The role of virtual integration, commitment, and knowledge-sharing in improving international supplier responsiveness

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Resources, Efficiency and Globalization

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The Role of Virtual Integration, Commitment, and Knowledge-Sharing in Improving International Supplier Responsiveness

Ruey-Jer 'Bryan' Jean and Rudolf R. Sinkovics

Introduction and motivation

Globalization has triggered significant structural strategy shifts of multinational enterprises (MNEs). With increasing global competition, MNEs have disintegrated their value-adding activities with their suppliers or subcontractors around the world (Buckley and Ghauri, 2004; Sturgeon, 2002). As a function of this mega-trend, the issue of how MNEs can effectively coordinate and control their global supply chain relationships with local suppliers becomes a critical task for MNE efficiency and competitiveness.

In the supply chain literature, responsiveness has become one of the most important performance metrics for managers in today's time-based competition era (Handfield and Bechtel, 2002; Hult, Ketchen, and Slater, 2004). With increasing demands from global customers, industrial suppliers or contract manufacturers have been pushed to respond more quickly and effectively to their international MNE customers. Interestingly, despite the overarching importance of supply chain responsiveness, the issue of how international supply chain partners can govern their transactions to enhance supplier responsiveness has not received widespread recognition in the literature (Hult et al. 2004). To this end, the main question of this research is 'What is the impact of specific governance mechanisms on supplier responsiveness in international customer-supplier relationships?'

Previously, several governance mechanisms have been identified that drive value creation in international channel relationships, such as, for example, relational norms, contracts, and knowledge-sharing (Cavusgil, Deligonul, and Zhang, 2004; Wu et al. 2007). Additionally, supply chain partners have embraced

information technologies (IT) and adopted these with a view to enhance supply chain performance through higher levels of process and information integration. Virtual integration of supply chain partners via IT has been considered a structural dimension of governance which can help control and relationship building in exchange relationships (Wang and Hsiao-Lan, 2007; Wang, Tai, and Wei, 2006). Therefore, improved understanding of how IT can impact on vertical governance mechanisms and generate interorganizational governance value is essential for firms. This study seeks to develop and test a model to explore the effects of three forms of governance that may be employed to generate higher supplier responsiveness in international customer-supplier relationships: virtual integration, commitment, and knowledge-sharing. In doing so, we aim to contribute to relevant literature in two ways: first, rather than focusing on cost-minimization of governance which transactional cost economics (TCE) proposed (Williamson, 1975), drawing from resource-based view (RBV) (Barney, 1991), this study focuses on the value and performance effect of governance, which is still limited in the extant literature. Second, we advance our knowledge on the effectiveness of plural forms of governance to realize the full potential of value creation in international channel relationships.

The context in which we investigate this issue is that of upstream supply chain relationships between MNEs and their contracting suppliers. Specifically, the relationship between international MNE customers and their OEM suppliers in Taiwan is used. This context helps to elucidate key managerial in the globally dispersed supply and value chain (Choe, 2008; Handfield and Nichols, 2004; Myers and Cheung, 2008). Survey methodology was pursued and structural equation modelling was employed to analyze the data.

The paper will be structured as follows. We start with a conceptual framework, where we define supply chain responsiveness and develop hypotheses relating the interrelationships between three different forms of governance mechanisms including virtual integration, commitment, and knowledge-sharing. Moreover, we also develop hypotheses which address the impact of different governance mechanisms on value creation in terms of supplier responsiveness in international customer-supplier relationships. We then follow with an empirical study that tests the framework and its hypotheses. We report the findings and discuss the implications for theory and managers. We conclude by outlining this study's limitation and areas for future research.

Conceptual framework

As shown in Figure 2.1, drawing from resource-based view and transaction cost economic (TCE) and following the emerging view of governance value analysis, we propose that three different governance mechanisms – virtual integration, commitment, and knowledge-sharing – can stimulate interorganizational

Figure 2.1 Conceptual framework

value in terms of supply chain responsiveness. Various governance mechanisms have been proposed for minimizing the cost of transactions in inter-firm relationships (Cavusgil et al. 2004; Wu et al. 2007). We select these three governance mechanisms because they represent a wider spectrum of governance modes that capture technological, sociological, and information aspects of relationship management, respectively. We also argue that different governance mechanisms can complement and reinforce each other in the process of interorganizational value creation.

