Research paper

Trust and knowledge sharing in green supply chains

Jao-Hong Cheng
Department of Information Management, National Yunlin University of Science and Technology, Taiwan

Chung-Hsing Yeh
Faculty of Information Technology, Monash University, Clayton, Victoria, Australia, and College of Management, National Cheng Kung University, Taiwan, and

Chia-Wen Tu
Department of Information Management, National Yunlin University of Science and Technology, Taiwan

Abstract
Purpose – The paper aims to examine how trust interacts with factors affecting interorganizational knowledge sharing in green supply chains, where cooperation and competition coexist.
Design/methodology/approach – A new research model is developed which comprises nine constructs and 13 research hypotheses, with trust as a mediating construct. The nine constructs are measured by well-supported measures in the literature. The hypotheses are tested on data collected from 288 major green manufacturing firms in Taiwan, using structural equation modeling.
Findings – The paper finds that trust is the pivot of the factors influencing interorganizational knowledge sharing. The more a factor contributes to trust positively (such as participation and communication) or negatively (such as opportunistic behavior), the more the factor contributes to knowledge sharing correspondingly. The factors with no significant influence on trust (such as shared values and learning capacity) have no or less influence on knowledge sharing.
Research limitations/implications – The empirical study is conducted on green supply chains, with data collected from Taiwan's green manufacturing firms. With the research model developed, cross-industrial studies on various forms of supply chains can be conducted to investigate whether differences between supply chains exist about the role that trust plays in interorganizational knowledge sharing.
Practical implications – The findings of the paper provide useful insights into how supply chain members should reinforce their collaborative behaviors and activities that would enhance the trust-based relationships, in order to achieve the competitive advantage of knowledge sharing for the supply chain as a whole.
Originality/value – The new research model developed allows the relationships between trust and other influencing factors on interorganizational knowledge sharing to be explored. The model reflects the coexistence of the cooperation and competition relationships between supply chain members, which is not dealt with in previous studies.

Keywords Trust, Knowledge sharing, Taiwan, Supply chain management

Paper type Research paper

1. Introduction

Knowledge and learning have increasingly become key determinants of supply chains' competitive advantages (Crone and Roper, 2001; Spekman *et al.*, 2002). A primary objective of knowledge management research and practice is to facilitate effective knowledge sharing among organizational members (Davenport and Prusak, 1998; Desouza, 2003). To improve interorganizational 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. Interorganizational knowledge sharing within a supply chain has thus become a common practice, because it enhances the competitive advantage of the supply chain as a whole (Holland, 1995).

The current issue and full text archive of this journal is available at **www.emeraldinsight.com/1359-8546.htm**

Supply Chain Management: An International Journal
13/4 (2008) 283–295

[DOI 10.1108/13598540810882170]

Received: 12 May 2006
Accepted: 8 September 2007

This research was supported by the National Science Council of Taiwan, ROC, under Contract NSC 94-2211-E-224-016. We thank two anonymous reviewers for their valuable comments and advice.

Supply Chain Management: An International Journal
Volume 13 · Number 4 · 2008 · 283–295

To achieve the advantages of knowledge sharing, it is of strategic importance for the manufacturing firms to understand the factors that affect knowledge sharing behaviors of their partners. Existing research on this important issue has focused on modeling all the factors under investigation as precursors or independent variables that directly affect the behaviors of knowledge sharing. These models do not consider indirect effects and pay no special attention to the likely coexistence of the cooperation and competition relationships between supply chain members, known as co-opetition (Brandenburger and Nalebuff, 1996). In a co-opetition business environment, despite the advantages of interorganizational knowledge sharing, manufacturing firms may impede knowledge sharing, if they regard their partners as potential competitors and try to protect their core knowledge from opportunistic behavior of their partners (Spekman *et al.*, 2002). This is mainly because sharing key knowledge or confidential information may increase the competitive advantage of their partners, which may be in conflict with their own interests in a highly competitive market.

To address the issue of the co-opetition partnership within supply chains for investigating factors influencing interorganizational knowledge sharing, we develop a new research model that treats trust as a mediating construct. The trust construct is used to reflect the level of the cooperation and competition relationships between supply chain members. In this context, trust is regarded as a firm's belief that its supply chain partners will perform actions that will result in positive outcomes and will not take unexpected actions that result in negative outcomes for the firm (Anderson and Narus, 1990). The strength of this belief thus may lead the firm to have confidence in its partner's reliability and integrity (Morgan and Hunt, 1994). With trust as a mediating construct, we can examine how trust, when interacting with other influencing factors, may have impacts on interorganizational knowledge sharing in supply chains.

To examine the new research model, we conduct an empirical study on green manufacturing firms and their partners in Taiwan's green supply chains. Green supply chains have recently emerged to comply with regulations for environmental protection. Green manufacturing firms and their supply chain partners are enthusiastic about developing environmentally friendly activities in order to maintain and promote their competitiveness. Due to the on-going development of green technologies and regulations, sharing green experience and up-to-date knowledge between manufacturing firms and their supply chain partners has become a necessity. With the new research model, we will examine the role that trust plays in interorganizational knowledge sharing with a view to providing insights into how effective sharing of green knowledge can be facilitated in green supply chains.

In subsequent sections, we first give an overview of interorganizational knowledge sharing in green supply chains. Next we discuss the factors affecting trust and knowledge sharing, and present the new research model with 13 hypotheses. We then describe the survey instrument developed and the data collected from Taiwan's major green manufacturing firms, followed by testing the model using structural equation modeling. Finally, we discuss the results, their practical implications and limitations, and suggestions for future research.

2. Interorganizational knowledge sharing in green supply chains

Supply chains are formed to achieve a sustainable competitive advantage for all parties involved. The social and political concerns on environmental issues have encouraged manufacturing firms to "green" their supply chains (Van Hoek, 1999). To improve both economic and environmental performance simultaneously throughout their supply chains, green manufacturing firms have created networks of suppliers or subcontractors to purchase environmentally superior products and to build common practices to waste reduction and operational efficiencies (Zhu and Cote, 2004). To reassure regulatory compliance of their business practices, green manufacturing firms often encourage their supply chain partners to develop an environmental management system (EMS) consistent with the ISO 14000 standards and to obtain the ISO 14001 certification (GEMI – Global Environmental Management Initiative, 2001). The successful implementation of the EMS involves identifying new techniques and opportunities for effective management of environmental impacts. As such, green manufacturing firms may need to help their supply chain partners develop environmental management capabilities by providing training programs and sharing their green knowledge.

Interorganizational knowledge sharing in green supply chains involves activities of transferring or disseminating green knowledge from green manufacturing firms to their partners with a view to developing new capabilities for effective actions. To achieve the benefits of interorganizational knowledge sharing, it is essential for all the parties involved to be in cooperative relationships (Dyer and Singh, 1998). With collaborations between manufacturing firms and their partners, a base of jointly held knowledge can be created and maintained through knowledge sharing, thus enhancing mutual understanding and expectations (Larsson *et al.*, 1998). With effective knowledge sharing, the strategic intent of interorganizational collaborations for a sustainable competitive advantage can be achieved by combining the relevant organizational resources and capabilities of all parties (Madhok and Tallman, 1998).

