
Supply Chain Partnership, Knowledge Trading and Cooperative Performance: An Empirical Study Based on Chinese Manufacturing Enterprises*

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Abstract

From the perspective of knowledge trading among supply chain partners, a conceptual model for the relationships among supply chain partnership, knowledge trading and cooperative performance is proposed and empirically tested using the data collected from 256 Chinese manufacturing enterprises in supply chain with the structural equation model. The dimension of supply chain partnership in this model is described from trust and relationship commitment. The results show that there are significant and positive impacts of trust on relationship commitment, knowledge trading and cooperative performance. Although relationship commitment has significant and positive impact on cooperative performance, it does not impact knowledge trading significantly. Finally, it is also proved that knowledge trading has significant and positive impact on cooperative performance. These findings can also give some guidelines to managers. They should not only put emphasis on the formation of high level trust and relationship commitment among members of supply chain, but also improve cooperative performance of supply chain through better knowledge sharing among supply chain partners by knowledge trading.

Key Words: Supply chain partnership, Knowledge trading, Cooperative performance, Relationship commitment

1. INTRODUCTION

Knowledge is a critical resource for organizations' competitive advantage (Kogut and Zander, 1992). Organizations have to acquire and create knowledge continuously to maintain their competitive advantages in rapidly changing environment (Lubit, 2001; Bruton et al., 2007; Ma et al., 2008; Kang et al., 2010). Similarly, Knowledge management and learning have increasingly become key determinants of supply chains' competitive advantages (Desouza et al., 2003; Hult et al., 2006; Cheng et al., 2008; Halley et al., 2010). A primary objective of knowledge management research and practice in supply chain is to facilitate effective knowledge sharing among members (Wang et al., 2008; Huang and Lin, 2010). To improve supply chains' coordination and product quality, manufacturing firms often demand that their supply chain partners such as subcontractors or suppliers implement common processes, which often require sharing process knowledge. Inter-organizational knowledge sharing in supply chain has thus become a common practice, because it enhances the competitive advantage of the supply chain as a whole (Cheung and Myers, 2008). Whereas, considering the members of supply chain are different stakeholders and economic agents, inter-organizational knowledge sharing among members is more difficult than intra-organizational knowledge sharing because there is no administrative organization promoting the knowledge sharing activities. However, it is an effective way to achieve the goal of inter-organizational knowledge sharing among members by establishing a knowledge market in supply chain and then utilizing the market mechanisms to guide, encourage, stimulate, supervise and regulate the knowledge trading among the members of supply chain. If the knowledge suppliers can obtain reciprocity and mutual benefit (e.g. price discounts, orders, rebates, staff training, etc.) through inter-organizational knowledge trading in supply chain, and the knowledge demanders gain knowledge which is a good value, the knowledge sharing is easily conducted. Therefore, the idea of knowledge trading among members of supply chain is a new philosophy and method for knowledge sharing and transfer, which is of theoretical significance in solving the current issues puzzling the business community and academia about the methods best suited to promote the inter-organizational knowledge sharing and transfer in supply chain.

The concept of an intra-organizational knowledge market was first proposed by Davenport and Prusak (1998) in their book of working knowledge. They pointed out that the participants in knowledge trading consisted of knowledge buyers, knowledge sellers and knowledge brokers, and moreover, the reward of knowledge trading included reciprocal compensation, personal reputation and altruism, etc. Based on the study of Davenport and Prusak (1998), many studies further studied the knowledge market and/or knowledge trading in intra-organizational structures. Ba et al (2001) analyzed how the intra-organizational knowledge market mechanism worked successfully, as well as factors resulting in knowledge market failure. Matson et al (2003) analyzed the mechanisms of knowledge market, and then studied issues such as how to promote knowledge trading. Desouza, a professor of information management at the University of Illinois is a major supporter of knowledge market theory proposed by Davenport and

published many papers about the intra-organizational knowledge market. In his studies, the intra-organizational knowledge market was used to solve the technological and social problems of knowledge management (Desouza and Awazu, 2003). In addition, the composition of the knowledge market and factors needed to be overcome when establishing a knowledge market were studied (Desouza and Awazu, 2004). Also, some relevant cases were studied and the crucial role of price mechanism in knowledge management was proved by use of mathematical models (Desouza et al., 2003; Desouza et al., 2005). According to Brydon and Aidan (2006), knowledge goods were classified and the influencing factors about operation effective of intra-organizational knowledge market were analyzed, and then counter measures were proposed based on their above analyses. Similar to the intra-enterprise knowledge market that Davenport and Prusak (1998) proposed, the knowledge flow and sharing in supply chain are also preceded with market-driven forces to a great extent. Therefore, the market mechanism can be introduced to the process of knowledge sharing or knowledge transfer in supply chain. However, current studies about the inter-organizational knowledge market and/or trading in supply chain are not found in academic circles of abroad. Previous studies of China regarding the inter-organizational knowledge trading in supply chain focused on theoretical research, which did not correspond with reality (Zhang et al., 2006; Zhang et al., 2008; Xu et al., 2008). The empirical analysis corresponds with reality and its results can provide the enterprises with some guidelines in the process of inter-organizational knowledge trading in supply chain. In order to promote the inter-organizational knowledge trading in supply chain, there are two problems which need to be addressed by empirical analysis: first, the impact path and extent of knowledge trading on supply chain cooperative performance are yet to be verified, which by the way is the focus of knowledge buyers and sellers in supply chain and is crucial to the implementation effect of inter-organizational knowledge trading; second, the impact path and extent of the supply chain partnership on knowledge trading and cooperative performance specific to China, a country which thinks highly regards the relational mechanism in trading activities, are also to be verified by empirical analysis.

