of freedom (df) = 299, root mean square error of approximation (RMSEA) = 0.116, comparative fit index (CFI) = 0.92, non-normed fit index (NNFI) = 0.91, goodness of fit index (GFI) = 0.72, and adjusted goodness of fit index (AGFI) = 0.67. These results show that the one-factor model is not acceptable, so the common method bias did not pose a serious threat to interpreting our present findings.

Table 3
Summary statistics of formal survey

Construct	Mean	SD	α	Scale source
Communication	4.3119	0.53505	0.631	Fynes et al. (2005a, b)
Cooperation	4.0244	0.53223	0.800	Fynes et al. (2005a, b) Woo and Ennew (2004)
Adaptation	3.4268	0.65012	0.760	Fynes et al. (2005a, b)
Trust	4.0667	0.55264	0.770	Fynes et al. (2005a, b)
Atmosphere	3.9871	0.53197	0.774	Woo and Ennew (2004)
Persistence	4.2444	0.59005	0.869	Young (2000)
Frequency	4.0386	0.57356	0.798	Young (2000)
Diversity	3.6999	0.65853	0.779	Young (2000)
Overall α: 0.889.				

SD = standard deviation; α = coefficient alpha.

4. Analysis and findings

In this paper, a two-stage approach was adopted to analyze the two distinct latent variable models: the measurement model and the structural model using structural equation modeling program (LISREL 8.53). The measurement model, which provides an assessment of convergent and discriminant validity, should be estimated before the structural model is estimated. The confirmatory factor analysis (CFA) approach was used to estimate the convergent and discriminant validity, and the structural model based on a path analysis approach was then estimated.

4.1. Measurement model

The validity of the scales and the fitness of the measurement model were assessed by means of CFA on the eight latent variables (i.e., communication, trust, cooperation, adaptation, atmosphere, persistence, frequency, and diversity). The goodness of fit statistics for the measurement model is: $\chi^2 = 658.05$; df = 271, RMSEA = 0.068, CFI = 0.97, NNFI = 0.97, GFI = 0.86, and root mean square residual (RMR) = 0.036. The hypothesized measurement model and data fit well. Table 4 displays standardized loading (λ), standardized error, and t value of each item. All items have high ($\lambda > 0.60$) and significant ($t > 1.96$) loading (Chin, 1998).

Validity analysis involves content validity and construct validity. All measurement items in the questionnaire were from existing literatures; therefore, they have good content validity. Construct validity, sometimes also called factorial validity, is related to the logic of items which comprise measures of social concepts. Construct validity is assessed in terms of convergent and discriminant validity. Convergent validity can be assessed from the measurement model by determining whether each indicator's estimated pattern coefficient on its hypothesized underlying construct factor is significant (greater than twice of its standard error) (Anderson and Gerbing, 1988). As shown in Table 4, all standardized loadings are statistically significant ($p < 0.01$), therefore, convergent validity was demonstrated.

The assessment of discriminant validity can be conducted by comparing two CFA-models: in one model the correlation of a pair of latent variables is constrained equal to 1.0, and in another model the correlation is free to vary, if the χ^2 value for unconstrained model is significant than that of the constrained model, discriminant validity is demonstrated (O'Leary-Kelly and Vokurka, 1998). This approach requires separate comparisons for each pair of latent variables. The results of discriminant validity indicate that the discriminant validity is demonstrated.

Table 4
Confirmatory factor analysis

Construct	Standardized loading (λ)	Standardized error	t Value
Communication			
CM1	0.72	0.03	12.43
CM2	0.64	0.04	11.17
Trust			
T1	0.71	0.04	13.25
T2	0.58	0.05	10.33
T3	0.72	0.04	13.48
T4	0.71	0.03	13.42
Cooperation			
CO1	0.76	0.03	14.85
CO2	0.68	0.04	12.82
CO3	0.69	0.04	12.99
CO4	0.64	0.04	11.75
CO5	0.59	0.04	10.81
Persistence			
P1	0.92	0.03	19.55
P2	0.84	0.03	17.23
Adaptation			
AD1	0.69	0.04	14.09
AD2	0.67	0.05	16.53
AD3	0.71	0.05	13.40
AD4	0.63	0.05	6.83
Atmosphere			
AT1	0.83	0.03	16.00
AT2	0.65	0.04	10.92
AT3	0.74	0.03	12.70
Frequency			
F1	0.79	0.03	15.74
F2	0.76	0.04	14.80
F3	0.73	0.04	13.98
Diversity			
D1	0.92	0.04	18.96
D2	0.68	0.05	12.76
D3	0.68	0.04	12.77

Notes: t value of 1.65 or greater are significant at the 0.05 level and t value of 1.96 or greater at the 0.01 level.