The value created by collaborative supply chains benefits all parties (Horvath, 2001). However, competition may occur when the green manufacturing firms and their supply chain partners need to capture specific business values created in the market or to protect their own interests. In other words, these parties are in a co-opetition relationship where cooperation and competition coexist (Brandenburger and Nalebuff, 1996). In the form of interorganizational knowledge sharing, cooperation has the potential to increase each party's knowledge base and, thus, competitiveness, as knowledge is a source of competitive advantage (Loebecke *et al.*, 1999). As such, firms would rather not share knowledge if they feel that what they gain from cooperation is outweighed by losses from relinquishing their monopoly over the knowledge. While the existence of this issue is known, little work has focused on how the issue may be examined and modeled.

To address this issue in green supply chains, we develop a new research model. The model treats trust as a mediating construct in order to reflect the coexisting cooperation and competition relationships when interorganizational knowledge sharing is practiced. This development is in line with the notion that a lack of trust between collaborative partners may

Supply Chain Management: An International Journal
Volume 13 · Number 4 · 2008 · 283–295

lead to competitive confusion about whether a partner is an ally or a competitor (Powell *et al.*, 1996). The constructs and hypotheses of the research model are discussed in the following section.

3. The research model

Figure 1 shows the new research model with the factors affecting trust and interorganizational knowledge sharing. The model comprises 13 research hypotheses to be tested. The arrows indicate the hypothesized relationships, and the plus and minus signs indicate positive and negative relationships respectively.

3.1 Shared values

The concept of shared values refers to the extent to which partners have common beliefs about what behaviors, goals, and policies are important or unimportant, appropriate or inappropriate, and right or wrong (Morgan and Hunt, 1994). In line with organizational behavior literature, partners tend to commit themselves more to their relationships when they have shared values (Morgan and Hunt, 1994). When supply chain members have the same perceptions about how to interact with one another, they can avoid possible misunderstandings in their communications and have more opportunities to exchange their ideas freely (Tsai and Ghoshal, 1998).

Shared values contribute to the development of interorganizational relationships and help supply chain members trust each other, because shared values enable one member to understand other member's behaviors and goals better (Dwyer *et al.*, 1987; Anderson and Weitz, 1989; Sahay, 2003). However, when supply chain members are in a co-opetition relationship and need to maximize their own interests, the willingness of sharing competitive knowledge may be limited. In other words, the supply chain members, having shared values and considering knowledge as a source of competitive advantage, might diminish their knowledge sharing behaviors (Tsai and Ghoshal, 1998; Jap, 1999). As such, it is hypothesized that:

H1. Shared value is positively related to trust.

H2. Shared value is negatively related to interorganizational knowledge sharing.

3.2 Participation

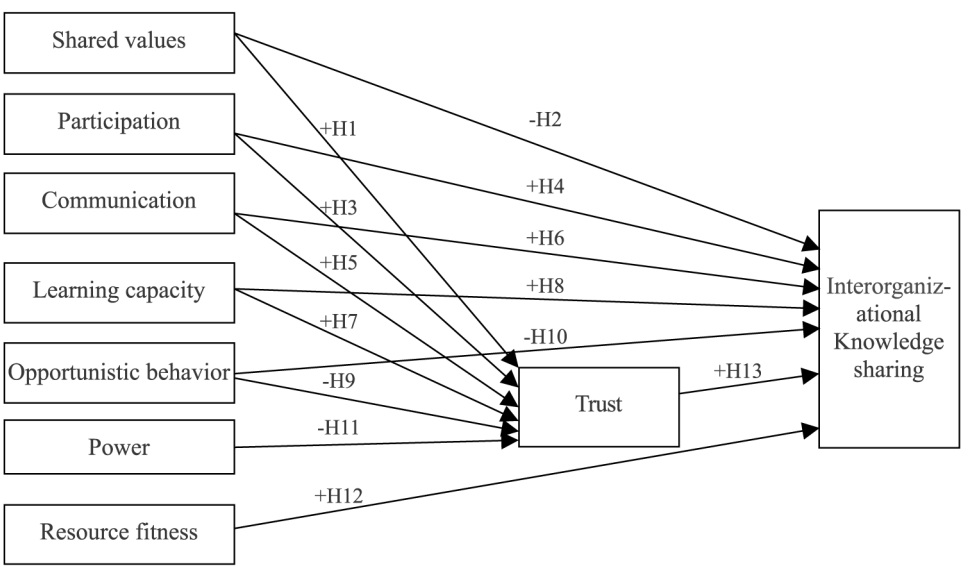
Participation refers to the degree to which a mutual commercial goal to be achieved is included in decision making, including the idea generation, decision making involvement, and goals setting (Dwyer and Oh, 1988). In an interorganizational relationship, participation implies the parties' input to the decision-making and reflects the amount of control distributed between the parties (Hernandez-Espallardo and Arcas-Lario, 2003). The parties' input to decisions and goal setting are important aspects of participation that lead to successful partnerships (Dwyer and Oh, 1988). Business units perform better when they have greater decision making participation (Walker and Ruekert, 1987). Research results have also suggested that participation not only reduces the functional conflicts of interorganizational relationships but also improves their quality (Henderson, 1990; Lee and Kim, 1999).

Sharing the decision making process would improve the collaboration performance of supply chains (Kim and Oh, 2005). The uncertainty involved in decision-making can be reduced by trust, because the trusting partner has confidence that the trustworthy party can be relied on (Morgan and Hunt, 1994). Trust facilitates a greater mutuality in goal setting and tackling issues (Sahay, 2003). Market research has suggested that participation has a positive influence on information sharing and utilization (Deshpande and Zaltman, 1982). An active participation in the relationship's decision-marking process would be assured if all parties involved have jointly held knowledge and information, thus requiring effective interorganizational knowledge sharing. It is thus hypothesized that:

H3. Participation is positively related to trust.

H4. Participation is positively related to interorganizational knowledge sharing.

Figure 1 The research model



Supply Chain Management: An International Journal
Volume 13 · Number 4 · 2008 · 283–295

3.3 Communication

Communication is defined as the formal and informal sharing of meaningful and timely information between organizations (Anderson and Narus, 1990). Communication processes underlie most aspects of organizational functioning (Mohr and Spekman, 1994). Like Anderson and Narus (1990), and Morgan and Hunt (1994), we regards communication as a partner's perception that past communications from another party have been frequent, timely, and reliable. Effective communications are essential for achieving the benefits of interorganizational collaboration (Cummings, 1984).

Communication is a major precursor of trust, and the accumulation of trust leads to better communication (Morgan and Hunt, 1994). Research has found that communication is positively related to trust in various interorganizational relationships (Anderson and Weitz, 1989; Anderson and Narus, 1990; Morgan and Hunt, 1994). It is also found that communication contributes to knowledge sharing (Hendriks, 1999) and failure to share knowledge is typically attributed to inadequate communication mechanisms (Gilbert and Cordey-Hayes, 1996; Treleaven, 2004). Communication captures the utility of the information exchanged (Mohr and Spekman, 1994). Establishing communication mechanisms in supply chains increases trust building and knowledge sharing, thus leading to effective management of collaboration (Cetindamar *et al.*, 2005). Accordingly, it is hypothesized that:

H5. Communication is positively related to trust.

H6. Communication is positively related to interorganizational knowledge sharing.

3.4 Learning capacity

Learning capacity refers to the ability of a firm to assimilate and apply new knowledge successfully to its commercial goals (Szulanski, 1996). A firm's ability to acquire, assimilate and exploit a partner's knowledge should be developed to speed capacity development and minimize its exposure to technological uncertainties (Lane and Lubatkin, 1998). To facilitate interorganizational knowledge transfer, the knowledge acquiring firm requires having the learning capacity to identify key information, understand the competitive importance of the knowledge and apply it (Jordan and Lowe, 2004).