Responsiveness

Supplier responsiveness, the ultimate outcome variable in this study, is defined as the extent to which suppliers are effective in marshalling and redeploying resources in their attempt to respond quickly to environmental changes (Fang et al. 2008; Handfield and Bechtel, 2002). In supply chain relationships, cycle time reduction has been regarded as one of the most important outcome variables (Hult, Ketchen, and Arrfelt, 2007; Hult et al. 2004). Today's complicated and dynamic business environment requires suppliers to develop cycle time-based capability to deal with competitive and changing situations to satisfied demanding global customers. Parallel with dynamic capability theory, responsiveness can be one of the most important dynamic capabilities which help firms to achieve greater competitiveness ahead of others. Researchers have demonstrated that higher supplier responsiveness links contribute to improving customer satisfaction (Handfield and Bechtel, 2002) and enhancing market performance (Kim, Cavusgil, and Calantone, 2006).

Governance mechanisms

Researchers have explored governance mechanisms that exist between organizations (Heide, 1994; Weitz and Jap, 1995) and within organizations (Ouchi

1980). Traditional TCE proposed that governance decisions of firms are based on either pure market or hierarchy. More recently, researchers have examined the effectiveness of hybrid governance mechanisms, which are between pure market and hierarchy, for governing interfirm relationships as the transactional context becomes increasingly complex. In the international context, particularly, scholars highlighted that relational governance dimensions such as trust and commitment are important hybrid structures that allow international exchange partners to cope with uncertainty including cultural and geographical distance (Skarmetas, Katsikeas, and Schlegelmilch, 2002). Moreover, Wu et al. (2007) hold that knowledge-sharing can also serve as a relational governance mechanism between exchange partners in which the partners coordinate their activities to increase the potential for higher performance. Recent work suggests that IT can reduce transaction cost and create hybrid governance forms between markets and hierarchies (Jean, Sinkovics, and Kim, 2008; Kim and Mahoney, 2006). Therefore, this study focuses on commitment, knowledge-sharing, and virtual integration as three important hybrid governance mechanisms for governing international customer-supplier relationships.

Research hypotheses

The impact of different governance mechanisms on supplier responsiveness

Virtual integration

The advancement of Internet and B2B technology has changed and restructured interfirm relationships. Virtual integration in this study refers to the extent to which firms conduct supply chain activities via virtual interconnectivity through Internet and B2B technology with their exchange partners (Jean et al. 2008; Wang and Hsiao-Lan, 2007; Wang et al. 2006). These virtual integrations involve activities ranging from online billing, checking ordering status, inventory levels etc. in supply chain relationships. It is one type of quasi-integration and is considered as part of governance structures in many studies (Wang et al. 2006; Zaheer and Venkatraman, 1994).

Because virtual integration can enhance information processing capabilities and reduces transaction cost, a higher level of virtual integration allows exchange parties to share more timely and more accurate information. Moreover, because all the joint actions between channel partners are information-intensive, online virtual integration can increase information visibility within supply chain relationships and thus improve all relevant coordination activities (Kim et al. 2006; Wang et al. 2006). Both coordination and information visibility-enhancing effects of virtual integration

(Yamin and Sinkovics, 2007) can help suppliers to achieve more adaptive and flexible relationships with their international customers. Thus,

Hypothesis 1a: The greater the virtual integration in international customer-supplier relationships, the greater the supplier responsiveness.

Knowledge-sharing

In this study, knowledge-sharing is defined as the extent to which the supplier and its international customer work together in joint exchange of information and know-how, analyzing and solving operational and strategic issues and problems to facilitate communication about the relationship (Wu et al. 2007). This reflects a process dimension of bilateral governance that involves the parties carrying out joint cooperative efforts which can help reduce transaction costs and deter opportunistic behaviours in the relationships (Cavusgil et al. 2004; Chang and Gotcher, 2007), which follows the transaction cost perspective (TCE) (Williamson, 1979).