Table 5
Fit statistics for structural model

	x^2 (df)	RMSEA	CFI	NNFI	GFI	RMR	AGFI
Fit statistics	175.53 (62)	0.077	0.98	0.97	0.92	0.027	0.88

4.2. Structural model

The structural model based on a path analysis was estimated after achieving a satisfactory goodness in the measurement model, the fit statistics for structural model are shown in Table 5, and the results of a path analysis are shown in Table 6. Path analysis produced the following fit statistics for structural model: $\chi^2 = 175.53$, df = 62, RMSEA = 0.077, CFI = 0.98, NNFI = 0.97, GFI = 0.92, RMR = 0.027, and AGFI = 0.88.

Standardized loading (γ), standardized error, and t value are given in Table 6 with all the standardized loadings being high ($\gamma > 0.20$) and significant ($t > 1.96$) (Chin, 1998). The results, thus, provide empirical support for all hypotheses (i.e., H1a, H1b, H1c, H1d, H1e, H2, H3, and H4). SCRQ positively and directly influence the persistence (0.87), frequency (0.78), and diversity (0.67).

The validated model is shown in Fig. 2.

5. Discussion and implications

This paper identifies dimensions of SCRQ between manufacturers and suppliers, and investigates the impact of SCRQ on cooperative strategy based on the questionnaire survey on manufacturing firms in Northwest China (i.e., Shaanxi, Gansu, and Xinjiang). The results show that SCRQ, as a higher-order construct, can be measured by communication, trust, cooperation, adaptation, and atmosphere, and SCRQ has a significant positive impact on cooperative strategy (i.e., persistence, frequency, and diversity). This research contributes to supply chain relationship management field in terms of theory development and managerial implications.

The first result extends existing studies of B2B relationships quality as a trust–communication–cooperation based structure proposed by Fynes et al. (2004, 2005a) and Woo and Ennew (2004) and the trust–commitment based structure proposed by other scholars (Kwon IK-Whan and Suh, 2005; Huntley, 2006; Rauyruen and Miller, 2007). It is significant that most previous studies on relationship quality have focused on satisfaction, trust, and commitment, whereas SCRQ attaches more importance to institutionalization/cooperation, adaptation, and atmosphere. It maybe because: (1) the history of existing business relationships should be considered when they make a commitment or build long-term relationship. Holm et al. (1999) also proposed that the development of mutual commitment is a time-consuming process which requires relationship-specific investments by both partner firms; (2) although satisfaction is widely accepted as a dimension of relationship quality, the nature of satisfaction remains ambiguous. Moreover, the origin of satisfaction lies initially in the studies of consumer markets, whether it represents the most appropriate conceptualization for the B2B relationship quality remains debatable (Woo and Ennew, 2004); (3) there is more uncertainty in the process of cooperation in the context of supply chain, sufficient communication and trust, and adaptation as well as atmosphere have more significance and positive effects on reducing the uncertainty. Adaptation and atmosphere are two particular constructs in supply chains. Adaptations mark a commitment by the buyer or seller to the relationship. They can be seen most clearly in such things as a supplier's development of a special product for a buyer, a buyer's modification of product system. On the other hand, in order to create a harmonious atmosphere, firms need to pay attention to power balance, conflicts resolution, and cooperation. For managers, on the one hand, mutual trust and mutual communication on product/service design and quality planning is necessary in developing good partnership. On the other hand, harmonious atmosphere and increased specialization of investment will have positive impact on the maintenance of supply chain relationship if there are sufficient communication and trust between firms.

This result also has implications for supply chain management practice in China. Managers need to take these five constructs into account in planning the operation of their supply chain relationships. From a management perspective, mutual trust, and communication is a more effective approach to manage supply chain relationship, these two factors all serve better relationships. Firms should recognize the significant influence of trust and communication on SCRQ. This requires frequent communication and collaboration on issues such as product and process design, quality, and scheduling. Developing and maintaining high quality relationships is a complex process and requires considerable investment in resources. Besides the positive effect of adaptation on relationship quality, managers must also realize negative impact of high switching cost induced by excessive adaptation, and ensure the specialization of investment in an appropriate level.