Learning in supply chains requires a level of trust that allows partners to openly share sensitive information in order to gain full benefits of collaboration (Spekman *et al.*, 2002). One key source of successful interorganizational knowledge sharing is the partners' ability to learn or acquire the needed knowledge (Lee, 2001). If a partner has excellent learning capacity, interorganizational trust intensifies (Mayer and Davis, 1995). In the context of knowledge sharing, it is observed that the capacity to learn significantly influences the level of knowledge acquisition (Lyles and Salk, 1996). It is therefore hypothesized that:

H7. Learning capacity is positively related to trust.

H8. Learning capacity is positively related to interorganizational knowledge sharing.

3.5 Opportunistic behavior

The concept of opportunism includes a wide variety of potentially different behaviors (Wathne and Heide, 2000). In the original theory, opportunistic behavior is defined as self-interest seeking with guile, leading to deceit-oriented violation of implicit or explicit promises (Williamson, 1975; Morgan and Hunt, 1994). Strategic alliances or interorganizational cooperative arrangements are arenas for potential opportunistic behavior by partners with different sets of goals, and the inherent temporalities of alliances play significant roles in partner opportunism (Das, 2006). The higher the perceived level of opportunistic behavior within a strategic alliance, the less favorable the alliance outcomes (Judge and Dooley, 2006). In interorganizational relationships, a partner is said to be opportunistic if its behaviors are inconsistent with some prior contact or agreement (Wathne and Heide, 2000). An opportunistic partner may subvert alliance goals if it becomes necessary to achieve its own goals (Das, 2006).

Trust decreases if a firm perceives its partner as engaging in opportunistic behavior (Morgan and Hunt, 1994). Trust is essential for minimizing risks stemming from exposure to opportunistic behavior by partners (Panteli and Sockalingam, 2005) and trust reduces the risk of opportunistic behavior in a long-term exchange relationship (Ganesan, 1994). Despite the benefits gained from sharing information and knowledge with external partners, firms must protect themselves against knowledge appropriation by partners' opportunistic behavior (Jordan and Lowe, 2004). In examining the process of knowledge transfer between strategic alliance partners, Simonin (1999) finds that some partners may use methods to protect key knowledge as a result of opportunistic behavior, thus impeding knowledge sharing between organizations. It is thus hypothesized that:

H9. Opportunistic behavior is negatively related to trust.

H10. Opportunistic behavior is negatively related to interorganizational knowledge sharing.

3.6 Power

Power is the ability to evoke a change in others' behavior, including the ability to cause others to do something they would not have done otherwise (Gaski, 1984). In other words, having power over others is to have the ability to condition others (Thorelli, 1986). For cooperation and coordination to be achieved in a marketing channel, one party may use power to control channel functions by controlling the activities of other parties (Hernandez-Espallardo and Arcas-Lario, 2003). This control process includes the use of a range of bureaucratic, cultural, and informal mechanisms by power and authority (Geringer and Hebert, 1989), which often causes management conflict between the partners (Inkpen and Currall, 2004). As such, the success of specific relationships lies in the presence of relationship commitment and trust, not power and the ability to condition others (Morgan and Hunt, 1994).

In a supply chain, coercive bases of power allow the manufacturing firm to use the resources to influence decisions (Skinner *et al.*, 1992). Coercive bases of power represent a power struggle that may increase the level of conflict inherent in a relationship, thus decreasing the level of trust. Trust and power between partners in a relationship co-evolve over time, in which the presence of trust may negate the need for using power in certain activities (Inkpen and Currall, 2004). A supplier or subcontractor who applies coercion or stress to act reliably will not improve the trust-based relationship (Sahay, 2003). If one party forces its partner into a supply chain

relationship, the partner is unlikely to act in a reliable and trustworthy manner (Handfield and Nichols, 1999). As such, it is hypothesized that:

H11. Power is negatively related to interorganizational trust.

3.7 Resource fitness

Resource fitness refers to a firm's ability to share its explicit and tacit knowledge with its partners, including knowledge resources, expressiveness, and time (Haldin-Herrgard, 2000). The need for face-to-face interaction is often perceived as a prerequisite for diffusion of knowledge, because the absorption of knowledge requires time for both individual and organizational forms of knowledge (Haldin-Herrgard, 2000). Lack of time and meeting places would inhibit knowledge sharing (Davenport and Prusak, 1998). Thus, synergetic values of knowledge sharing only exist if both parties have sufficient resources such as time, capacity for communicating (Hendriks, 1999). It is thus hypothesized that:

H12. Resource fitness is positively related to interorganizational knowledge sharing.

3.8Trust

Numerous definitions of the term trust have been given from a number of different perspectives and research disciplines (Doney and Cannon, 1997; Sahay, 2003). As a multidimensional construct, trust is a belief, sentiment or expectation about an exchange partner that results from the partner's expertise, reliability and intentionality (Ganesan, 1994), or from the partner's honesty and benevolence (Kumar *et al.*, 1995). In this study, to reflect the co-opetition relationship between supply chain members in the research model, trust refers to a firm's belief to have confidence in its partner's reliability and integrity that lead to positive outcomes (Anderson and Narus, 1990; Morgan and Hunt, 1994). For all levels of analysis, trusting parties must be vulnerable to some extent for trust to become operational (Doney and Cannon, 1997). In operational terms, trust implies the belief that the other partner is honest and sincere (Claro *et al.*, 2006).

It is evidenced in knowledge management that trust is a necessary condition for interorganizational knowledge learning (Davenport and Prusak, 1998; Dyer and Nobeoka, 2000). Trust plays a critical role in facilitating a deeper exchange relationship such as knowledge sharing (Morgan and Hunt, 1994; Davenport and Prusak, 1998; Dyer and Nobeoka, 2000; Soekijad and Andriessen, 2003; Moller and Svahn, 2004). Without trust during the collaborative process, information exchanged or knowledge shared between the partners may be low in accuracy (Currall and Judge, 1995). In the context of supply chains, trust is seen as a phenomenon, which contributes to the strength of interorganizational relationships (Sahay, 2003; Wu *et al.*, 2004). Trust is an important precondition in supply chain management (Halldorsson *et al.*, 2007) and information sharing is a prerequisite for trust in supply chains (Henriott, 1999; Kwon and Suh, 2005). As such trust facilitates interorganizational knowledge sharing (Mentzer *et al.*, 2000). In particular, if the knowledge sharing process involves sharing vital and confidential information, the process not only helps build trust but also grows with the presence of trust (Sahay, 2003). Without trust, supply chain members will not share confidential information, as it risks a substantial investment (Sahay, 2003). With trust, partners are able to engage in more open and effective knowledge sharing (Panteli and Sockalingam, 2005). It is thus hypothesized that

H13. Trust is positively related to interorganizational knowledge sharing.

4. Research method

To develop the survey instrument, a pool of items was identified from the literature for measuring the constructs of the research model. Data from a survey sample were used to assess the instrument's validity and reliability, and to test the hypothesized relationships of the research model.

4.1 Content validity

All measures of the survey instrument were developed from the literature. The expressions of the items were adjusted, where appropriate, to the context of green supply chains, as shown in Table I. The items were to be measured on a five-point Likert scale, ranging from "Strongly disagree" (1) to "Strongly agree" (5).