The process of knowledge-sharing can result in the formation of relationship norms that help to reduce the need for and cost of monitoring in the exchange process (Wu et al. 2007). Thus, knowledge-sharing can serve as relational governance mechanism between channel partners which enhances confidence to cooperate and coordination efforts. Building on RBV's notion of value, rarity, and inimitability, the knowledge-based view argues that unique abilities to create and exploit knowledge can deliver competitive advantage and thereby enhance outcomes. In the supply chain context, Hult et al. (2007) find that knowledge development has a positive effect on supply chain responsiveness. Hence,

Hypothesis 1b: The greater the knowledge-sharing in international customer-supplier relationships, the greater the supplier responsiveness.

Commitment

Commitment in this study refers to an exchange partner belief that an ongoing relationship with another party is important and thus a maximum effort in terms of maintaining it is warranted (Morgan and Hunt, 1994). Studies have shown that relationship commitment represents an essential part of successful long-term business relationships. It facilitates the smooth organization and coordination of economic activities between trading parties (Morgan and Hunt, 1994). In international customer-supplier relationships, a supplier that is committed to its overseas customer can serve a mechanism for reducing transaction cost also promote the willingness of partners to perform recurrent transactions and thus permit flexibility when a trading partner introduces extra requirement. Such flexibility allows efficient interfirm coordination and adaptation to environment changes. Commitment was regarded as a relational

governance mechanism which is manifested in its flexibilities-enabling feature as a form of cooperative behaviour (Skarmeas et al. 2002). Empirical studies also find that commitment is a critically important element for improving international channel performance (Skarmeas et al. 2002). Therefore,

Hypothesis 1c: The greater the supplier commitment in international customer-supplier relationships, the greater the supplier responsiveness.

Interrelationships between different governance mechanisms

The relationship between virtual integration and commitment

Virtual integration in international customer-supplier relationships requires both suppliers and their international customer to invest a lot of fiscal and nonfiscal investments including systems, personnel, and knowledge which are specific to the exchange relationships. Such relationship assets are highly specialized and impossible or difficult to redeploy to an alternative exchange arrangement. This specificity forces firms to try their best to maintain the relationship in order to keep and enhance the value of their investments in the relationships (Wang and Hsiao-Lan, 2007). Previous research showed that transactional specific investment can create a lock-in effect and bind firms together constructively in exchange relationships (Anderson and Weitz, 1992). Accordingly, virtual integration was regarded as a relationship-specific investment which can enhance mutual commitment in business exchange relationships (Kim and Mahoney, 2006). Hence, it is hypothesized that:

Hypothesis 2: The greater the virtual integration in the international customer-supplier relationship, the greater the supplier commitment to the relationship.

The relationship between virtual integration and knowledge-sharing

Some researchers have linked the impact of IT to knowledge-sharing (Kane and Alavi, 2007; Real, Leal, and Roldán, 2006; Tippins and Sohi, 2003). Most of them argue that IT can enhance the quality and quantity of information exchange within and between firm boundaries (Kim et al. 2006) and thus can facilitate greater knowledge-sharing. In the context of supply chains and buyer-seller relationships, electronic integration is expected to assist joint learning activities like information exchange and joint sense making. Unlike traditional Electronic Data Interchange (EDI), new formats of Internet-based IT systems in SCMs allows firms to link up with a large number of supply chain partners and exchange rich information that goes beyond day-to-day operational levels. Moreover, advanced IT in SCMs like collaborative planning, forecasting, and replenishment (CPFR) can help uncover patterns in data and help in the processing of large quantities of raw data. Such IT-based systems can help interpret information in a timely and accurate way for the whole

supply chain members (Malhotra, Gosain, and Sawy, 2005). Further, enterprise resource planning (ERP) systems, include advanced databases which allows firms to tap into previously stored information received from external sources in order to create new knowledge in exchange relationships (Malhotra et al. 2005). Building on the above arguments, we posit:

Hypothesis 3: The greater the virtual integration in the international customer-supplier relationship, the greater the knowledge-sharing in the relationship.

