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WHY FOCAL FIRMS SHARE INFORMATION? A STUDY OF THE EFFECTS OF POWER AND INFORMATION TECHNOLOGY COMPETENCE

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Abstract

Supply chain management has become an important issue for Taiwan's manufacturing industry due to escalating global competition. Virtual vertical integration is an important issue in supply chain management. Because organizations only have limited resources, they pursue long-term partnership with specific transaction partners. They share information to improve visibility, speed responses to markets, and reduce costs from information distortion or information asymmetry. This study empirically explores the factors affecting inter-organizational information sharing from the perspective of focal firms. 1,000 questionnaires were administered to top 1,000 manufacturing companies in Taiwan, with 139 valid responses. The results show that partner's power and relation-specific asset investments positively affect inter-organizational information sharing. On the other hand, the partner's power does not significantly affect the organization's relation-specific investments. This study further investigates the moderating role of information technology competence. The result indicates that when an organization has lower information technology competence, the relationship between the partner's power and relation-specific investments is significant. Implications and discussion are then provided.

Keywords: Supply Chain Management, Information Sharing, Power, Relation-Specific Investments, IT Competence.

1 INTRODUCTION

As the concept of supply chain management is getting more and more attention, many relationships among organizations have evolved from arm-length buy-sell relationships into tightly coupled supply chain collaborations. Organizations realize the importance of network management--the effectiveness of one element in the network does not assure the effectiveness of the whole system (Croom, 2000). Taiwan's manufacturing industry is composed of clusters of high specialized companies focused in their own domain. As such, inter-organizational transaction and collaboration is important for competition. In addition, the trend of standardization made "cost" the most important factor of competition (Handfield & Bechtel 2002). In order to reduce uncertainties of supplies, vertical integration became a major solution (Fearon 1989). However, the inflexible and inefficient structure of large enterprises forced organizations to pursue a more efficient way to operate. At the end of 1980s and 1990s, Wal-Mart and Proctor & Gamble adopted a new transaction relationship that is characterized by a high degree of information exchange (Skjott-Larsen & Kotzab & Grieger 2003). The advancement of inter-organizational information technology and global logistics is the main force to realize the collaboration between organizations. On the other hand, information transparency reduces the phenomenon of information distortion that is called bullwhip effect (Handfield & Nichols Jr. 2002, Hult & Hurley & Giunipero & Nichols Jr. 2000). As a result, organizations have better order fulfilments, shorter response time, and more competitive (Skjott-Larsen, et al. 2003). Such a way for inter-organizational cooperation can benefit not only one organization but also the whole system (Lambert & Cooper & Pagh 1998).

Nowadays, organizations that link their customers and suppliers in a tightly integrated network would be the most competitive (Frohlich & Westbrook 2002). Taiwan's computer industry plays a critical role in the global supply chain in desktop and notebook computers. The most common business model is OEM/ODM (Original Equipment Manufacturer/Original Design and Manufacturing). Most of them are small and medium size enterprises. They face high pressures from customers, and must integrate with dozens of suppliers to lower cost and reduce order fulfilment lead-time. Besides, maintaining long-term relationships with customers and increase information visibility are also critical issues. The IT-based supply chain management system and relationship management are thus closely related with an organization's success.

This research aims to explore why focal firms share information with their customers. Focal firms of a value chain are at the forefront of the changes by virtue of being in the middle and operating on thin margins. They are squeezed from both business customers and suppliers to add more value in the value chain (El Sawy & Malhotra & Gosain & Young 1999). Most of Taiwan's IT manufacturing companies play the role as focal firms. However, prior researches about IT-enabled integration have typically been focused on the viewpoint of business customers or network leaders, with small amounts of attentions given to the benefits accrued to focal firms (e.g., Subramani 2004, Wang & Tai & Wei 2006). We believe that understanding the determinants of focal firms' intention to share information is important; therefore this study focuses on focal firms' relationships with their customers, especially customers that have higher power.