4.2 Pre-test and pilot-test

A pre-test was performed with three academic researchers and four PhD students on a questionnaire consisting of 27 items of the survey instrument for improvement in its content and appearance. Then several large green manufacturing firms were contacted to help with the pilot-test of the instrument. A survey packet including a cover letter explaining the research objectives, the questionnaire, and a stamped, return-addressed envelope, was distributed to production managers of each participating firm. The respondents were asked to complete the questionnaire and provide comments on the wording, understandability and clarity of the items, as well as on the overall appearance and content of the instrument. The responses suggested that all statements were retained and only minor cosmetic changes were needed. After a further review by two other academic researchers, the instrument was deemed ready to be sent to a large sample in order to gather data for testing our research model. Table I shows the 27 items together with the corresponding constructs to be measured.

4.3 Data collection

Two rounds of survey were conducted by distributing the survey instrument in the form of questionnaire to the production managers of 397 green manufacturing firms in Taiwan. These firms were selected because they obtained the ISO 14001 certification before 2004 and were listed in the directories of the 2004 top 1,000 firms in *Business Weekly* (Taiwan's leading business magazine). The first round yielded 192 effective responses, and the second round yielded an additional 96 responses. This resulted in 288 effective responses and a total response rate of 72.5 per cent. A chi-square analysis of the industry distribution of the respondents showed no difference from the industry distribution of all the firms used in the survey. This suggested no non-response bias in the returned questionnaires. Table II shows the demographic and characteristic profiles of participating firms.

5. Results

Structural equation modeling (SEM) with LISREL 8.52 (Joreskog and Sorbom, 1993) was used to test and analyze the hypothesized relationships of the research model. SEM aims

Table I Constructs and measures of the research model

Construct		Source
Shared values		
SV1	You have compatible goals with your partner	Morgan and Hunt (1994); Jap (1999); Tsai and Ghoshal (1998)
SV2	You are enthusiastic about pursuing the collective missions of your partner	
SV3	You and your partner support each other's goals	
Participation		
PA1	You are involved in the set up of the commercial goals with your partner	Deshpande and Zaltman (1982);Hernandez-Espallardo and Arcas-Lario (2003); Walker and Ruekert (1987)
PA2	Your partner takes into account your suggestions	
PA3	You perform an active role in the decision making	
Communication		
CM1	You and your partner frequently exchange each other's opinions	Hurley and Hult (1998); Mohr and Spekman (1994); Morgan and Hunt (1994)
CM2	Your partner frequently keeps you informed of new developments	
CM3	You and your partner frequently discuss each other's expectations	
Learning capacity		
LC1	Your partner has the ability to apply new green knowledge to commercial goals	Kogut and Zander (1992); Lane and Lubatkin (1998)
LC2	Your partner has the ability to extend existing capabilities to encompass new green knowledge	
LC3	Your partner has the ability to reconfigure existing green knowledge within new patterns of integration	
Opportunistic behavior		
OB1	Your partner has intentional policies to restrict the sharing of its green knowledge	Williamson (1975); Simonin (1999); Morgan and Hunt (1994)
OB2	To accomplish his own goals, sometimes your partner alters the facts slightly	
OB3	To accomplish his own goals, sometimes your partner promises to do things without actually doing them later	
Power		
PW1	You could have made things difficult for your partner	Gaski (1984); Skinner *et al.* (1992)
PW2	You could threat to refuse to renew your partner's contract	
PW3	You hinted that you would take certain actions that would reduce your partners' profits	
Resource fitness		
RF1	You have well expressiveness to share green knowledge with your partner	Ajzen (1989); Davenport and Prusak (1998); Haldin-Herrgard (2000)
RF2	You have enough time to share green knowledge with your partner	
RF3	You have valuable green knowledge to share with your partner	
Trust		
TR1	You think your partner is completely open in dealing with you	Doney and Cannon (1997); Ganesan (1994); Kumar *et al.*(1995)
TR2	Promises made by your partner are reliable	
TR3	Your partner does not make false claims	
Knowledge sharing behavior		
KS1	You and your partner share green knowledge obtained from newspapers, magazines, journals, television and other sources	Kale *et al.* (2000); Kogut and Zander (1992); Lee (2001)
KS2	You and your partner share each other's know-where and know-whom	
KS3	You and your partner share know-how from work experience with each other	

to examine the inter-related relationships simultaneously between a set of posited constructs, each of which is measured by one or more observed items (measures). SEM involves the analysis of two models: a measurement (or factor analysis) model and a structural model (Anderson and Gerging, 1988). The measurement model specifies the relationships between the observed measures and their underlying constructs, with the constructs allowed to inter-correlate. The structural model specifies the posited causal relationships among the constructs.

Table II Profiles of participating green manufacturing firms

Demographic profile	Number of firms	Percentage	Chi-square	df	*p* value
Industry type					
Electrical machinery/cable	28	9.7	8.661	10	0.564
Machinery and equipment	52	18.1			
Electronic parts and components	82	28.5			
Transport equipment	20	6.9			
Chemical	38	13.2			
Textiles/fiber	22	7.6			
Basic metal industries	22	7.6			
Printing and related support activities	4	1.4			
Food/beverage	6	2.1			
Non-metallic mineral products	6	2.1			
Others	8	2.8			
Total sales revenue (New Taiwan $)					
$1 billion to below $2 billion	44	15.3	5.204	5	0.391
$2.1 billion to below $3 billion	50	17.4			
$3.1 billion to below $5 billion	42	14.6			
$5.1 billion to below $10 billion	54	18.7			
$10.1 billion to below $20 billion	36	12.5			
$20.1 billion and above	62	21.5			
Years of establishment					
Less than five years	16	5.6	4.378	6	0.625
Six to ten years	36	12.5			
11-15 years	30	10.5			
16-20 years	32	11.1			
21-25 years	46	15.9			
26-30 years	36	12.5			
Over 31 years	92	31.9			
Position of respondent					
Higher than production manager	130	45.1	2.316	5	0.677
Production manager	150	52.1			
Lower than production manager	8	2.8			

5.1 Assessment of the measurement model

With the measures and their underlying constructs shown in Table I, the measurement model specified for the research model was assessed to ascertain the extent to which the observed measures (surveyed items) are actually measuring their corresponding construct. The 27 items of the survey instrument were first analyzed to assess their dimensionality and measurement properties. An assessment of the eigenvalues and scree plot suggested a nine-factor solution (shared values, participation, communication, learning capacity, opportunistic behavior, power, resource fitness, trust, knowledge sharing behavior). In addition, all items loaded significantly and substantially on their underlying constructs, thus providing evidence of convergent validity. With a confirmatory factor analysis, all items performed well and were thus retained in the model.

The chi-square of the measurement model was significant ($\chi^2 = 352.67$, df = 288, $p = 0.005$), with the value of (χ^2/df) smaller than 2, indicating an ideal fit (Bentler, 1988). The large chi-square value was not surprising, since the chi-square statistic has proven to be directly related to sample size (Joreskog and Sorbom, 1993). To assess the overall model fit without being affected by sample size, alternative stand-lone fit indices less sensitive to sample size were used. These indices included the goodness of fit index (GFI), the adjusted goodness of fit index (AGFI), the comparative fit index (CFI), the root mean square residual (RMSR), and the root mean square error of approximation (RMSEA) (Joreskog and Sorbom, 1993; Browne and Cudeck, 1993). To have a good model fit, GFI should be close to 0.90, AGFI more than 0.80, CFI more than 0.9, RMSR less than 0.05, and RMSEA less than 0.10 (Joreskog and Sorbom, 1993; Hair *et al.*, 1998). An assessment of the measurement model suggests an acceptable model fit (GFI = 0.850; AGFI = 0.803; CFI = 0.979; RMSR = 0.011; RMSEA = 0.04).