The relationship between supplier commitment and knowledge-sharing

High levels of commitment can encourage suppliers to become more deeply involved in interactions with international customers by devoting additional resources to their international exchange relationships, which, in turn, are expected in enhanced knowledge-sharing activities. It has been suggested that partner commitment and shared vision is related to collaborative learning activities (Dyer and Singh, 1998). Recent studies also find that commitment has a positive effect on relationships learning (Selnes and Sallis, 2003). Therefore,

Hypothesis 4: The greater the supplier's commitment to the international customer-supplier relationships, the greater the knowledge-sharing in the relationship.

Methodology

Empirical context and data collection

The empirical context of this paper is international customer-supplier relationships between Taiwanese OEM/ODM suppliers and their international buyers in the electronics industry, a type of international subcontracting relationship. Our focus is on a particular OEM/ODM supplier's action, in the form of their responsiveness, to the form of exchange relationships with their international customers with regard to international governance strategy including coordination efforts, control, trust and virtual integration. We deliberately focus on the electronics industry in Taiwan as empirical context because members in electronics industry are firms that pioneer the development of information technology and make great IT investments in supply chain management. Moreover, the structure of the ODM/ODM electronics supplying network is characterized by significant asymmetric bargaining relationships between international customers and their local suppliers (Kang, Mahoney, and Tan, 2009).

We collected data through a cross-sectional survey. The sampling frame for the survey comprised of all electronic companies from the year 2007 directory of the Top 5000 Largest Firms in Taiwan, published by China Credit Information Service Ltd (a total of 1069 companies). This database covers a range of electronics companies including communication products, semiconductors, computer

components, and peripherals, and so on. All 1069 firms were contacted to assess their eligibility and locate appropriate informants for the study.

Data was obtained through a key informant technique, which has been deployed in prior studies on interorganizational issues (Kumar, Stern, and Anderson, 1993). Key informants in this study are senior account managers and marketing managers who are in charge of maintaining relationship with international customers and have knowledge about IT investment in supply chain relationships. We also assessed their familiarity with the themes raised in the questionnaire to ascertain appropriate responses.

The survey was conducted in two waves. Four weeks after the first mailing of questionnaires and introductory letter, reminder letters and questionnaires were sent out to no respondents. As result, 219 useable questionnaires were received, for a response rate of 20%.

Nonresponse bias was assessed by a comparison of (1) sample statistics to known values of the population, such as annual sales volume and number of employees, and (2) first and second wave data (Armstrong and Overton, 1977). Neither procedure revealed significant difference between sampled and target populations.

Descriptive information about the respondents is shown in Table 2.1.

Table 2.1 Characteristics of responding firms

Product distribution	Percentage	Sales revenue	Percentage
Communication products	12.2	NT100M-NT500M (US \$3M)	19.1
Systems	6.5	NT501-NT1B	15.9
Computer peripherals	14.2	NT1B-NT5B	39.0
Optoelectronics	14.6	NT5B-NT10B	7.3
Semiconductors	15.9	More than NT10B (US \$300M)	18.7
Computer components	36.6	Total	100
Total	100	Length of international partnerships	
Employee numbers			
Less than 100	20.3	Less than 1 year	4.5
100–199	21.1	1–2 years	8.9
200–499	26.4	3–5 years	39
500–999	13	6–10 years	35
1000–4999	14.6	11 years and above	12
5000–9999	1.6	Country of origin of international customers	
10000 and above	2.8		
Total	100	America	43.5
		Asia	34.6
		Europe	22.9

Questionnaire development and measures

Global supply chain management research is relatively new in terms of theoretical development (Samiee, 2008). Therefore, to create the survey items, 15 in-depth interviews were conducted with 15 senior OEM/ODM account or marketing managers or directors. Additionally, to balance the dyadic point of view in international subcontracting, we also conducted two interviews with branded electronics international buyers. These interviews, along with and extensive review of the literature, were used to develop the questionnaire.