This study empirically investigates manufacturing companies in Taiwan and attempts to answer following questions: (1) Is a partner's power and relation-specific investments affect the extent of information sharing? (2) Is IT competence changes the effects of the partner's power?

2 CONCEPTUAL FRAMEWORK

Figure 1 shows the conceptual framework of this study.

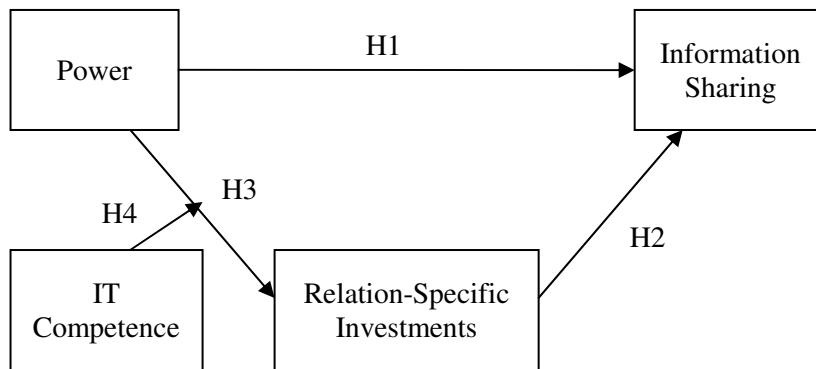


Figure 1. Research Model

2.1 Information Sharing

Since the 1980s, organizations attempted to build a tight integration with partners so that they could focus on strengthening their core competence. Information sharing and collaboration are the components of inter-organizational relationships. Organizations that manage information from their partners constitute another type of vertical integration--virtual vertical integration. The advancement of information technology makes "virtual vertical integration" possible. Virtual integration implies the substitution of ownership with partnership. Internal cost, such as bureaucratic cost, can be avoided because the growth of the organization is limited. On the other hand, transaction cost can be reduced by inter-organizational connection (Noordewier & John & Nevin 1990). As Zaheer & Venkatraman (1994) indicated, the uncertainty surrounding a transaction that results in a variety of transaction costs could be alleviated by superior IT capabilities.

Virtual vertical integration is a way that facilitates cooperation and coordination between supply chain partners (Wang & Wei 2007). It enables smaller organizations to gain competitive advantages without physically integrating upstream or downstream. This is because the high visibility reduces the transaction costs and response time so that the organizations can effectively meet the customers' requirements with lower costs (Wang et al. 2006). In other words, virtual vertical integration makes integration possible regardless of the size of an organization. Smaller organizations could gain the benefits of integration through cooperation.

Information sharing is the activities that exchange of critical information among supply chain partners. Such information includes orders, product specifications, distribution schedules, and market information (such as price and rolling forecast) (Mohr & Spekman 1994, Buvik & Gronhaug 2000). Information sharing enhances the visibility of the supply chain. As a result, the bullwhip effects could be reduced or eliminated. On the other hand, the opportunistic behavior of partners due to information asymmetry could be avoided (Yu & Yan & Cheng 2001). It is believed that information sharing with supply chain partners could not only enhance operational benefits but also strategic benefits. Besides, information sharing could be viewed as a sign of an organization's willingness to build a long-term relationship. It helps in strengthening the partnership.

2.2 Power

Power can be viewed as an ability that could affect the decisions or behavior of others (Wilkinson 1974, Hallen & Johanson & Seyed-Mohamed 1991, Hart and Saunders 1997). In other words, as one can compel one's partner to do something, it reveals its power (Dahl 1957). The source of power could be coercive punishments or non-coercive rewards (French & Raven 1968, Hart & Saunders 1997, Ireland & Webb 2007). If power originates from coercive punishments, the party with weaker power

would be asked to satisfy some requirements. When requirements are not satisfied, the party would be punished. On the other hand, if power is originated from non-coercive rewards, the party with weaker power would gain extra value for satisfying requirements.