To assess the reliability of the constructs, composite reliability (CR) was used. All of the composite reliability values, ranging from a low of 0.822 to a high of 0.929, exceeded the recommended cut-off value of 0.80 (Fornell and Larcker, 1981; Joreskog and Sorbom, 1993; Hair *et al.*, 1998). A variable's squared multiple correlation (SMC) is the proportion of its variance that is accounted for by its predictors. The average variance extracted (AVE) was greater than 0.5 in all cases, meaning that the variance accounted for by each of the constructs was greater than the variance accounted for by measurement error (Fornell and Larcker,

1981; Joreskog and Sorbom, 1993; Hair *et al.*, 1998). In addition, an assessment of discriminant validity between the constructs supported the model fit. Table III summarizes the assessment results of the measurement model.

5.2 Assessment of the structural model

Table IV shows the inter-correlation between 9 constructs of the structural model, which supports the positive and negative relationships of the research model in Figure 1. The overall fit of the structural model is acceptable, since all measures of fit reach an acceptable level ($\chi^2 = 357.23$, df = 290, $p = 0.004$; GFI = 0.849; AGFI = 0.803; CFI = 0.978; RMSR = 0.011; RMSEA = 0.04).

5.3 Hypotheses testing

In SEM analysis, the relationships among independent and dependent variables are assessed simultaneously via covariance analysis. Maximum likelihood (ML) estimation is

Table III Assessment results of the measurement model

Construct	Items	Standardized loading	Standardized error	*t*-value	SMC	CR	AVE
Shared values	SV1	0.918**	0.009	4.121	0.843	0.903	0.757
	SV2	0.915**	0.007	4.272	0.837		
	SV3	0.768**	0.011	7.442	0.590		
Participation	PA1	0.886**	0.009	5.194	0.785	0.887	0.726
	PA2	0.921**	0.008	3.911	0.847		
	PA3	0.739**	0.012	7.529	0.546		
Communication	CM1	0.726**	0.020	6.695	0.528	0.822	0.608
	CM2	0.880**	0.021	3.533	0.774		
	CM3	0.722**	0.026	6.745	0.521		
Learning capacity	LC1	0.926**	0.009	3.562	0.858	0.884	0.720
	LC2	0.902**	0.010	4.543	0.814		
	LC3	0.699**	0.015	7.770	0.488		
Opportunistic behavior	OB1	0.879**	0.013	5.272	0.773	0.846	0.655
	OB2	0.926**	0.011	3.532	0.857		
	OB3	0.579**	0.032	8.073	0.335		
Power	PW1	0.919**	0.008	4.561	0.845	0.923	0.801
	PW2	0.915**	0.012	4.715	0.838		
	PW3	0.848**	0.010	6.744	0.719		
Resource fitness	RF1	0.875**	0.008	6.508	0.765	0.929	0.815
	RF2	0.936**	0.006	4.279	0.877		
	RF3	0.896**	0.007	5.962	0.802		
Trust	TR1	0.924**	0.006	5.153	0.854	0.913	0.779
	TR2	0.941**	0.005	4.301	0.885		
	TR3	0.773**	0.013	7.711	0.598		
Knowledge sharing behavior	KS1	0.914**	0.004	5.420	0.835	0.904	0.758
	KS2	0.859**	0.005	6.812	0.737		
	KS3	0.837**	0.004	7.093	0.701		

Note: ** denotes significance at $p < 0.01$

Table IV Correlation matrix of constructs

Construct	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Shared values	1.00								
Participation	0.56	1.00							
Communication	0.36	0.43	1.00						
Learning capacity	0.44	0.44	0.27	1.00					
Opportunistic behavior	−0.29	−0.43	−0.43	−0.39	1.00				
Power	−0.32	−0.34	−0.19	−0.29	0.339	1.00			
Resource fitness	0.42	0.54	0.39	0.64	−0.475	−0.28	1.00		
Trust	0.47	0.61	0.56	0.44	−0.705	−0.49	0.51	1.00	
Knowledge sharing	0.48	0.67	0.60	0.58	−0.786	−0.41	0.67	0.82	1.00

used to estimate model parameters with the covariance matrix as data input. The ML estimation method has been described as being well suited to theory testing and development (Anderson and Gerging, 1988; Joreskog and Sorbom, 1993; Hair *et al.*, 1998).

Figure 2 shows the structural model with the coefficients for each path (hypothesized relationship), where solid and dashed lines indicate a supported and unsupported relationship respectively. With the exception of shared values (*H1*: $\gamma = 0.08$, $t = 1.09$, $p > 0.05$; *H2*: $\gamma = -0.01$, $t = -0.14$, $p > 0.05$) and learning capacity (*H7*: $\gamma = 0.02$, $t = 0.36$, $p > 0.05$), all other hypothesized relationships are supported. Participation (*H3*: $\gamma = 0.22$, $t = 2.75$, $p < 0.01$; *H4*: $\gamma = 0.16$, $t = 2.30$, $p < 0.05$), communication (*H5*: $\gamma = 0.21$, $t = 2.93$, $p < 0.01$; *H6*: $\gamma = 0.15$, $t = 2.33$, $p < 0.05$), opportunistic behavior (*H9*: $\gamma = -0.42$, $t = -5.68$, $p < 0.01$; *H10*: $\gamma = -0.35$, $t = -4.74$, $p < 0.01$) are significantly associated with both trust and knowledge sharing behavior. Power (*H11*: $\gamma = -0.20$, $t = -3.18$, $p < 0.01$) has a negative impact on trust. Learning capacity (*H8*: $\gamma = 0.13$, $t = 2.04$, $p < 0.05$), resource fitness (*H12*: $\gamma = 0.15$, $t = 2.11$, $p < 0.01$) and trust (*H13*: $\gamma = 0.26$, $t = 3.00$, $p < 0.01$) are significantly related to knowledge sharing behavior. Overall, the model explains 69.7 per cent of the variance in trust, and 85.5% in knowledge sharing.

6. Discussion

6.1 Shared values

In Taiwan's green supply chains, shared values do not play a significant role in interorganizational trust or knowledge sharing. This result seems to reflect the coexistence of the cooperation and competition relationships between green supply chain members. Either the members' cooperation is not based on shared values or the shared-values-based cooperation does not significantly help them trust each other, probably due to their inherent competition relationship. With the need to achieve their common business goals, this competition relationship does not significantly impede their knowledge sharing, although the sharing of green knowledge may be limited to contracted collaborative activities. To maximize advantages of interorganizational collaborations through trust and knowledge sharing and to minimize conflicting interests, it is of strategic importance for the supply chain members to recognize the co-opetition relationship and establish trustworthy knowledge sharing processes.