In view of the above problems in inter-organizational knowledge trading in supply chains of China, a conceptual model for the relationships among supply chain partnership, knowledge trading and cooperative performance will be proposed from the perspective of knowledge trading among supply chain partners in this paper. Subsequently, this study will utilize upstream and downstream enterprises in the Chinese manufacturing supply chain as study targets and examine the relationships proposed by the above conceptual model, hoping to provide the enterprises with some guidelines for promoting knowledge trading and then enhancing the competitive advantages and cooperative performance of supply chain.

2. LITERATURE REVIEW

2.1 Supply chain partnership

Many scholars define the partnership from different aspects. Ellram (1991) argued that partnership is an agreement to share information, benefits and risks between buyers and sellers. Rigby and Buchanan (1994) held that partnership is a relationship that different enterprises input relevant resources for the shared goal. Lambert et al (1996) considered partnership as a relationship that enterprises trust each other and share risks and benefits in order to obtain competitive advantage and improve financial performance. Vohkurka (1998) believed partnership is a deal between the sellers and buyers to share information, risks and benefits. Combining the above definitions of partnership and the research perspective based on knowledge trading, we define the supply chain partnership as a long-term and stable relationship to share resource (information and knowledge etc.), risks and benefits.

According to viewpoints of Moorman, etc. (1992), Morgan and Hunt (1994), and Kumar and Dissel (1996), the dimension of supply chain partnership can divide into trust and relationship commitment. Trust has been viewed as a set of specific beliefs dealing primarily with the integrity, benevolence, and ability of another party in the management literature (Mayer et al., 1995; Gefen et al., 2003). At the interfirm level, trust refers to the extent to which a firm believes that its exchange partner is honest and/or benevolent (Zaheer et al., 1998). Previous studies have suggested that trust among members is one of many factors critical to the success of knowledge sharing or knowledge transfer (Nahapiet and Ghoshal, 1998; Li, 2005; Chiu et al., 2006; Chow and Chan, 2008; Renzl, 2008; Maurer, 2010). Because trust eases communication among parties, when trust exists, the recipient is more likely to be open and receptive to the knowledge offered by another (Uzzi, 1997; Inkpen and Tsang, 2005). This intimacy is also associated with frequent communication (Szulanski, 1996) and coordination flexibility, because parties are more willing to respond quickly to interfirm requests (Das and Teng, 1998). Commitment is an important factor for the both parties in the resource transaction relationship. Early research on commitment mostly focused on the organizational commitment which was considered as a positive psychological feeling to the organization. However, some scholars (Lagace et al., 1991; Moorman et al., 1992) have made further observations recently. They described the psychological contract between the two trading sides with relationship commitment. For example, Lagace et al. (1991) held that relationship commitment means the psychological contract or binding generated by the trust between the two sides; Moorman et al. (1992) argued that the relationship commitment is the continual desire of the buyers and sellers to maintain a valuable relationship. Because trust and relationship commitment may have different abilities to effect knowledge transfer and sharing (Renzl, 2008; Maurer, 2010), we will examine how trust and relationship commitment each affects inter-organizational knowledge trading and cooperative performance in supply chain.

2.2 Knowledge trading

Davenport and Prusak (1998) pointed out that the intra-organizational knowledge market is similar to the tangible goods and service markets. As for the intra-organizational knowledge market, the people searching for knowledge in order to solve their problems are buyers, and the

people holding valuable knowledge in exchange for payment are sellers, and knowledge brokers connect the buyers and sellers together. The enterprises often have to pay cash when purchasing knowledge from the external environment, while intra-organizational knowledge trading rarely uses cash; it uses mainly reciprocity, reputation and altruism instead of money. The operation of the knowledge market is promoted largely by market mechanisms which are similar to markets for tangible goods (Ba et al., 2001; Matson et al., 2003; Desouza et al., 2005). Similar to the intra-organizational knowledge market Davenport and Prusak (1998) proposed, the knowledge flow and sharing among members of supply chain are also proceeded by market forces to a great extent, and the intangible knowledge market in supply chain is actually existing. The knowledge trading among members of supply chain is that the knowledge supplier enterprises provide some non-core knowledge for return to knowledge demander enterprises. As a result, the mutual benefit of bilateral cooperation will be achieved and the capacity for innovation and competitiveness of supply chain will be enhanced. Since the supply chain is a business alliance composed of many independent legal entities, all the members are bound to take into account their different interests, therefore, the market mechanism involves not only reciprocity, reputation, etc. in intra-organizational knowledge market, but also includes the volume of orders, price discounts, rebates, staff training and other mutually beneficial cooperation between enterprises.

2.3 Cooperative performance

The cooperative performance is the final results of the cooperation between the partners. It is usually measured by indicators of objective outputs, including absolute indicators and relative indicators (McGee, 1995). The absolute indicators are measured by customer satisfaction, cost, earning capacity as well as relationship continuance, while the relative indicators are measured by the target reaching rate, profit rate and growth rate of net profit. Some of these values are evaluated by short-term and long-term indicators. The short-term indicators focus on period costs, revenues and profits, and the long-term indicators focus on the stability of the relationship and maximization of the continuing value (Ganesan, 1994). Undoubtedly, the definition and measurement of cooperative performance have differentiation in different study background. From the perspective of knowledge trading among members in supply chain, cooperative performance can be defined as partners in supply chain are willing to input more knowledge with better quality to participate in knowledge trading with their relationship developed, so as to achieve knowledge matching, knowledge innovation and product innovation, and then competitive advantage of the whole supply chain is improved and collaborative benefit is derived.

3. HYPOTHESES AND CONCEPTUAL MODEL

3.1 Trust and relationship commitment

Trust is the premise to fulfill the commitment while commitment is the result of trust (Moorman et al., 1992). Morgan and Hunt (1994) argued that trust is the confidence to the

partners presently, while commitment means the wish to continue the relationship in the future and trust will do help to continue the wish of keeping relationship commitment in the future. So the level of trust will impact on the quality of the relationship commitment. Garbarino and Johnson (1999) held that trading commitment between the partners is based on the benefits and affection. Benefits are usually based on team trust while affection is mainly dependent on individual trust. Carnevale and Probst (1998) argued that in union organization, trust would reduce the harm to individual generated by uncertainties, enhance the psychological ownership of individual to the union organization and then bring about a greater willingness of commitment. Therefore, it can be assumed:

Hypothesis 1. Trust has a significant and positive impact on relationship commitment in supply chain.