Overall, all constructs in the model were measured with multiple-item reflective scales. In general, well-validated measures reported in previous top marketing, international business and strategic management journal were used. We also followed Churchill's (1979) multiple-steps and multi-validation methods to modify and develop the items for key construct in the conceptual framework. For all scales, each item was measured using a 7-point Likert scale (7 = strongly agree, 1 = strongly disagree).

As shown in Table 2.2, virtual integration was measure by four items, building on the work by Wang et al. (2006) and adapted to the cross-border context in the study. A 4-item scale was used to measure trust. It was taken from Morgan and Hunt (1994) and adapted to our context. Knowledge-sharing was measured by four items assessing the joint activities between exchange partners in which the partners share information that is jointly interpreted to generate mutually shared behaviour. The items were adapted from Chen et al. (2009) work. Finally, supplier's responsiveness was measured by four items which modified from Kim et al (2006) and Handfield and Bechtel's (2002) work. The items were used to capture suppliers' capability to quickly respond's to their international customers' need.

Reliability and validity

A confirmatory factor analysis was carried out to investigate the convergent and discriminant validity of each construct in the proposed conceptual model (Bentler, 2005). The measurement model including all constructs was fitted by the estimated procedure of the EQS program (Bentler, 2005). The results of the analysis are shown in Table 2.2. The model provides a good fit given the complex nature of the second-order confirmatory factor analysis (CHI-SQUARE = 282.866 with degree of freedom (d.f.) = 137; CFI = 0.945; NFI = 0.945; NNFI = 0.931; RMSEA = 0.071). Moreover, all items loaded on their respective constructs are statistically significant. Further, the composite reliability for all constructs was above the 0.7 level (shown in Table 2.2) suggested by Hair et al. (2006), indicating adequate reliability for each construct.

Moreover, all factors loadings were statistically significant at the 5% level, and all of the factor loadings exceed the arbitrary 0.5 standard (Fornell and Larcker, 1981a), as shown in Table 2.2. Thus, these measures demonstrate

Table 2.2 Results of CFA

Construct and measures	Std. factor loadings	Composite reliability (α) (Average Variance Extraction)
Virtual integration		0.865(0.570)
Our international customer accesses or traces our shipping/delivery schedule electronically.	0.598	
Our international customer monitors our quality of product electronically.	0.680	
We exchange product price and market information with our international customer electronically.	0.645	
We and our international customer coordinate production plans with each other electronically.	0.899	
Commitment		0.885(0.658)
We believe the information that our international customer provides us.	0.765	
Our international customer is genuinely concerned that our business succeeds.	0.882	
We trust our international customer keeps our best interests in mind.	0.765	
Our international customer is trustworthy.	0.827	
Knowledge-sharing		0.768(0.530)
It is common to establish joint teams to analyze and discuss strategic issues.	0.579	
The atmosphere in the relationship stimulates productive discussion encompassing a variety of opinions.	0.771	
We have a lot of face-to-face communication in this relationship.	0.812	
In this relationship, we frequently adjust our common understanding of trends in technology related to our business.	0.703	
Supplier's responsiveness		0.893(0.676)
Compared to our competitors, our supply chain responds more quickly and effectively to changing major international customer needs.	0.838	

Continued

Table 2.2 Continued

Construct and measures	Std. factor loadings	Composite reliability (α) (Average Variance Extraction)
Compared to our competitors, our supply chain develops and markets new products more quickly and effectively.	0.783	
We have the ability to deal with orders for our international customer in a short lead time.	0.870	
We have the ability to be outstanding in on time delivery for our international customer.	0.794	

CFA Model Goodness of Fit Indexes: CHI-SQUARE = 282.866 and with degree of freedom(d.f.) = 137; Comparative Fit Index (CFI) = 0.945 ; Bollen Fit Index = 0.945; Bentler-Bonett Non-Normed Fit Index (BBNFI) = 0.931; root mean square of approximation (RMSEA) = 0.071; 90% confidence of RMSEA (0.059; 0.082).