As power is considered in an inter-organizational relationship, it implies that the transaction partner has the ability to affect the decisions of the other organizations (Wilkinson 1974). For supply chain management, power is one of the influential factors that affect inter-organizational business process integration (Hart & Saunders 1997, Wu & Chiag & Wu & Tu 2004) and enhance coordination among the organizations (Frazier & Rody 1991, Scheer & Stern 1992).

Transaction partners might ask the organization to share information, and the organization would be forced to share it in order to build or maintain the relationship. On the other hand, focal firms might highly depend on some of their customers. Information sharing could help them to satisfy the customers' needs and provide them with a better service; this would help in enhancing and strengthening the relationship between the focal firm and its customers. Regardless of the source of power--coercive punishments or non-coercive rewards--power would enhance the level of information sharing. Hence we conduct the first hypotheses.

H1: power of a customer will enhance information sharing with its focal firm.

2.3 Relation-Specific Investments

Asset specificity is a concept that originated from transaction cost economics. It refers to nonredeployable assets that are specific to a particular relationship (Williamson 1981, Williamson 1985). Asset specificity is viewed as a major source of transaction cost. Relation-specific investments can be divided into two broad categories: tangible specific assets and intangible specific assets (Rasheed & Geiger. 2001, Subramani & Venkatraman 2003). The following are the three types of tangible asset specificity: (1) site specificity, (2) physical asset specificity, and (3) human asset specificity (Williamson 1985). Intangible relationship-specific assets are usually related to human and operation processes within an organization (Simon 1991, von Hippel 1994, Zack 1999). Meanwhile, Kogut & Zander (1992) viewed relationship-specific intangible investments in organizations as comprising two components: "know-how" and "know-what." Subramani et al. (2003) termed the intangible relationship specificity of these two components as "business process specificity" and "domain knowledge specificity," respectively. It is believed that relationship-specific intangible investments could generate greater causal ambiguity and lock-in effects than tangible specific assets (Subramani 2004). This study focuses on the role of intangible specific assets and uses the definition from Subramani et al. (2003).

Business process specificity refers to the degree to which the critical business processes of a focal firm are specific to the requirements of a customer in an inter-organizational relationship. Specialized business processes include the context-specific processes for new product introduction, customer service, inventory management, and quality control. Specialized routines or standard operating procedures evolve over time in organizations through the codification and institutionalization of successful partners derived from the repeated execution of activities (Nelson & Winter 1982). Domain knowledge specificity refers to the degree to which the critical assets of knowledge of a focal firm are specific to the requirements of a customer. It refers to an organization's ability to access and deploy a specific body of prior knowledge in an inter-organizational relationship (Nonaka 1994, Teece 1998). For example, important domains of organizational expertise in the retail distribution channel that are specific to a particular relationship include competitive analysis, strategy formulation, and new product conception. Specialized knowledge is created through social processes that encourage the validation, refinement, and enrichment of knowledge in the context of action (Nonaka 1994).

In order to satisfy the requirements of customers, a focal firm might have investments that are specific to a particular customer. For focal firms, specific investments imply the expectation of maintaining a long-term relationship with the customer. On the other hand, relation-specific investments are

important sources of the added value of transactional relationships (Williamson 1995) and competitive advantage (Dyer & Singh 1998). When a focal firm makes such investments, intangible specific assets might reduce the customers' cost and increase their dependence on the focal firms (Subramani 2004), thus creating the switching barrier or switching cost (Subramani et al. 2003). In addition, such investments might accelerate information sharing and enhance the degree of supply chain integration (Patnayakuni & Rai & Seth 2006). The following is the second hypothesis:

H2: relation-specific investments will enhance information sharing between a focal firm and its customer.