3.2 Trust and knowledge trading

A major obstacle to interfirm knowledge sharing is the potential leakage of valuable knowledge (Dyer and Singh, 1998; Inkpen, 2000). Similarly, the potential risk of knowledge leakage is one of the key factors to the success of inter-organizational knowledge trading (Desouza et al., 2005; Brydon and Aidan 2006). Trust helps overcome this obstacle by establishing a level of behavioral predictability and reliability through the accumulation of exchange experiences in supply chain. That is, a belief that the partner will not use knowledge at the focal firm's expense increases parties' willingness to trade valuable knowledge. Moreover, trust enables greater cooperation between the recipient and the knowledge source by creating the mutual understanding that both parties will consider the interests of the other (Lane et al., 2001). For example, trust may foster knowledge transfer by establishing idiosyncratic sharing routines to facilitate learning of specified information and know-how (Dyer and Singh, 1998) and increasing the overall level of information exchange between parties (Tsai and Ghosal, 1998). Therefore, trust is particularly important in volitional behaviors such as knowledge trading in supply chain. Based on the above analyses, it can be assumed:

Hypothesis 2. Trust has a significant and positive impact on knowledge trading in supply chain.

3.3 Trust and cooperative performance

The influences of trust on cooperative performance are reflected in many ways. First, trust in supply chain transactions is the necessary condition for partners to gain trading information, so that the partners could respond positively to the market changes according to the "information chain" and reduce the market risk brought by "Bullwhip effect" (Bradach and Eccles, 1989). Second, enhancing the mutual trust between supply chain partners would reduce the trading costs, increase the success possibility of the trading and improve the profitability (Mayer et al., 1995; Gefen et al., 2003). Third, mutual trust is the necessary condition for establishing a long-term cooperation. It is also the key factor for maintaining sustained partnership (Ganesan, 1994). Exchange relationship is based on trust which does help to maintain a long-time relationship between the enterprise and the customers. After the two sides in trading establish a

high degree of trust, they would focus on cooperative performance, and finally it would increase each other's competitiveness and reduce transaction costs (Noordewier et al., 1990). Based on the above analyses, it can be assumed:

Hypothesis 3. Trust has a significant and positive impact on cooperative performance in supply chain.

3.4 Relationship commitment and knowledge trading

Relationship Commitment is an important factor for the both parties in the resource transaction relationship, because they will encourage the cooperation between the trading partners (Morgan and Hunt, 1994). From the perspective of inter-organizational knowledge trading in supply chain, relationship commitment can be viewed as an investment in transaction-specific assets, which are difficult or impossible to redeploy when a relationship is terminated (Joshi and Stump, 1999). Therefore, relationship commitment can reduce the risk and uncertainty of external environment in the process of knowledge trading such as "free riders" and "knowledge leakage", and promote long-lasting mutual transaction relationship in supply chain. Based on the above analyses, it can be assumed:

Hypothesis 4. Trust has a significant and positive impact on cooperative performance in supply chain.

3.5 Relationship commitment and cooperative performance

Relationship commitment is the willingness of a party to invest financial, physical or relationship-based resources in a relationship (Morgan and Hunt, 1994). In supply chain, it is an attitude of supply chain partners about the development and maintenance of a stable, long-lasting mutual relationship (Anderson and Weitz, 1992). What is more, high level of relationship commitment will do good to enhance the stability of partnerships and reduce the impact of random events. Therefore, it can be assumed:

Hypothesis 5. Trust has a significant and positive impact on cooperative performance in supply chain.

3.6 Knowledge trading and cooperative performance

Lyles and Salk (1996) had verified that the knowledge acquisition has a significant and positive effect on the cooperation performance in an empirical study about the impact of international joint venture (IJV)'s organizational characteristics, structural mechanisms and contextual factors on knowledge acquisition. Hitt et al (2000) pointed out that company could acquire and create new technical knowledge from inside and outside by means of skill learning, then the performance of company could be improved through the use of integration mechanisms applying for the development strategy of company. As an effective way to achieve the goal of inter-organizational knowledge sharing and transfer among members in supply chain, knowledge trading can promote partners to acquire more complementarity knowledge from

other members, which is favorable for the improvement of competitive advantage and cooperative performance. Based on the above analysis, it can be assumed:

Hypothesis 6. Knowledge trading has a significant and positive impact on cooperative performance in supply chain.

Based on the above analyses, the conceptual model is as shown in Figure 1.