Table 6
Path analysis of structural model

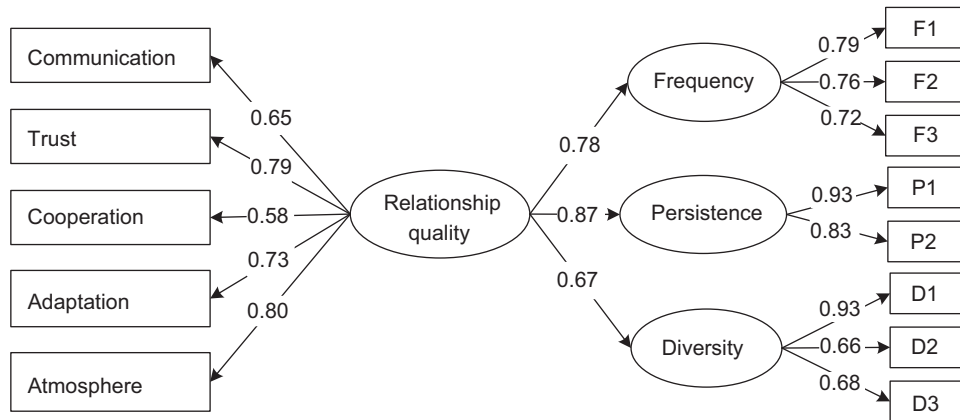| Hypotheses	Path	Standardized loading (γ)	Standardized error	t Value	Result
H2	SCRQ→persistence	0.78	0.12	11.04	Supported
H3	SCRQ→frequency	0.87	0.11	10.68	Supported
H4	SCRQ→diversity	0.67	0.14	9.74	Supported

Fig. 2. Validated model and path coefficients.

The second result of this research is about the impact of SCRQ on cooperative strategy. The test indicates that the SCRQ has a significant and positive influence on persistence, frequency, and diversity. This shows that the existing partnership will influence the decision-making of the development of business relationship and relationship quality can be used to forecast the behaviors of suppliers and manufacturers. The positive impact of SCRQ on persistence maybe because of the long-term orientation of supply chain relationships. When the manufacturer considers the partnership with selected supplier is good, he will reward this supplier with developing durable relationships further. The positive impact of SCRQ on frequency and diversity maybe because the number of suppliers that the manufacturer deals with decrease over time. The number of suppliers will decrease because manufacturer will screen the supplier. For a firm, the volume of contract and scope of business are settled. Thus, manufacturer will interact with selected supplier frequently. Moreover, the scope of cooperation with selected supplier will increase too. This result is consistent with Fisman and Ghosh's (2005) research. According to Fisman and Ghosh (2005), both frequency and volume of transactions increase with the development of supplier–firm relationships. Theoretical conceptualizations of the relationships between relationship quality and cooperative strategy would further enhance our understanding of various management phenomena.

One managerial implication drawn from the second result relates to how to develop business relationships further. It is important to emphasize that firms should examine their existing partnership in advance of making cooperation decisions. The choice of activities (terminating, maintaining or extending relationship) in the development process of business relationships rests with both parties' perception of partnership. From firm's point of view, it is vital to give attention to the SCRQ for successful business and cooperation with other firms. If both parties want to develop long-term supply chain partnership or extend scopes of cooperation, they must pay attention to existing relationship quality between them, and eliminate short-term behaviors. They should avoid the negative impact of non-economic factors and individual preference on partnership through high specialization of investment.

The implication for suppliers is that they need to be involved in the product/process design and quality planning early and quickly. Wynstra and ten Pierick (2000); Wynstra et al. (2001) have proposed the supplier involvement in product development projects has become an increasingly popular method for improving project effectiveness (product costs and quality) and project efficiency (development costs and time). Resulting from the communication of product/process design and quality planning, suppliers can identify buyers' need effectively, and create a harmonious atmosphere. Furthermore, suppliers can reduce the limitation of investment specialization to them in cooperation through early participation, and avoid being at a disadvantageous position in cooperation.