As the trend of supply chain management is integration and specialization, organizations tend to maintain fewer partners for a long period of time. When there are fewer partners, the dependency of partners would increase. The level of dependency determines the strength of power (Emerson 1962, Hart & Saunders 1997, Pfeffer 1981). In the case of Taiwan's manufacturing industry, most of the organizations obtain orders from a small number of international customers, most of whom are large-scale enterprises. In addition, most of them are major customers of the focal firms and hold greater power (Ireland & Webb 2007). In order to survive the rigorous competition, they ask focal firms to lower the inventory cost and time to market. For focal firms, satisfying the requirements of the customers is a critical issue. Solutions include asking for suppliers' cooperation and setting up specialized processes.

When a transaction partner has greater power than the focal firm, the focal firm might be forced to invest specific assets in order to satisfy the partner's requirements, such as EDI adoption (Hart & Saunders 1997). On the other hand, the focal firm might actively invest specific assets to improve the service quality and "lock" the customer. Irrespective of whether relation-specific investments are passive or active decisions, the customer's power is an important trigger. Thus we induce the third hypothesis:

H3: power of a customer will increase the relation-specific investments of the focal firm.

2.4 Information Technology Competence (IT Competence)

Utilizing information technology to facilitate the cooperation and supply chain management is called information partnerships or electric integration (Chae & Yen & Sheu 2005). IT has changed the way in which organizations manage the process of supply chain and improved competitiveness (Singh & Lai & Chen 2007). McGrath & Tsai & Venkataraman (1996) defined that competence as a purposive combination of firm-specific assets (or resources) that enables the firm to accomplish a given task. Thus, competence not only suggests the ability to execute a transformation but also to execute it well. IT competence refers to the extent to which a firm is knowledgeable about and effectively utilizes IT to manage information within the firm (Tippins & Sohi 2003). It could be viewed as the organization's capability and could be used to implement virtual vertical integration.

IT competence consists of three co-specialized resources: IT objects, IT knowledge, and IT operations (Tippins et al. 2003). IT objects (also called IT infrastructure) refer to computer-based hardware, software, and support personnel (Duncan 1995). They act as "enablers" and provide a foundation for information production and dissemination across the entire organization. IT objects also help in developing and implementing the present and future business applications (Byrd & Turner 2000, Broadbent & Weill 1997). IT knowledge is conceptualized as the extent to which a firm possesses a body of technical expertise about objects such as computer-based systems (Tippins et al. 2003). Intangible resources such as knowledge are more likely to produce a competitive advantage than tangible resources (Hitt & Bierman & Shimizu & Kochhar 2001). IT operations reflect the extent to which a firm utilizes IT to manage the market and customer information (Tippins et al. 2003). This conceptualization corresponds with Dehning & Stratopoulos's (2003) idea of managerial IT skills, which are the management's ability to conceive, develop, and exploit IT applications. As Dehning et al. (2003) indicated, IT operations enable firms to manage the technical and market risks. They are

tacit, causally ambiguous, and the result of socially complex processes; moreover, they need to be developed over time and with considerable experience. Consequently, IT operations are believed to be a source of a sustainable competitive advantage for firms.

Although an organization might invest resources to satisfy the customers with greater power, these investments are not necessarily specific to the customers. We believe that when an organization has higher IT competence, it would have higher capabilities of integrating related resources to maximize utility. In addition, the organization could utilize resources that are initially specific to a customer in other relationships. As a result, these investments are no longer relation-specific. In this study, IT competence is viewed as a moderator that affects the influence of the customer's power. The fourth hypothesis is as follows:

H4: an organization's IT competence moderates the relationship between the power of a customer and the degree of relation-specific investments.

H4a: when an organization has higher IT competence, the power of a customer will not necessarily influence the relation-specific investments of the focal firm.

H4b: when an organization has lower IT competence, the power of the customer will increase the relation-specific investments of the focal firm.