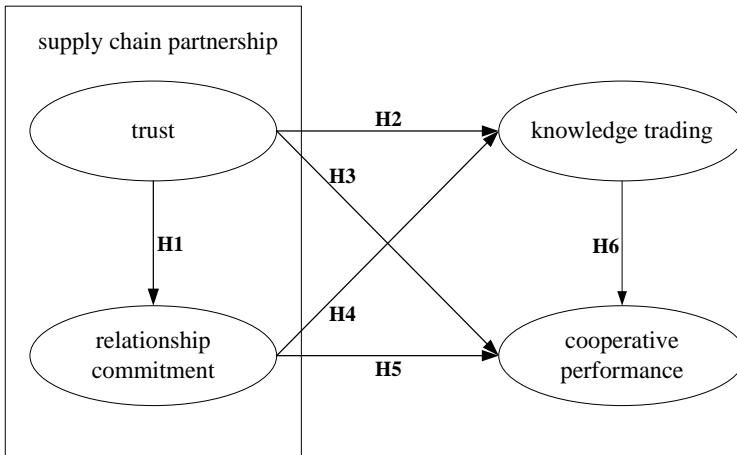


Fig.1 The conceptual model

4. DATA COLLECTION AND EMPIRICAL ANALYSIS

4.1 Data collection and sample

Our study focus on the relationships among supply chain partnership, knowledge trading and cooperative performance requires an empirical setting in which enterprises must acquire and employ knowledge from other members in supply chain. China provides a rich context for this empirical requirement. Because of China's fast growing manufacturing industry and huge market potential after reform and opening-up, it hosts a larger number of local enterprises entering manufacturing industry and many well-known foreign manufacturers establishing subsidiaries in China. With the rapid development of China's manufacturing industry, market competition is very fierce in manufacturing industry as a result of the large number of competitors and the high degree of substitution between different brands, so enterprises in manufacturing industry hope to enhance their competitive advantage by acquiring the valuable knowledge from members of supply chain and thus establish a stable supply chain partnership. Therefore, the survey target mainly involved the key employees of upstream and downstream enterprises of supply chain in the manufacturing industry of China such as electronic appliances, metal and mechanical engineering, food and beverage, and chemicals.

We have used two ways to collect sample through questionnaire survey. First, we chose enterprises in Chongqing, Chengdu, Guiyang and Kunming (The southwest area of China)

which had long-term cooperative relationship with our project team to finish the questionnaires through face to face interview, post or email. Second, we sent questionnaires to on-job postgraduates (e.g. EMBA, MBA, etc.) of 4 top universities in Shanghai (The east area of China), Beijing (The north area of China), Wuhan (The middle area of China) and Guangzhou (The south area of China) respectively. The investigation was directly conducted in class. After the teachers introduced the objective of the survey, the questionnaires were completed by eligible students and taken back at the scene. A total of 387 responses were received out of the total 600 questionnaires sent with both ways, thus representing a response rate of 64.50 percent. Invalid questionnaires were eliminated with following criteria: (1) too many missing answers in the response, (2) obviously regularity of the answers, (3) obviously contradictory reactions. Finally, we have acquired 256 valid questionnaires, giving a valid response rate of 42.67 percent. Of all the 256 responses, our sample also represented a different types of manufacturing enterprises, including state-owned enterprises (36.33%), collective ownership enterprises (15.23%), private enterprises (17.58%), joint venture (22.27%) and overseas-funded enterprises (8.59%). The investigation subjects involved the key employees of supply chain. The respondents were relatively familiar to the issues involved in the questionnaire. Considering the age, 92.13 percent of the respondents were over 30 years old and 77.15 percent had a length of work for more than five years. Considering the departments, employees in technical and information departments which well known the situation of knowledge trading in enterprise were the main respondents (totally accounted for 76.56 percent). Other respondents were from customer service (7.03 percent), finance (9.77 percent), warehousing and transportation (6.64 percent). The respondents who had the title of or above accounted for 79.30 percent, they had direct experience of making decisions. In addition, considering the education, all the respondents were above college education, they had no difficulties in understanding the issues and answering the questions appropriately.

4.2 Variables measures

We developed the questionnaire on the basis of previous studies and theories, as well as our field interviews. The variables of questionnaire were measured by the five-point Likert scale. To develop the scale items and evaluate scale properties, we employed traditional psychometric approaches. First, we created an initial pool of scale items on the basis of a thorough review of the literatures and interviews with some senior managers in manufacturing enterprises. Second, we refined the wording and expressing of several survey items on the basis of a pre-test with 30 senior managers in related departments. Finally, the formal questionnaire was formed on basis of the above two steps. In the Table1, we provided full details about these measures to variables.

The dimension of supply chain partnership in the model is described from trust and relationship commitment. Combining the research of Doney and Cannon (1997) with Seppanen et al (2007), we operationalize trust with four items that tap the degree of perceived trust between the knowledge buyers and sellers in supply chain. We measure relationship commitment using

three items adapted from Morgan and Hunt (1994), Ramaseshan et al (2006) and Karande et al (2008) that consider the level of relationship commitment in the dyadic relationship among members in supply chain.

We use four-item scales adapted from Lyles and Salk (1996), Tsang (2002), and Dhanaraj et al (2004) to measure the knowledge trading. These measurement items describe the extent of knowledge that the enterprise has learned from its members of supply chain by knowledge trading.

We measure cooperative performance using four items adapted from Mcgee et al (1995), Ganesan et al (2007), and Anderson and Faff (2008).

4.3 Reliability and validity analysis

We determined the reliability of the scales according to the Cronbach's α coefficient. The results showed that the Cronbach's α coefficient of above scales were all greater than the 0.7 cutoff (see the Table1). On the whole, the average reliability of the scale was above the acceptable level of 0.7 proposed by Nunnally (1978).

Validity analysis includes content validity and structure validity. The measurement items of the variables are based on the studies of foreign and domestic scholars and revised by some experts, so the content validity is favorable. The structure validity includes convergent validity and distinction validity. We used confirmatory factor analysis (CFA) to establish the validity of latent construct with structural equation modeling (SEM). The main indicators of CFA (see the Table1) fit the data satisfactorily. All factor loadings were highly significant ($p < 0.01$) and related to their respective constructs, indicating the unidimensionality and convergent validity of the measures (Gerbing and Anderson, 1988). Thus, all of the constructs have demonstrated adequate convergent validity. To test the distinction validity of all four latent constructs, we ran a series of nested CFA model comparisons in which we constrained the correlation between each pair of constructs to one. For all 6 pairs, when we compared the constrained model with a freely estimated model, the difference was significant, in support of distinction validity (Gerbing and Anderson, 1988). These results thus showed that our measures possessed adequate reliability and validity. So, the quality of questionnaire in this paper is good for the further study.