Table 2.3 Mean, SD, inter-construct correlations, and average variance extracted (n = 219)

	Mean (S.D.)	F1	F2	F3	F4
F1 Virtual integration	4.560 (1.032)	0.754			
F2 Commitment	5.560 (1.107)	0.054	0.811		
F3 Knowledge-sharing	5.236 (0.928)	0.239**	0.432**	0.728	
F4 Responsiveness	5.675 (1.124)	0.254**	0.495**	0.602**	0.904

Note: Numbers in bold denote the square root of the average Variance extracted (AVE), **= $p < 0.01$

adequate convergent validity. In terms of discriminant validity, this study assessed the discriminant validity of each construct in two ways (Wu et al. 2007). First, a procedure recommended by Bagozzi, Yi, and Phillips (1991) was adopted. We examined pairs of related constructs in a two-factor CFA, once constraining the correlations between two constructs to unity and once freeing this parameter. Then a chi-square difference test was conducted. The results indicated that the chi-square values were significantly lower for the unstrained models at the 5% level, which suggest that the constructs exhibit discriminant validity. This study also checked the methods suggested by Fornell and Larcker (1981b). As shown in Table 2.3, the square root of the average variance extracted is greater than all corresponding correlations, which indicates adequate discriminant validity.

Chi-square: 247.615, *df* = 97, NNFI: 0.918, IFI: 0.935, CFI: 0.934, RMSEA:0.081
p* < 0.05; *p* < 0.01, Dashed line indicates insignificant paths.

Figure 2.2 Structural model

Table 2.4 Summary of hypothesis test results

Hypothesis	Results
H1a: The greater the virtual integration in international customer-supplier relationships, the greater the supplier responsiveness.	Supported
H1b: The greater the knowledge-sharing in international customer-supplier relationships, the greater the supplier responsiveness.	Supported
H1c: The greater the supplier commitment in international customer-supplier relationships, the greater the supplier responsiveness.	Supported
H2: The greater the virtual integration in the international customer-supplier relationship, the greater the supplier commitment to the relationship.	Not supported
H3: The greater the virtual integration in the international customer-supplier relationship, the greater the knowledge-sharing in the relationship.	Supported
H4: The greater the supplier commitment in the international customer-supplier relationship, the greater the knowledge-sharing in the relationship.	Supported

Structural model test results

Figure 2.2 presents results of the structural tested evaluating overall model fit. The overall fit statistics indicate a very good fit for the full model (Chi-square: 257.615, *df* = 97, NNFI: 0.918, IFI: 0.935, CFI: 0.934, RMSEA: 0.081). Regarding the hypothesis relationships, consistent with the claim of Hypothesis 1a, 1b, and 1c, virtual integration, knowledge-sharing, and commitment have positive and significant impacts on supplier responsiveness.

($t = 4.323, p < 0.1$), ($t = 6.379, p < 0.1$), ($t = 2.142, p < 0.05$), respectively. Thus, the results suggest that Hypothesis 1a, 1b, and 1c are all supported. The path coefficient from virtual integration to commitment is .045 ($t = .730; p > 0.1$), which does not support Hypothesis 2. We will provide possible explanation for this result in the next section. The path coefficient from virtual integration to knowledge-sharing is 0.2197 ($t = 2.978, p < 0.01$), which supports Hypothesis 3. We tested a positive effect of supplier commitment on knowledge-sharing with Hypothesis 4. According to the result, supplier commitment facilitates knowledge-sharing in international customer-supplier relationships ($p < 0.01$), as expected in Hypothesis 4. All the summary of hypotheses test results was shown in Table 2.4.