3 METHODOLOGY

3.1 Research Design and Sample

A cross-sectional mail survey was administrated for the empirical investigation of the antecedents of information sharing between the focal firm and one of its major customers. The sample firms for this study were drawn from "2006 Taiwan Top 1000 Listing" issued by Common Wealth Magazine, a leading magazine in Taiwan. Since this study focuses on the relationship between the focal firm and its customers, informants are required to have some knowledge of the degree of system and activity integration with their companies' business customers. As such, the sales managers of these firms are the target informants for the survey, since we believe that they should be the most knowledgeable and reliable informants within a company to answer our questionnaire. In addition, informants were asked to select one of the company's important customers while responding to the questions on our research constructs.

We mailed 1,000 questionnaires, of which 143 were returned. Four responses were incomplete and hence, were dropped. The effective rate is 13.9%. The samples for this study consist of manufacturers in a variety of areas. The majority of the respondents are from the fields of electronics (27.22%), semiconductor/optoelectronics (15.65%), and the metal (12.52%) and electromechanical industry (6.00%). Respondents that represented less than 4% of the sample come from the plastic and rubber products, cars and related parts, nonmetal minerals, communication networks, pharmaceuticals and biotechnology, food/beverages, and paper industries, among others. Compare to the "2006 Taiwan Top 1000" list, the sampling frame, we find that the distribution of our sampled firms is a good representation of the sampling frame. In addition, as indicated in Table 1, the majority of the respondents are managers (61.15%), followed by executives (20.14%) and others (18.71%). The average work experience of the respondents is 10.29 years, and the average number of years that the respondents held the current position is 4.20 years. We believe that the respondents have sufficient knowledge to answer the survey. Most of the respondents (76.98%) are associated with the target customer for more than five years, thus implying a long-term relationship.

Demographic Variables	Frequency	Percentage
Respondent Position		
Executive	28	20.14%
Manager	85	61.15%
Others	26	18.71%
Respondent's Service Year (Mean=10.29)		
0-10	81	58.27%
10-20	37	26.62%
20-30	19	13.67%
30-40	2	1.44%
Years in Current Position (Mean = 4.20)		
0-5	89	64.03%
5-10	38	27.34%
10-15	10	7.19%
15-20	2	1.44%
Years of the relationship with the target customer		
0-5	32	23.02%
5-10	49	35.25%
10-15	30	21.58%
Over 15	28	20.14%

Table 1. Demographic Profile of the Respondents (N=139)

3.2 Measurement Reliability and Validity

All constructs are measured by using multiple-item scales, and wherever possible, measurement items were adapted from the literature. In addition, items associated with these constructs employ a seven-point Likert type scale wherein informants are asked to rate their agreement with a given statement on a scale that ranged from “strongly disagree” to “strongly agree,” with its midpoint anchored as “neither agree nor disagree.”

Several domain experts were asked to assist the translation and modification of the instrument in order to ensure content validity. After compiling the questionnaire, to ensure that the wording of the instrument is consistent with the original version of the questionnaire, semantic differences were checked. Moreover, a pilot test was conducted by using several business executives enrolled in the EMBA program of a school of management in order to ensure the face validity of our questionnaire. Thus, the wordings could be understood by the target audience.

The data analysis was conducted in two steps. First, the measurement model (without the moderators) was analyzed using the confirmatory factor analysis (CFA) approach in order to evaluate the validity of the measurement. The partial least squares (PLS) method was then used to analyze the significance of the hypotheses with bootstrap resampling.

At first, the results of the CFA were used to ensure the reliability and validity of the constructs. After excluding four items with high cross-loadings, all other items were found to have factor loadings higher than 0.5. The result was consistent with the suggestion of Fornell and Larcker (1981). Further, we computed the average variance extracted (AVE) for each variable. All the values that were obtained were higher than 0.5, indicating that the measurement had sufficient convergent validity (Fornell et al. 1981). Discriminant validity was assessed by the root of AVE. The result revealed that the correlation coefficients of all the variables were smaller than the root of AVE, which indicates sufficiently good discriminant validity.