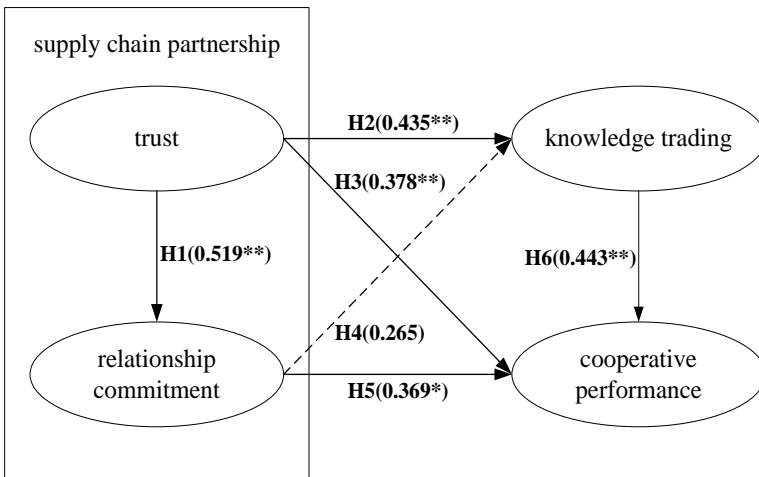
4.4 Model testing

The evaluation of the model fitness was based on the recommendations of Bagozzi and Yi (1988); using basic standards, overall model fitness, and internal structure fitness of these indicators. First, the basic standard, the factor loading of all indicators reached the significant level of 0.5, and there was no negative measurement error. Second, the results of overall mode fitness are C-min/df = 1.314, goodness of fit index (GFI) = 0.958, root mean square residual (RMR) = 0.017, root mean square error of approximation (RMSEA) = 0.025. It can be seen that GFI, RMR and RMSEA all reached the acceptable level. Third, for the internal

structure fitness of the model, the study showed that reliability coefficient of each variable was above the acceptable level of 0.5. Based on the evaluation of combination reliability and extracted variance of the potential variables, the combination reliability of trust, relationship commitment, knowledge trading and cooperative performance were between 0.756 and 0.867. The extracted variances were between 0.567 and 0.654. They all reached the acceptable level, so it can be inferred that this model has good internal structure fitness.

4.5 Empirical results

According to the conceptual model and model assessment through the structural equation model (SEM), the empirical results of the study are showed in Figure2 and Tabel2.



**significant at $P < 0.01$; * significant at $P < 0.05$.

Fig.2 The relationships of the variables in overall model

Table.1 The results of reliability and validity analysis

Variables	Measurement items	Factor loading	Cronbach's α	The main indicators of CFA
Trust	TR1: This partner of supply chain is trustworthy.	0.783		
	TR2: This partner keeps promises it makes to our firm.	0.791		$\chi^2/df=1.432$
	TR3: When making important decisions, this partner considers our welfare as well as its own.	0.754	0.824	RMR=0.021, CFI=0.973, GFI=0.991, NFI=0.968
Relationship commitment	TR4: This partner is genuinely concerned that our business succeeds.	0.812		
	RE1: This partner is very important ally of our business.	0.791		$\chi^2/df=1.567$
	RE2: The business of this partner and our business are closely meshed together.	0.876	0.739	RMR=0.007, CFI=0.993, GFI=0.987, NFI=0.981
	RE3: We have developed a close business relationship with this partner.	0.905		
	To what extent has your firm learned from your members of supply chain by knowledge trading?			
Knowledge trading	KN1: knowledge about technology.	0.904		$\chi^2/df=1.637$,
	KN2: knowledge about operating procedures.	0.837		RMR=0.034, CFI=0.959,
	KN3: knowledge about management techniques.	0.815	0.912	GFI=0.963, NFI=0.945
	KN4: knowledge about marketing expertise.	0.764		
Cooperative performance	CP1: We have gained competitive advantage over our competitors.	0.825		$\chi^2/df=1.732$,
	CP2: We have gained benefits that enable us to compete more effectively in the marketplace.	0.843		RMR=0.035, CFI=0.925,
	CP3: The rate of target reaching has been improved	0.817	0.885	GFI=0.947, NFI=0.951
	CP4: The customer satisfaction has been improved.	0.861		

Through the empirical analysis, the hypothesis H1, H2, H3, H5 and H6 are verified; P-Value of H4 is not notable and fails to pass the test (see the Table2). The results of empirical analysis show that there are significant and positive impacts of trust on relationship commitment, knowledge trading and cooperative performance. Although relationship commitment has significant and positive impact on cooperative performance, it does not impact knowledge trading significantly. Finally, it is also proved that knowledge trading has significant and positive impact on cooperative performance.

Tab.2 The test results of hypothesis

Hypothesis	Path direction	Path coefficient	P-Value	Results
H1	trust → relationship commitment	0.519	0.000	Pass
H2	trust → knowledge trading	0.435	0.005	Pass
H3	trust → cooperative performance	0.378	0.003	Pass
H4	relationship commitment → knowledge trading	0.265	0.074	Reject
H5	relationship commitment → cooperative performance	0.369	0.019	Pass
H6	knowledge trading → cooperative performance	0.443	0.000	Pass

Tab.3 The results of total path coefficient

Hypothesis	Path direction	Total path coefficient		
		Direct	Indirect	Total
H1	trust → relationship commitment	0.519	0	0.519
H2	trust → knowledge trading	0.435	Indistinctively	0.435
H3	trust → cooperative performance	0.378	0.385	0.763
H4	relationship commitment → knowledge trading	Indistinctively	0	0
H5	relationship commitment → cooperative performance	0.369	Indistinctively	0.369
H6	knowledge trading → cooperative performance	0.443	0	0.443

In addition, the direct path coefficient, indirect path coefficient and total path coefficient between the variables have been showed in Table3. The total path coefficient is equal to the sum of direct and indirect path coefficient, and indirect path coefficient is equal to the product of the subsection direct path coefficient. According to the Table3, knowledge trading has the greatest direct impact on cooperative performance, while the greatest impact of trust on

cooperative performance is achieved by the mediating effect of relationship commitment and knowledge trading.