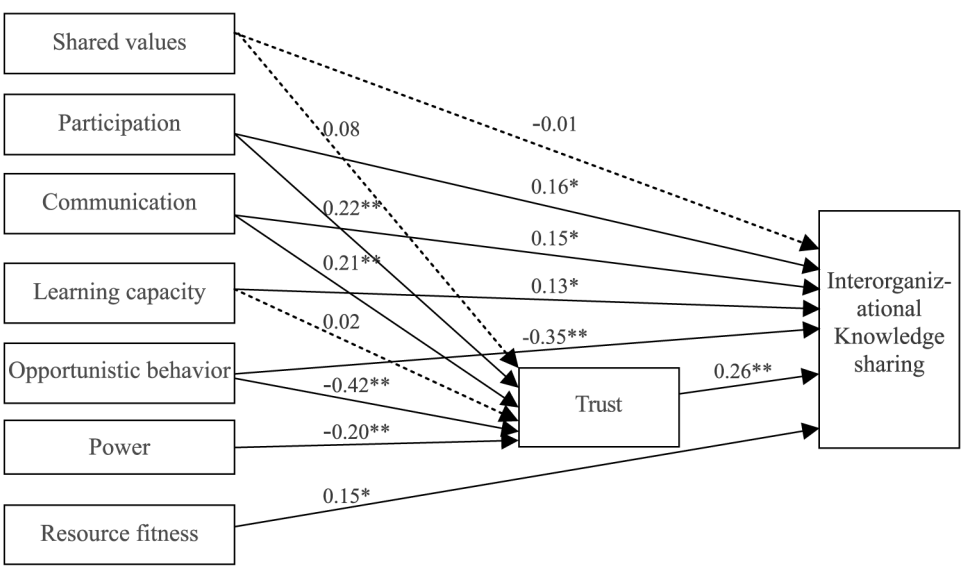
6.2 Participation and communication

Both participation and communication show evidence of a positive relationship with trust and interorganizational knowledge sharing in Taiwan's green supply chains, consistent with previous studies on various organizational settings (e.g. Anderson and Narus, 1990; Henderson, 1990; Lee and Kim, 1999; Sahay, 2003). This result reflects the fact that if a manufacturing firm trusts its partner, it will get its partner actively involved in the decision-making processes and share its knowledge proactively in order to make the decision-making effective and reduce uncertainty. The benefits of joint planning and decision-making would be enhanced by effective communication, as it will facilitate mutual understanding and knowledge sharing. This suggests that effective participation and communication among green supply chain members can ensure the advantages of interorganizational collaboration are achieved through trust formation and knowledge sharing.

6.3 Learning capacity

Learning capacity of a green supply chain partner seems to play a less significant role in enhancing trust and knowledge sharing with its supporting manufacturing firm, in comparison with other factors. This may reflect a practical phenomenon in green supply chains that green supply chain partners conventionally take reactive attitudes in obtaining and applying up-to-date green knowledge in order to meet their environmental obligations. In addition, the green manufacturing firms may not have total confidence in

Figure 2 The structural model



Note: * and ** denote significance at $p < 0.05$ and $p < 0.01$ respectively

learning capacity of their partners in keeping up with new regulations and technologies which are updated quite frequently.

6.4 Opportunistic behavior

Conforming to the hypothesis, opportunistic behavior has the strongest negative influence on interorganizational trust and knowledge sharing. This finding is in line with previous research on the subject. In green supply chains, this factor plays the most significant role in undermining interorganizational trust and knowledge sharing. This may attribute to the relatively unstable relationships between green supply chain members, probably due to frequently created new business opportunities resulting from increasing environmental concerns from the government and the general public. This coincides with the finding on shared values, as far as the co-opetition relationship is concerned. The potential competition relationship in green supply chains would lead to the opportunistic behavior of a partner when the opportunity of increasing its own interests arises.

6.5 Power and resource fitness

As hypothesized, power has a negative impact on interorganizational trust, and resource fitness would contribute to interorganizational knowledge sharing. Like other interorganizational relationships, green supply chain members need to respect their partners in order to gain trust and to provide sufficient resources for facilitating knowledge sharing.

Trust

Trust is found to have a positive influence on interorganizational knowledge sharing. This is in accordance with the findings of previous studies (Morgan and Hunt, 1994; Davenport and Prusak, 1998; Dyer and Nobeoka, 2000; Soekijad and Andriessen, 2003; Moller and Svahn, 2004). The results of the overall structural model in Figure 1 show that the constructs with a significant influence on trust positively (such as participation and communication) or negatively (such as opportunistic behavior) also have a corresponding influence on knowledge sharing. The more a construct's influence on trust, the more the construct's influence on knowledge sharing. The constructs with no significant influence on trust, such as shared values or learning capacity, have no or less influence on knowledge sharing. This suggests that trust plays a significant role in knowledge sharing behaviors of green supply chains where their members are in a co-opetition relationship. To achieve effective knowledge sharing, the relevant parties should reinforce their collaborative behaviors and activities in relation to the factors that would enhance the trust-based relationships.

7. Conclusion

Interorganizational knowledge sharing enhances the competitive advantage of supply chains as a whole. In this paper, we have developed a new research model to examine the factors influencing interorganizational knowledge sharing, particularly the role-played by trust. With the study of Taiwan's green supply chains, we have found that all the factors modeled, except the shared values factor, have a significant influence on interorganizational knowledge sharing. A significant finding is that trust is the pivot of the influencing factors. The factors, contributing more to trust positively (such as participation and communication) or negatively (such as opportunistic behavior), contribute more to interorganizational knowledge sharing correspondingly. The factors with no significant association with trust (such as shared values and learning capacity) have no or less influence on interorganizational knowledge sharing. This finding seems to reflect the coexistence of the cooperation and competition relationships between supply chain members. To enhance the benefits of cooperation and to diminish the conflicts of competition when knowledge sharing is involved, relevant parties should develop trust-based relationships by focusing on activities that would enhance mutual trust (such as participation and communication) and avoid activities that would undermine mutual trust (such as opportunistic behavior and power).

With the development of the new research model, this study makes a theoretical contribution in linking trust with interorganizational knowledge sharing and its influencing factors for exploring the cooperation and competition relationships between supply chain members. The theoretical framework of the model can be applied to other forms of interorganizational collaborations involving knowledge sharing. The findings of the study provide practical insights in understanding how enhanced trust-based relationships can help enhance interorganizational knowledge sharing for achieving the competitive advantage of supply chains.

Despite these contributions, the study has limitations due to the empirical data and the method used. The sample size of this study is constrained by the population size of Taiwan's green manufacturing firms. Although the sample size of 288 used in this study exceeds the minimum sample size of 200 needed for reducing biases in structural equation modeling (Tanaka, 1987; Kline, 1998; Boomsma and Hoogland, 2001; Curran *et al.*, 2002), a larger sample size would be preferred in order to ensure robust estimates of the model. This sample size limitation may be overcome by examining the model using a specific supply chain with a large population size in a future study. In addition, the resultant findings of the study cannot be generalized for all forms of supply chains, as these findings reflect the setting of Taiwan's green supply chains only. To address these inherent limitations, future research on cross-industrial studies on various forms of supply chains would be worth conducting in order to investigate whether differences between supply chains exist in relation to the influencing factors and particularly the role that trust plays in interorganizational knowledge sharing.

As a pioneer research in addressing the cooperation and competition relationships between supply chain members from the perspective of interorganizational knowledge sharing, the study uses trust as a mediating construct to reflect the relationships. The theoretical framework of the research model may serve as a starting point for future theoretical and empirical research in exploring alternative constructs and measures for describing and modeling the complex cooperation and competition relationships.

References

Ajzen, I. (1989), "Attitude structure and behavior", in Pratkanis, A.R., Breckler, S.J. and Greenwald, A.G. (Eds), *Attitude Structure and Function*, Lawrence Erlbaum Associates, Hillsdale, NJ, pp. 241-74.

Anderson, J.C. and Gerging, D.W. (1988), "Structural equation modeling in practice: a review and recommended two-step approach", *Psychological Bulletin*, Vol. 103 No. 3, pp. 411-23.

Anderson, J.C. and Narus, J.A. (1990), "A model of distributor firm and manufacturer firm working partnerships", *Journal of Marketing*, Vol. 54 No. 1, pp. 42-58.