The reliability of the scales was assessed using Cronbach's alpha and composite reliability. Nunnally (1978) suggested that if the value of Cronbach's alpha is larger than 0.7 and the composite reliability is larger than 0.8, the variable has sufficient good reliability. In our study, all indicators satisfied the

standards. The result implied that our measurement had good reliability and highly internal consistency. Table 2 shows the related indicators in this study.

	AVE	CR	Cronbach's α	Power	Relation-Specific Investments	IT Competence	Information Sharing
Power	0.852	0.920	0.828	0.923			
Relation-Specific Investments	0.649	0.937	0.923	0.159	0.806		
IT Competence	0.545	0.928	0.917	0.376	0.153	0.738	
Information Sharing	0.627	0.938	0.923	0.439	0.260	0.487	0.792

Table 2. Composite reliabilities, AVE, Cronbach's α and correlations (Diagonal with grey shading is the root of AVE)

3.3 Testing of the Hypothesized Model

We used VisualPLS 1.04 (Fu 2007) to conduct a PLS regression for analyzing the research model. The result is presented in Figure 2. The main effects were tested to assess path coefficients and R-squared. The results of PLS revealed that *H1* and *H2* are supported as both "Power" and "Relation-Specific Investments" are positively and significantly related to "Information Sharing" (p-value < 0.05). 23% of the variances of "Information Sharing" are explained. On the other hand, *H3* is not supported as the relationship between "Power" and "Relation-Specific Investments" is not significant.

Product items of "Relation-Specific Investments" and "IT Competence" were then included in our model in order to test the moderating effect of IT competence. Although "Relation-Specific Investments" still did not have a significant effect, the moderating effect is significant under 5% significance level; thus, *H4* is supported. In addition, as the interaction construct was included, R-squared had increased from 3.5% to 6.4%. The overall effect size is 0.45. According to Cohen's (1988) suggestion, the interaction effect is strong; however, the variance explained is relatively low. There might have been other factors that determine the degree of relation-specific investments.

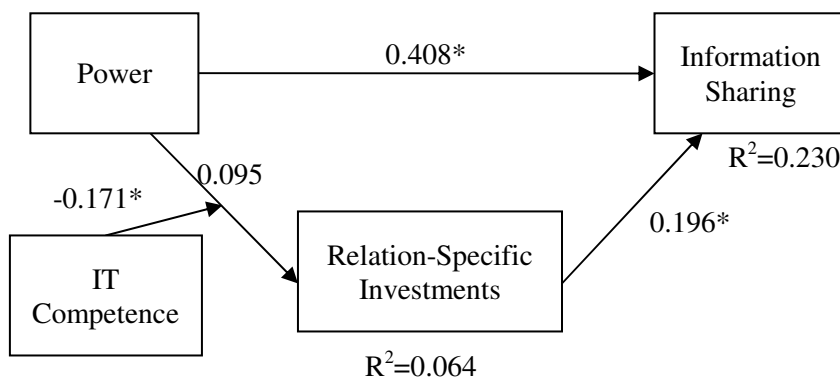


Figure 2. Result

In order to understand the moderating effect, an ANOVA post hoc analysis was conducted. The respondents were classified into four groups according to "Power" and "Relation-Specific Investments". At the 10% significance level, the relationship between "Power" and "Relation-Specific Investments" is significantly positive when the respondent has lower IT competence. On the other

hand, if an organization has higher IT competence, the customer's power would not associate with the respondents' relation-specific investments. The result is consistent with our hypotheses. Figure 3 shows the moderating effect of IT competence.