5. DISCUSSION

The findings above not only verify the hypotheses but also bring positive reality implications to Chinese manufacturing enterprises which are working hardly to promote knowledge sharing and look forward to gain high competitive advantages and cooperative performance in supply chain.

First of all, trust has significant and positive impacts on relationship commitment, knowledge trading and cooperative performance, and the greatest impact of trust on cooperative performance is achieved by the mediating effect of relationship commitment and knowledge trading. Considering the members of supply chain are different stakeholders and economic agents, inter-organizational knowledge sharing among members is more difficult than intra-organizational knowledge sharing because there is no administrative organization (department) promoting the knowledge sharing activities. Meanwhile, the contractual relationships among members of supply chain are incomplete which result in lacking mandatory binding on mutual behavior, “free riders” and other inevitable opportunism behaviors. That is to say, lack of trust will lead to negative effect on knowledge trading between enterprises. Therefore, the level of relationship commitment can be improved by building the trust mechanism among members of supply chain which can also reduce the risk and uncertainty of external environment. Furthermore, it can promote knowledge trading and then the cooperative performance can be improved. However, mutual trust cannot be enforced by contract, but only by long-term and gradual accumulation of communication with each other. Thus, the extensive and effective communication mechanism which can promote information and knowledge flowing smoothly among supply chain members should be constructed. In addition, it is important to develop reputation strategies that meet the enterprises’ practical business by enhancing member enterprises’ reputation and establish long-term relationships by improving the acceptance of supply chain members. With the above measures, the risks of opportunism and “free riders” problem can be prevented successfully.

Secondly, relationship commitment has significant and positive impact on cooperative performance, but the impact on knowledge trading is not significantly. The main reason is that the objects of knowledge trading in this paper are focused on non-core knowledge resources of partners in supply chain. This kind of non-core knowledge is not only transacted with the partners who have the most stable and close strategic relationship in supply chain, but also transacted with some other partners who are relatively trusted. Thus, the knowledge sellers may not ask for partners’ long-term commitment of cooperation when they dealing with those non-core knowledge trading. Although the relationship commitment cannot indirectly impact the cooperative performance through mediating effect of knowledge trading, but it can impact cooperative performance directly which indicates that relationship commitment of the supply

chain partners can contribute to maintain and develop long-term supply chain partnership and promote the cooperative performance of supply chain.

Finally, it is proved that knowledge trading has significant and positive impact on cooperative performance. In the supply chain, each member has its own core knowledge and non-core knowledge, some non-core knowledge to its owner is worthless, but is valuable for other partners. On this basis, these heterogeneous and complementary knowledge resources form a “knowledge base of supply chain” which has much more knowledge than any partner, which is to say, the whole supply chain is a rich knowledge source to all the members. Knowledge trading as an effective way for knowledge sharing and transfer, it can cut costs and reduce risks of obtaining and creating knowledge, increase the efficiency of knowledge utilization, collaborate and optimize the knowledge level of partners in supply chain. Therefore, building and perfecting knowledge trading mechanism (including organization and management mechanism, incentive mechanism, pricing mechanisms, payment mechanisms, etc) and promoting knowledge trading are very important for enhancing the competitive advantages and cooperative performance of supply chain.

6. CONCLUSIONS

The central focus of this research is to study the relationships among supply chain partnership, knowledge trading and cooperative performance in supply chain. We begin this study by noticing a few studies which introduce inter-organizational knowledge trading in supply chain and do not match with reality, especially in China, a country which thinks highly regards the relational mechanism in trading activities. Based on previous studies, a conceptual model for the relationships among supply chain partnership, knowledge trading and cooperative performance is proposed. The dimension of supply chain partnership in the model is described from trust and relationship commitment. Then using the questionnaires, we collect data from various Chinese manufacturing enterprises in supply chain and examine the relationships proposed by the above conceptual model. The findings of this study show that there are significant and positive impacts of trust on relationship commitment, knowledge trading and cooperative performance. Although relationship commitment has significant and positive impact on cooperative performance, it does not impact knowledge trading significantly. Finally, it is also proved that knowledge trading has significant and positive impact on cooperative performance.

As with any exploratory study, this study has some limitations. Because the data is derived from Chinese manufacturing enterprises in supply chain, the findings may not be applicable to other industries. Also, the research results may lack universality in different level countries. Therefore, researchers should collect data from different industries in different level countries to obtain more practical and general conclusions in further studies.