Anderson, E. and Weitz, B. (1989), "Determinants of continuity in conventional industrial channel dyads", *Marketing Science*, Vol. 8 No. 4, pp. 310-23.

Bentler, P.M. (1988), *Theory and Implementation of EQS: A Structural Equations Program*, Sage, Newbury Park, CA.

Boomsma, A. and Hoogland, J.J. (2001), "The robustness of LISREL modelling revisited", in Cudeck, R., du Toit, S. and Sorbom, D. (Eds), *Structural Equation Modeling: Present and Future*, Scientific Software International, Chicago, IL, pp. 139-68.

Brandenburger, A.M. and Nalebuff, B.J. (1996), *Co-Opetition*, Bantam Doubleday Dell Publishing Group, New York, NY.

Browne, M.W. and Cudeck, R. (1993), "Alternative ways of assessing model fit", in Bollen, K.A. and Long, J.S. (Eds), *Testing Structural Equation Models*, Sage, Newbury Park, CA, pp. 136-62.

Cetindamar, D., Catay, B. and Basmaci, O.S. (2005), "Competition through collaboration: insights from an initiative in the Turkish textile supply chain", *Supply Chain Management*, Vol. 10 No. 4, pp. 238-40.

Claro, D.P., de Oliveira Claro, P.B. and Hagelaar, G. (2006), "Coordinating collaborative joint efforts with suppliers: the effects of trust, transaction specific investments and information network in the Dutch flower industry", *Supply Chain Management*, Vol. 11 No. 3, pp. 216-24.

Crone, M. and Roper, S. (2001), "Local learning from multinational plants: knowledge transfers in the supply chain", *Regional Studies*, Vol. 35 No. 6, pp. 535-48.

Cummings, T. (1984), "Transorganizational development", *Research in Organizational Behavior*, Vol. 6, pp. 367-422.

Currall, S.C. and Judge, T.A. (1995), "Measuring trust between organizational boundary role persons", *Organizational Behavior and Human Decision Processes*, Vol. 64, pp. 151-70.

Curran, P.J., Bollen, K.A., Paxton, P., Kirby, J. and Chen, F. (2002), "The noncentral Chi-square distribution in misspecified structural equation models: finite sample results from a Monte Carlo simulation", *Multivariate Behavioral Research*, Vol. 37 No. 1, pp. 1-36.

Das, T.K. (2006), "Strategic alliance temporalities and partner opportunism", *British Journal of Management*, Vol. 17, pp. 1-21.

Davenport, T.H. and Prusak, L. (1998), *Working Knowledge*, Harvard Business School Press, Boston, MA.

Deshpande, R. and Zaltman, G. (1982), "Factors affecting the use of market research information: a path analysis", *Journal of Marketing Research*, Vol. 19 No. 1, pp. 14-33.

Desouza, K.C. (2003), "Strategic contributions of game rooms to knowledge management: some preliminary insights", *Information and Management*, Vol. 41 No. 1, pp. 63-74.

Doney, P.M. and Cannon, J.P. (1997), "An examination of the nature of trust in buyer-seller relationships", *Journal of Marketing*, Vol. 61 No. 2, pp. 35-51.

Dwyer, F.R. and Oh, S. (1988), "A transaction cost perspective on vertical contractual structure and interchannel competitive strategies", *Journal of Marketing*, Vol. 52, pp. 21-34.

Dwyer, F.R., Schurr, P.H. and Oh, S. (1987), "Developing buyer-seller relationships", *Journal of Marketing*, Vol. 51 No. 2, pp. 11-27.

Dyer, J.H. and Nobeoka, K. (2000), "Creating and managing a high-performance knowledge-sharing network: the Toyota case", *Strategic Management Journal*, Vol. 21 No. 3, pp. 345-67.

Dyer, J.H. and Singh, H. (1998), "The relational view: cooperative strategy and sources of interorganizational competitive advantage", *The Academy of Management Review*, Vol. 23 No. 4, pp. 660-79.

Fornell, C. and Larcker, D.F. (1981), "Evaluating structural equation models with unobservable variables and measurement error", *Journal of Marketing Research*, Vol. 18 No. 1, pp. 39-50.

Ganesan, S. (1994), "Determinants of long-term orientation in buyer-seller relationships", *Journal of Marketing*, Vol. 58 No. 2, pp. 1-19.

Gaski, J.F. (1984), "The theory of power and conflict in channels of distribution", *Journal of Marketing*, Vol. 48 No. 3, pp. 9-29.

GEMI – Global Environmental Management Initiative (2001), *New Paths to Business Value*, GEMI, Washington, DC.

Geringer, J.M. and Hebert, L. (1989), "Control and performance of international joint ventures", *Journal of International Business Studies*, Vol. 20, pp. 235-54.

Gilbert, M. and Cordey-Hayes, M. (1996), "Understanding the process of knowledge transfer to achieve successful technological innovation", *Technovation*, Vol. 16 No. 6, pp. 301-12.

Hair, J.F. Jr, Anderson, R.E., Tatham, R.L. and Black, W.C. (1998), *Multivariate Data Analysis with Readings*, 4th ed., Prentice-Hall, Englewood Cliffs, NJ.

Haldin-Herrgard, T. (2000), "Difficulties in diffusion of tacit knowledge in organizations", *Journal of Intellectual Capital*, Vol. 1 No. 4, pp. 357-65.

Halldorsson, A., Kotzab, H., Mikkola, J.H. and Skjott-Larsen, T. (2007), "Complementary theories to supply chain management", *Supply Chain Management*, Vol. 12 No. 4, pp. 284-96.

Handfield, R.B. and Nichols, E.L. (1999), *Introduction to Supply Chain Management*, Prentice-Hall, Englewood Cliffs, NJ.

Henderson, J.C. (1990), "Plugging into strategic partnerships: the critical is connection", *Sloan Management Review*, Vol. 31 No. 3, pp. 7-18.

Hendriks, P. (1999), "Why share knowledge? The influence of ICT on the motivation for knowledge sharing", *Knowledge and Process Management*, Vol. 6 No. 2, pp. 91-100.

Henriott, L. (1999), "Transforming supply chains into e-chains", *Supply Chain Management Review, Global Supplement*, Spring, pp. 15-18.

Hernandez-Espallardo, M. and Arcas-Lario, N. (2003), "The effects of authoritative mechanisms of coordination on market orientation in asymmetrical channel partnerships", *International Journal of Research in Marketing*, Vol. 20 No. 2, pp. 133-52.

Holland, C.P. (1995), "Cooperative supply chain management: the impact of interorganizational information systems", *Journal of Strategic Information Systems*, Vol. 4 No. 2, pp. 117-33.

Horvath, L. (2001), "Collaboration: the key to value creation in supply chain management", *Supply Chain Management*, Vol. 6 No. 5, pp. 205-7.

Hurley, R.F. and Hult, G.T.M. (1998), "Innovation, market orientation, and organization learning: an integration and empirical examination", *Journal of Marketing*, Vol. 62 No. 3, pp. 42-54.

Inkpen, A.C. and Currall, S.C. (2004), "The coevolution of trust, control, and learning in joint ventures", *Organization Science*, Vol. 15 No. 5, pp. 586-99.

Jap, S.D. (1999), "Pie-expansion efforts: collaboration processes in buyer-supplier relationships", *Journal of Marketing Research*, Vol. 36 No. 4, pp. 461-75.

Jordan, J. and Lowe, J. (2004), "Protecting strategic knowledge: insights from collaborative agreements in the aerospace sector", *Technology Analysis & Strategic Management*, Vol. 16 No. 2, pp. 241-59.