Discussion and implications

Although different governance mechanisms and their impacts on cost minimization in interfirm relationships has been examined by previous studies, which based on TCE, there is limited understanding the roles of that governance mechanisms play in interorganizational value creation in international exchange relationships. This study adds to the contemporary knowledge based RBV by providing an explanation of how different governance mechanisms including virtual integration, knowledge-sharing and commitment impact on supplier responsiveness in international customer-supplier relationships. The model was tested using data collected from Taiwanese electronics suppliers in relationships with international customers. The results support most hypotheses but fail to support the link between virtual integration and commitment. Based on the findings, a number of guidelines can be offered to both scholars and practitioners regarding the theoretical and managerial implications.

Interorganizational governance value creation through effective governance mechanism

First of all, we postulated that different governance mechanisms including virtual integration, knowledge-sharing, and commitment will facilitate supplier responsiveness in international customer-supplier relationships. The hypotheses are all supported. The results suggest that different governance mechanisms including relational, technology, and information aspects of governance can contribute to supplier responsiveness in the exchange relationships. This is consistent with the view of plural forms of governance in the value creation process in the exchange relationships (Wu et al. 2007). Firms can simultaneously use different governance approaches to create value in terms enhancing supplier responsiveness in international exchange relationships. Moreover, among different hybrid governance mechanisms,

we find that knowledge-sharing has the strongest positive effect on supplier responsiveness, following by commitment and virtual integration. The results indicated that knowledge-sharing play the most effective role in interorganizational governance value creation in international exchange relationships. This is consistent with Myer and Cheung's (2008) recent findings that the crucial role of knowledge-sharing plays in creating value in global supply chain relationships. Moreover, the results show that relational governance such as relationship commitment is also crucial in facilitating supplier responsiveness. This contributes the emerging stream of research highlighting the importance and the performance enhancement of relational norm in governing international exchange relationships (Cavusgil et al. 2004). In addition, the findings also indicate that virtual integration can facilitate supplier responsiveness in the international customer-supplier relationships. This sheds some lights on the debate and inconsistent findings on performance implications of IT investment in supply chain relationships (Kim et al. 2006).

Interrelationships between different governance mechanisms

In addition to a direct impact of three different governance mechanisms including virtual integration, knowledge-sharing, and commitment on value creation in international customer-supplier relationships, this study investigates the interrelationships between different governance. Whether different governance mechanisms function as complements or substitutes can be an intriguing research question. The findings of this study reveal that virtual integration and commitment can facilitate knowledge-sharing in international customer-supplier relationships, which in turn, can lead to greater supplier responsiveness. Knowledge-sharing not only has the strongest direct impact on supplier responsiveness, but it also plays a key mediating role for technology and relationship aspect of governance mechanism. The findings contribute to the emerging stream of research on the interacting and mediating effect of knowledge management with other capabilities in supply chain relationships.

In terms of the relationships between virtual integration and commitment, the empirical findings do not support the positive link. One line of speculation for the lack of positive link between virtual integration and commitment pertains to the firm's potential lock in risk of virtual integration in the exchange relationship (Saraf, Langdon, and Gosain, 2007). Virtual integration can reduce firm's flexibility, make firms change partners more difficult and costly, and limit the specificity facilitating capability of virtual integration in international customer-supplier relationships. Therefore, virtual integration may not be able to serve as an effective mechanism in enhancing relationship commitment in the exchange relationships.

Limitations and future research

As research is always messy and never perfect, several limitations of this study have to be acknowledged. Firstly, this study only adopted one perspective in the dyadic supply chain relationship, focusing on perceptual data from a supplier's perspective. This raises a potential bias and future research may complement this research by examining our proposed model from the international customers' perspectives. Secondly, this study is based on cross-sectional data. Given significant advantages of longitudinal data over cross-sectional data (Rindfleisch et al. 2008) future longitudinal research is encouraged, as it may provide valuable insight into the dynamic nature of IT, commitment, and knowledge-sharing facilitated responsiveness in international channel relationships. Finally, this study only examines commitment and virtual integration as antecedents of knowledge-sharing and determinants of supplier's responsiveness. Other potential variables such as contracts or dependence (Handfield and Bechtel, 2002) should be examined in the future.

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