REFERENCES

- [1] Anderson, E. and Weitz, B. 1992. The use of pledges to build and sustain commitment in distribution channels. *Journal of marketing research* 29(1): 18-34.
- [2] Anderson, J.A. and Faff, R.W. 2008. Point and figure charting: A computational methodology and trading rule performance in the S&P 500 futures market. *International Review of Financial Analysis* 17(1): 198-217.
- [3] Ba, S., Stallaert, J. and Whinston, A.B. 2001. Optimal investment in knowledge within a firm using a market mechanism. *Management Science* 47(9): 1203-1219.
- [4] Bagozzi, R.P. and Yi, T. 1988. On the evaluation of structural equation models. *Journal of the Academy of Marketing Science* 16(1): 74 - 94.
- [5] Bradach, J.L. and Eccles, R.G. 1989. Price, authority, and trust: From ideal types to plural forms. *Annual Review of Sociology* 15: 97-118.
- [6] Bruton, G.D., Dess, G.G. and Janney, J.J. 2007. Knowledge management in technology-focused firms in emerging economies: Caveats on capabilities, networks, and real options. *Asia Pacific Journal of Management* 24(2): 115-130.
- [7] Brydon, M. and Aidan, R. 2006. Understanding the failure of internal knowledge markets: A framework for diagnosis and improvement. *Journal of Information & Management* 43(8): 964-974.
- [8] Carnevale, P.J. and Probst, T. 1998. Social values and social conflict in creative problem solving and categorization. *Journal of Personality and Social Psychology* 74(5): 1300-1309.
- [9] Cheng, J.H., Yeh, C.H. and Tu, C.W. 2008. Trust and knowledge sharing in green supply chains. *Supply Chain Management* 13(4): 283-295.
- [10] Cheung, M.S. and Myers, M.B. 2008. Managing knowledge sharing networks in global supply chains. *International Journal of Management and Decision Making* 9(6): 581-599.
- [11] Chiu, C.M., Hsu, M.H. and Wang, E.T.G. 2006. Understanding knowledge sharing in virtual communities: An integration of social capital and social cognitive theories. *Decision Support Systems* 42(3): 1872-1888.
- [12] Chow, W.S. and Chan, L.S. 2008. Social network, social trust and shared goals in organizational knowledge sharing. *Information & Management* 45(7): 458-465.
- [13] Das, T.K. and Teng, B.S. 1998. Between trust and control: Developing confidence in partner cooperation in alliances. *The Academy of Management Review* 23(3): 491-512.
- [14] Davenport, T.H. and Prusak, L. 1998. Working knowledge, Harvard Business School Press, Boston.
- [15] Desouza, K.C. and Awazu, Y. 2003. Constructing internal knowledge markets: Considerations from mini cases. *International Journal of Information Management* 23(4): 345-353.

- [16] Desouza, K.C. and Awazu, Y. 2004. Markets in know-how. *Business Strategy Review* 15(3): 59-65.
- [17] Desouza, K.C., Awazu, Y. and Yamakawa, S. 2005. Facilitating knowledge management through market mechanism. *Knowledge and Process Management* 12(2): 99-107.
- [18] Desouza, K.C., Yamakawa, S. and Awazu, Y. 2003. Pricing organizational knowledge: An imperative. *Ivey Business Journal* 67(7): 1-5.
- [19] Dhanaraj, C., Lyles, M.A., Steensma, H. K. and Tihanyi, L. 2004. Managing tacit and explicit knowledge transfer in IJVs: The role of relational embeddedness and the impact on performance. *Journal of International Business Studies* 35(5): 428-442.
- [20] Doney, P.M. and Cannon, J.P. 1997. An examination of the nature of trust in buyer-seller relationships. *The Journal of Marketing* 61(2): 35-51.
- [21] Dyer, J.H. and Singh, H. 1998. The relational view: Cooperative strategy and sources of inter-organizational competitive advantage. *The Academy of Management Review* 23(4): 660-679.
- [22] Ellram, L.M. 1991. Supply-chain management: The industrial organization perspective. *International Journal of Physical Distribution & Logistics Management* 21(1): 13-22.
- [23] Ganesan, S. 1994. Determinants of long-term orientation in buyer-seller relationships. *Journal of Marketing* 58(1): 1-19.
- [24] Ganesan, S., Ambrose, M. and Hess, R.L. 2007. The relationship between justice and attitudes: An examination of justice effects on event and system-related attitudes, *Organizational Behavior and Human Decision Processes* 103(1): 21-36.
- [25] Garbarino, E. and Johnson, M.S. 1999. The different roles of satisfaction, trust, and commitment in customer relationships. *Journal of Marketing* 63(2): 70-87.
- [26] Gefen, D., Karahanna, E. and Straub, D. W. 2003. Trust and TAM in online shopping: An integrated model. *Mis Quarterly* 27(1): 51-90.
- [27] Gerbing, D.W. and Anderson, J.C. 1988. An updated paradigm for scale development incorporating unidimensionality and its assessment. *Journal of Marketing Research* 25(2): 186-192.
- [28] Halley, A., Nollet, J., Beaulieu, M. and Roy, J. 2010. The impact of the supply chain on core competencies and knowledge management: Directions for future research. *International Journal of Technology Management* 49(4): 297-313.
- [29] Hitt, M.A., Ireland, R.D. and Lee, H. 2000. Technological learning, knowledge management, firm growth and performance. *Journal of Engineering and Technology Management* 17(3): 231 - 246.
- [30] Huang, C.C. and Lin, S.H. 2010. Sharing knowledge in a supply chain using the semantic web. *Expert Systems with Applications* 37(4): 3145-3161.
- [31] Hult, G.T.M., Ketchen, D.J. and Cavusgil, S.T. 2006. Knowledge as a strategic resource in supply chains. *Journal of Operations Management* 24(5): 458-475.