This paper also explains the phenomenon that manufactures tend to concentrate on a few suppliers. It is because that developing and maintaining close relationship with main suppliers can reduce the uncertainty and transaction cost, and close relationships between manufacturers and suppliers are a powerful barrier to the entry of another company. This barrier consists of inertia in existing relationships, the uncertainties for the manufacturer in any change of supplier, and the lack of awareness of information about possible alternative suppliers (Ford, 1980). Moreover, maintaining close relationship with main supplier benefits supplier relationships management through reducing the complexity and cost of relationship management. Nevertheless, single sourcing has risks for manufacturers. Thereby, manufacturers usually require that suppliers should make specific investment in these relationships to minimize the risks of single source.

6. Limitations and future research

Although the study results have theoretical and managerial implications for relationship quality scholars and practitioners respectively, some caution should be taken because of the

limitations of this study. First, the authors investigated only the manufacturing firms in Northwest China by questionnaire survey. No service firms were involved in the questionnaire survey of this study. We may obtain different conclusions in service firms because of the differences between manufacturing and service firms in business process, dependency on suppliers, and so on.

Second, the authors collected the data from "downstream" firms in supply chains. It can be argued that the perceptions of SCRQ in this study are somewhat one-sided, in that they represent the opinions of just one party and ignore the opinions of suppliers. The perception of SCRQ is virtually bidirectional, and it involves manufacturer's perception and supplier's perception as well. Collecting data from both buyer and seller in a relationship could assess the degree to which their perspectives converge (Huntley, 2006). Additional insights could be gained from the supplier's perspective.

Furthermore, this research generates some problems that need to be addressed in future study. First, this research gives some useful conclusions and implications for both scholars and practitioners based on the questionnaire survey conducted in manufacturing firms. It is necessary to test the conclusions by a questionnaire survey with service firms to make sure if these conclusions can be extended to service industry. Second, the perceptions of supply chain relationship are manufacturer-based in this study. Does "supplier-based" perception alter the conclusions of this study? Therefore, it is valuable for future researches to be conducted from perspective of the supplier, and compare the influence of different perspective of SCRQ on cooperative strategy.

Acknowledgements

Appendix A

Respondents are asked to rate the extent or degree of current practice of the following items on a five-point Likert scale with 1 = "strongly disagree" to 5 = "strongly agree".

Communication (Fynes et al., 2005a, b)

- CM1—in this relationship, any information that might help the other party will be provided for them timely and forwardly.
- CM2—exchange of information in this relationship takes place informally, and not only according to a per-specified agreement.
- CM3—both parties keep each other informed about events or changes that may affect the other party.

Cooperation (Source: Fynes et al., 2005a, b; Woo and Ennew, 2004)

- CO1—we cooperate extensively with this supplier with respect to product design.
- CO2—we cooperate extensively with this supplier with respect to process design
- CO3—we cooperate extensively with this supplier with respect to forecasting and production planning.

- CO4—this supplier is able to handle our complaints immediately.
- CO5—this supplier is collaborative in resolving conflicts with us.

Adaptation (Source: Fynes et al., 2005a; Woo and Ennew, 2004)

- AD1—gearing up to deal with this supplier requires highly specialized tools and equipment.
- AD2—we have made significant investments in tooling and equipment that are dedicated to our relationship with this supplier.
- AD3—our production system has been tailored to meet the requirement of this supplier.
- AD4—this supplier offers us new technical solutions timely when conditions change.

Trust (Source: Fynes et al., 2005a, b)

- T1—based on your past and present experience, how would you characterize the level of trust your firm has in its working relationship with this supplier?
- T2—we feel that this supplier can be counted on to help us.
- T3—we feel that we can trust this supplier completely.
- T4—this supplier has a high level of integrity.

Atmosphere (Source: Woo and Ennew, 2004)

- AT1—I consider the general atmosphere surrounding the working relationship with this supplier as very harmonious.
- AT2—I regard the overall relationship with this supplier as very close.
- AT3—I believe mutual expectations for the project have been established with this supplier to a greater extent.

Relationship persistence (Source: Young, 2000)

- P1—we have cooperated with this supplier for a long time.
- P2—we expect to cooperate with this supplier unceasingly.

Relationship frequency (Source: Young, 2000)

- F1—we cooperate with this supplier on product quality and price decision frequently.
- F2—we cooperate with this supplier on technology frequently.
- F3—we cooperate with this supplier on many other businesses frequently.

Relationship diversity (Source: Young, 2000)

- D1—we cooperate with this supplier in many fields.
- D2—the cooperation with this supplier is complex for us.
- D3—we expect to extend cooperative fields with this supplier.

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