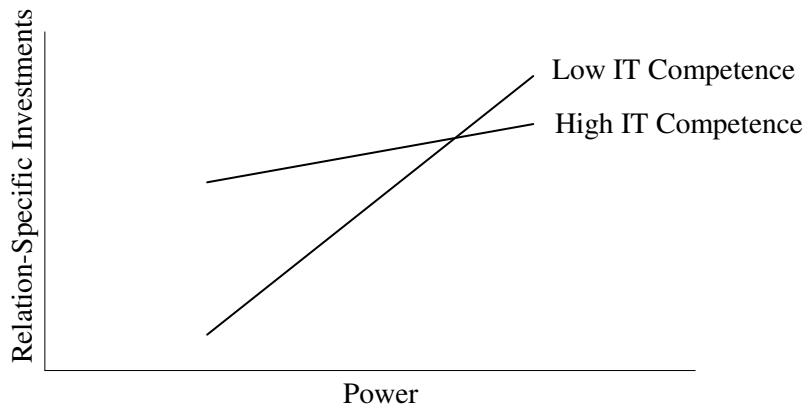


Figure 3. Moderating effect

4 DISCUSSION AND CONCLUSION

4.1 Findings

First, pressure from the customer is an important determinant for organizations to share information. Besides, organizations might invest specific resources in satisfying the customer's requirements. In other words, information sharing might be a passive decision in response to a customer.

Second, the customer's power does not significantly affect the organization's relation-specific investments. The result contradicts with those of prior researches. The possible explanation is that more than three-fourths of the respondents had transaction relationships with their customers for more than five years. Based on the success of the practice with a specific customer, it might be applied to other customers as the best practice. As a result, the effect of the customer's power on asset specificity would not be apparent.

Lastly, we contribute to verify the moderating effect of IT competence. The result indicates that the relationship between the customer's power and relation-specific investments changes when the organization's IT competence differs. As expected, when an organization has higher IT competence, the customer's power does not significantly affect relation-specific investments. Although the organization does not face less pressure from its customer, it has higher capabilities to integrate or transform its investments. In addition, an organization with higher IT competence might be more capable of generalizing investments to maintain relationships with other customers; thus, the degree of asset specificity would be lower.

4.2 Implications

In this study, we investigate the antecedents of information sharing from the viewpoint of a focal firm and the role of IT competence. First of all, we reconfirm the influence of a customer's power. An organization's decision is affected by customers that have greater power. It would change the business process or acquire specific domain knowledge. In order to reduce the risk of the customer's opportunistic behavior, the selection of transaction partners is an important issue. In addition, the customer's power could have positive effects. Information sharing is a form of cooperation and is the beginning of a long-term relationship, thereby making the selection of a partner more important.

On the other hand, the organization should understand how IT affects its operations. It would help the organization to evaluate the value of IT (Lucas 1999). The effects of IT include internal operation and supply chain management. Although some researches indicated that IT does not benefit the organization's performance, other researches found that IT has indirect benefits. The development of IT brings a competitive advantage and finally, becomes the source of profit (Porter 1985, Powell & Dent-Micallef 1997).

In addition, IT not only reduces the transaction cost but also intensifies the relationships with transaction partners (Chae et al. 2005, Patnayakuni et al. 2006). More importantly, the result of this study also indicates that IT competence could shift the nature of relation-specific investments. When an organization utilizes IT as a type of infrastructure and as a means to integrate its resources, the efficiency and affectivity of transactions would be improved. Such a capability could transform the relation-specific investments into general purpose investments that could provide a greater profit to the organization to a greater extent. For focal firms, IT competence leverages their dependency to the customer. The result encourages focal firms to invest in information technology.

4.3 Limitations and Future Research

There are some limitations in our research that should be overcome in the future. First, the data for this study were obtained from a single informant in the focal firm. However, it is believed that multiple respondents could ensure the validity of results (John & Reve 1982). In the future, different sources of data, such as IT managers, could be involved in the survey in order to provide more robust evidence for the study. Second, the sample frame of this study is the manufacturing industry and excludes other segments that possess equivalent supply chain collaboration relationships. Thus, the generalizability of this study is limited. Including other industries such as the service industry would be helpful. Besides, conduct a comparison analysis of different industries would be another direction for further research. Finally, the variance explained of relation-specific investments is 6.4%, which indicates that there must be other factors that affect the degree of asset specificity. It would be meaningful to understand why an organization is willing to make relation-specific investments.

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