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- [32] Inkpen, A.C. 2000. Learning through joint ventures: A framework of knowledge acquisition. *Journal of Management Studies* 37(7): 1019-1044.
- [33] Inkpen, A.C. and Tsang, E.W.K. 2005. Social capital, networks, and knowledge transfer. *The Academy of Management Review* 30(1): 146-165.
- [34] Joshi, A.W. and Stump, R.L. 1999. Determinants of commitment and opportunism: Integrating and extending insights from transaction cost analysis and relational exchange theory. *Canadian Journal of Administrative Sciences* 16(4): 334-352.
- [35] Kang, J., Rhee, M. and Kang, K.H. 2010. Revisiting knowledge transfer: Effects of knowledge characteristics on organizational effort for knowledge transfer. *Expert Systems with Applications*, 37(12): 8155-8160.
- [36] Karande, K., Ha, J. and Singhapakdi, A. 2008. The role of contextual factors in relationship commitment of buyers to foreign suppliers: A survey of Korean importers. *Industrial Marketing Management* 37(7): 856-862.
- [37] Kogut, B. and Zander, U. 1992. Knowledge of the firm, combinative capabilities, and the replication of technology. *Organization science* 3(3): 383-397.
- [38] Kumar, K. and Dissel, H.G.V. 1996. Sustainable collaboration: Managing conflict and cooperation in inter-organizational systems. *Mis Quarterly* 20(3): 279-300.
- [39] Lagace, R.R., Dahlstorm, R. and Gassnheimer, J.B. 1991. The relevance of ethical salesperson behavior on relationship quality: The pharmaceutical industry. *Journal of Selling and Sale Management* 11 (4): 39-47.
- [40] Lambert, D.M., Emmelhainz, M.A. and Gardner, J.T. 1996. Developing and implementing supply chain partnerships. *International Journal of Logistics Management* 7(2): 1-18.
- [41] Lane, P.J., Salk, J.E. and Lyles, M.A. 2001. Absorptive capacity, learning, and performance in international joint ventures. *Strategic Management Journal* 22(12): 1139-1161.
- [42] Li, L. 2005. The effects of trust and shared vision on inward knowledge transfer in subsidiaries' intra-and inter-organizational relationships. *International Business Review* 14(1): 77-95.
- [43] Lubit, R. 2001. Tacit knowledge and knowledge management: The keys to sustainable competitive advantage. *Organizational Dynamics* 29(3): 164-178.
- [44] Lyles, M.A. and Salk, J.E. 1996. Knowledge acquisition from foreign parents in international joint ventures: An empirical examination in the Hungarian context. *Journal of International Business Studies* 27(5): 877-903.
- [45] Ma, Z.Z., Qi, L.Y. and Wang, K.Y. 2008. Knowledge sharing in Chinese construction project teams and its affecting factors: An empirical study. *Chinese Management Studies* 2(2): 97-108.

- [46] Matson, E., Patiath, P. and Shavers, T. 2003. Stimulating knowledge sharing: Strengthening your organization's internal knowledge market. *Organizational Dynamics* 32(3): 275-285.
- [47] Maurer, I. 2010. How to build trust in inter-organizational projects: The impact of project staffing and project rewards on the formation of trust, knowledge acquisition and product innovation. *International Journal of Project Management* 28(7): 629-637.
- [48] Mayer, R.C., Davis, J.H. and Schoorman, F.D. 1995. An integrative model of organizational trust. *The Academy of Management Review* 20(3): 709-734.
- [49] Mcgee, J.E., Dowling, M.J. and Megginson, W.L. 1995. Cooperative strategy and 77 new venture performance: The role of business strategy and management experience. *Strategy Management Journal* 16(7): 565-580.
- [50] Moorman, C., Zaltman, G. and Deshpande, R. 1992. Relationships between providers and users of marketing research: The dynamics of trust within and between organizations. *Journal of Marketing Research* 29(3): 314-329.
- [51] Morgan, R.M. and Hunt, S.D. 1994. The commitment-trust theory of relationship marketing. *Journal of Marketing* 58(3): 20-38.
- [52] Nahapiet, J. and Ghoshal, S. 1998. Social capital, intellectual capital, and the organizational advantage. *The Academy of Management Review* 23(2): 242-266.
- [53] Noordewier, M.O., Towell, G.G. and Shavlik, J.W. 1990. Refinement of approximate domain theories by knowledge-based artificial neural networks. *Proceedings of the Eighth National Conference on Artificial Intelligence*, Boston, MA, pp. 861-866.
- [54] Nunnally, J.C. 1978. Psychometric theory, McGraw-Hill, New York.
- [55] Ramaseshan, B., Yip, L.S.C. and Pae, J.H. 2006. Power, satisfaction, and relationship commitment in Chinese store-tenant relationship and their impact on performance. *Journal of Retailing* 82(1): 63-70.
- [56] Renzl, B. 2008. Trust in management and knowledge sharing: The mediating effects of fear and knowledge documentation. *Omega* 36(2): 206-220.
- [57] Rigby, D.K. and Buchanan, W.T. 1994. Putting more strategy into strategic alliances. *Directors & Boards* 18(2): 14-19.
- [58] Seppanen, R., Blomqvist, K. and Sundqvist, S. 2007. Measuring inter-organizational trust--a critical review of the empirical research in 1990-2003. *Industrial Marketing Management* 36(2): 249-265.
- [59] Szulanski, G. 1996. Exploring internal stickiness: Impediments to the transfer of best practice within the firm. *Strategic Management Journal* 17: 27-43.
- [60] Tsai, W. and Ghoshal, S. 1998. Social capital and value creation: The role of intrafirm networks. *The Academy of Management Journal* 41(4): 464-476.

- [61] Tsang, E.W.K. 2002. Acquiring knowledge by foreign partners from international joint ventures in a transition economy: Learning-by-doing and learning myopia. *Strategic Management Journal* 23 (9): 835-854.
- [62] Uzzi, B. 1997. Social structure and competition in interfirm networks: The paradox of embeddedness. *Administrative science quarterly* 42(1): 35-67.
- [63] Vokurka, R.J. 1998. Supply partnership: A case study. *Production and Inventory management* 39(1): 30-35.
- [64] Wang, C., Fergusson, C., Perry, D. and Antony, J. 2008. A conceptual case-based model for knowledge sharing among supply chain members. *Business Process Management Journal* 14(2): 147-165.
- [65] Xu, Y.Z., Wang, D.P. and Yang, B.R. 2008. Study on knowledge transaction and pricing in supply chain. *Science of Science and Management of S & T* 29(11): 97-101 (in Chinese).
- [66] Zaheer, A., McEvily, B. and Perrone, V. 1998. Does trust matter? Exploring the effects of interorganizational and interpersonal trust on performance. *Organization Science* 9(2): 141-159.
- [67] Zhang, X.M., Zhang, H.T. and Zhu, Q. 2006. Research on knowledge markets in supply chain. *Scientific Management Research* 26(5): 69-72 (in Chinese).
- [68] Zhang, X. M., Zhang, Y.R. and Zhang, H.T. 2008. Study on the knowledge market and the model of knowledge trading among enterprises in supply chain. *Journal of Industrial Engineering and Engineering Management* 22(3): 81-85 (in Chinese).