Joreskog, K.G. and Sorbom, D. (1993), *LISREL 8: Structural Equation Modeling with the SIMPLIS Command Language*, Scientific Software International, Chicago, IL.

Judge, W.Q. and Dooley, R. (2006), "Strategic alliance outcomes a transaction-cost economics perspective", *British Journal of Management*, Vol. 17, pp. 23-37.

Kale, P., Singh, H. and Perlmutter, H. (2000), "Learning and protection of proprietary assets in strategic alliances: building relational capital", *Strategic Management Journal*, Vol. 21 No. 3, pp. 217-37.

Kim, B. and Oh, H. (2005), "The impact of decision-making sharing between supplier and manufacturer on their collaboration performance", *Supply Chain Management*, Vol. 10 No. 3, pp. 223-36.

Kline, R.B. (1998), *Principles and Practice of Structural Equation Modeling*, Guilford Press, New York, NY.

Kogut, B. and Zander, A. (1992), "Knowledge of the firm, combinative capabilities, and the replication of technology", *Organization Science*, Vol. 3 No. 3, pp. 383-97.

Kumar, N., Scheer, L.K. and Steenkamp, J.-B.E.M. (1995), "The effects of perceived interdependence on dealer attitudes", *Journal of Marketing Research*, Vol. 32 No. 3, pp. 348-56.

Kwon, I.-W.G. and Suh, T. (2005), "Trust, commitment and relationships in supply chain management: a path analysis", *Supply Chain Management*, Vol. 10 No. 1, pp. 26-33.

Lane, P.J. and Lubatkin, M. (1998), "Relative absorptive capacity and interorganizational learning", *Strategic Management Journal*, Vol. 19 No. 5, pp. 461-77.

Larsson, R., Bengtsson, L., Henriksson, K. and Sparks, J. (1998), "The interorganizational learning dilemma: collective knowledge development in strategic alliances", *Organization Science*, Vol. 9 No. 3, pp. 285-305.

Lee, J.N. (2001), "The impact of knowledge sharing, organizational capability and partnership quality on is outsourcing success", *Information and Management*, Vol. 38 No. 5, pp. 323-35.

Lee, J.N. and Kim, Y.G. (1999), "Effect of partnership quality on is outsourcing success: conceptual framework and empirical validation", *Journal of Management Information Systems*, Vol. 15 No. 4, pp. 29-61.

Loebecke, C., Van Fenema, P.C. and Powell, P. (1999), "Co-opetition and knowledge transfer", *Advances in Information Systems*, Vol. 30 No. 2, pp. 14-25.

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*, Vol. 27 No. 5, pp. 877-903.

Madhok, A. and Tallman, S.B. (1998), "Resources, transactions and rents: managing value through interfirm collaborative relationships", *Organization Science*, Vol. 9 No. 3, pp. 326-39.

Mayer, R.C. and Davis, J.H. (1995), "An integrative model of organizational trust", *Academy of Management Review*, Vol. 20 No. 3, pp. 709-34.

Mentzer, J.T., Min, S. and Zacharia, Z.G. (2000), "The nature of interfirm partnering in supply chain management", *Journal of Retailing*, Vol. 76 No. 4, pp. 549-68.

Mohr, J. and Spekman, R.E. (1994), "Characteristics of partnership success: partnership attributes, communication behavior, and conflict resolution techniques", *Strategic Management Journal*, Vol. 15 No. 2, pp. 135-52.

Moller, K. and Svahn, S. (2004), "Crossing east-west boundaries: knowledge sharing in intercultural business networks", *Industrial Marketing Management*, Vol. 33 No. 3, pp. 219-28.

Morgan, R.M. and Hunt, S.D. (1994), "The commitment-trust theory of relationship marketing", *Journal of Marketing*, Vol. 58 No. 3, pp. 20-38.

Panteli, N. and Sockalingam, S. (2005), "Trust and conflict within virtual inter-organizational alliances: a framework for facilitating knowledge sharing", *Decision Support Systems*, Vol. 39, pp. 599-617.

Powell, W.W., Koput, K.W. and Smith-Doerr, L. (1996), "Interorganizational collaboration and the *locus* of innovation: networks of learning in biotechnology", *Administrative Science Quarterly*, Vol. 41, pp. 116-45.

Sahay, B.S. (2003), "Understanding trust in supply chain relationships", *Industrial Management & Data Systems*, Vol. 103 No. 8, pp. 553-63.

Simonin, B.L. (1999), "Ambiguity and the process of knowledge transfer in strategic alliances", *Strategic Management Journal*, Vol. 20 No. 7, pp. 595-623.

Skinner, S.J., Gassenheimer, J.B. and Kelley, S.W. (1992), "Cooperation in supplier-dealer relations", *Journal of Retailing*, Vol. 68 No. 2, pp. 174-93.

Soekijad, M. and Andriessen, E. (2003), "Conditions for knowledge sharing in competitive alliances", *European Management Journal*, Vol. 21 No. 5, pp. 578-87.

Spekman, R.E., Spear, J. and Kamauff, J. (2002), "Supply chain competency: learning as a key component", *Supply Chain Management*, Vol. 7 No. 1, pp. 41-55.

Szulanski, G. (1996), "Exploring internal stickiness: impediments to the transfer of best practice within the firm", *Strategic Management Journal*, Vol. 17, pp. 27-43.

Tanaka, J.S. (1987), "'How big is big enough?': sample size and goodness of fit in structural equation models with latent variables", *Child Development*, Vol. 58 No. 1, pp. 134-46.

Thorelli, H.B. (1986), "Networks: between markets and hierarchies", *Strategic Management Journal*, Vol. 7, pp. 37-51.

Treleaven, L. (2004), "A knowledge-sharing approach to organizational change: a critical discourse analysis", in Tsoukas, H. and Mylonopoulos, N. (Eds), *Organizations as*

Knowledge Systems: Knowledge, Learning and Dynamic Capabilities, Palgrave Macmillan, New York, NY, pp. 154-80.

Tsai, W. and Ghoshal, S. (1998), "Social capital and value creation: the role of intrafirm networks", *Academy of Management Journal*, Vol. 41 No. 4, pp. 464-76.

Van Hoek, R.I. (1999), "From reversed logistics to green supply chains", *Supply Chain Management*, Vol. 4 No. 3, pp. 129-34.

Walker, O.C. Jr and Ruekert, R.W. (1987), "Marketing's role in the implementation of business strategies: a critical review and conceptual framework", *Journal of Marketing*, Vol. 51 No. 3, pp. 15-33.

Wathne, K.H. and Heide, J.B. (2000), "Opportunism in interfirm relationships: forms, outcomes, and solutions", *Journal of Marketing*, Vol. 64 No. 4, pp. 36-51.

Williamson, O.E. (1975), *Markets and Hierarchies, Analysis and Antitrust Implications*, The Free Press, New York, NY.

Wu, W.-Y., Chiag, C.-Y., Wu, Y.-F. and Tu, H.-F. (2004), "The influencing factors of commitment and business integration on supply chain management", *Industrial Management & Data Systems*, Vol. 104 No. 4, pp. 322-33.

Zhu, Q. and Cote, R.P. (2004), "Integrating green supply chain management into an embryonic eco-industrial development: a case study of the Guitang group", *Journal of Cleaner Production*, Vol. 12 Nos 8-10, pp. 1025-35.

Corresponding author

Chung-Hsing Yeh can be contacted at: ChungHsing.Yeh@infotech.monash.edu.au