

The Moderating Effects of System Integration on Value Co-creation in Central-Satellite System of Taiwan

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Abstract

Nowadays, organizations are facing a very competitive business environment than before. In addition, the aspects of the strategic formulation process for the operations strategy is gradually changing from the competition focused on the collaboration viewpoint. Therefore, the type of competition is shifted to the supply chain level instead of the traditional firm level competition. Therefore, system integration between firms has been regarded as an effective strategy to achieve a firm's competitive advantages. The purpose of this study is trying to discover the relationship which will stimulate firms to apply system integration between each other for better communication and cooperation with partners in the supply chain. Therefore, the study tries to find out the system integration moderates the relationship between relationship-specific social capital and value co-creation and also tested the relationship between value co-creation to firm performance. Study samples are selected from the firms of central-satellite development system (CSD) in Taiwan because the characteristics of Taiwan's CSD include the short product life cycle, uncertainty of market demand and delivery on time, etc. The study results appeared system integration moderated the relationship among structural (information sharing), cognitive (shared valued) and value co-creation. Moreover, the value co-creation for firms from upper stream significantly influences supply chain performance for the firm performance of customer's responses in the downstream of the supply chain. Theoretical contributions and managerial implications are also discussed providing several future research directions and suggestions for firms in the supply chain respectively.

Keywords: System Integration, Social Capital Theory, Value Co-creation, Firm Performance

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Introduction

Nowadays, business competition is more intensive than in the past. A firm cannot compete with its competitors and environment just by itself anymore. The core of the business strategy is gradually changing from competition to collaboration. A firm needs to collaborate with its partners including suppliers and customers simultaneously. Suppliers/vendors, manufacturers, distributors, and retailers interconnected by transportation, information, and financial infrastructure consists of a supply chain. The supply chain's objective is to provide values from the manufacturers to the end consumer regarding products and services, and for each channel participant to reap a profit in doing so (Carr and Hale 2007; Sahin and Robinson 2002).

Therefore, the competitions trend for business is between supply chains (SC) instead of competing with a firm alone. Because of SC collaboration, firms have already broken the organizational boundaries and try to collaborate with their partners. IT has played an important role to enable real-time integration of supply chain partners, provided organizations with forward visibility, and improved production planning, inventory management, and distribution by sharing of large and accurate amounts of information in the whole supply chain, including operational, logistical, delivery and even the strategic planning data (Li et al. 2009).

In this study, system integration (SI) is defined that firms in the supply chain connect and communicate with partners through the Internet and the level of SI for IT application. Moreover, the real-time information must transfer to every member of the SC quickly and accurately. Therefore, the close collaboration will help to decrease the bullwhip effects and lead to the firm's better performance (Frohlich 2002; Lee et al. 1997). Since the SI has played a more and more important role days after days, we apply the relations between firms to exploit how they influence the level of firms to adopt SI. Thus, the study proposes system integration as a moderator to find out the effects of the relationship between social capital and value co-creation. Moreover, because the value co-creation is made by the focal firm and its main supplier, the study also tries to find the firm performance whether the value co-creation influence a firm's performance of customer's responsiveness.

For the research purpose, many studies found the direct effects of system integration to supply chain performance as value co-creation (Droge et al. 2012; Li et al. 2009; Zhou et al. 2018). Most studies applied system integration as an antecedent of the supply chain performance. Differently, the study tries to explore the system integration from other perspective and the focus on the moderating effects of IT integration to value co-creation for upstream partners to explore the effects to the supply chain performance for downstream firm performances.

Literature Review

System Integration

As to the Pre-Internet stage, real-time demand information and inventory visibility were not easily accessed, and most supply and demand integration are involved telephoning, faxing and EDI. However, these phenomena have changed in the Internet era, and firms widely applied for the web-based technologies to allow e-supply chain (e-SC) integration for inventory planning, demand forecasting, order scheduling and customer relationship management (Frohlich 2002). In addition, SC adoption also applies IT especially the Internet with effects to speed communication and information

flow throughout the whole SC. The internet has also allowed the collaboration among SC partners to become automated, providing access to real-time information and forming a communication-based network for businesses as a platform to operate throughout its SC (Lancaster et al. 2006). E-SC adoption can be defined as a business process that adopts the Internet or another electronic medium as a channel with supplier members (Swaminathan and Tayur 2003). They adopted these dimensions to measure electronic data interchange (EDI), and it is suitable to measure the different levels of interfirm system integration by the Internet. Zhu et al. (2006) and Shi et al. (2010) applied open standard inter-organizational system (IOS) research model with the Internet. It also reveals the applicability of these IOS use dimensions to a new advancement in IT in the supply chain.

A common description made for system integration is that it enables more sophisticated and flexible forms of analysis leading to enhanced supply chain performance (Chapman and Kihn 2009). System integration refers to utilize information technology (IT) in order to the sharing of key information along with the supply chain network. One of the main purposes of system integration is to achieve real-time transmission and processing of information required for supply chain decision making (Prajogo and Olhager 2012). Increased logistics-related communication is for higher levels of integration, greater coordination of the firm's logistics activities with those of its suppliers and customers, and more blurred organizational distinctions between the logistics activities of the firm and those of its suppliers and customers may become more blurred organization distinctions between firms (Prajogo and Olhager 2012). Moreover, system integration refers to the extent to which "a manufacturer strategically collaborates with its supply chain partners and collaboratively manages intra- and inter-organization processes," (Flynn et al. 2010). Firms can collaborate with their SC partners in many different ways, and thus there can be various dimensions of SC integration (Lee et al. 2014).

Relationship-specific Social Capital

The concept of social capital has become increasingly popular in social science disciplines (Adler and Kwon 2002). It has been applied to interpret a wide range of social phenomena Nahapiet and Ghoshal (1998), and researchers have considered the role of social capital to have an impact on the development of human capital (Coleman 1988; Loury 1976; Loury 1987); on the economic performance of firms (Baker 1990), geographic regions (Putnam 1993; Putnam 1995), and nations (Evans 1996; Fukuyama 1995); and on economic development (Woolcock 1998). Utilizing the social capital theory into academic theory has provided a broader view for exploring the firm's advantage achieved through their social networks. According to (Nahapiet and Ghoshal 1998; Tsai and Ghoshal 1998), it can be categorized into three dimensions: structural, cognitive, and relational of the social capital.

First, structural social capital regards the pattern of connections between actors, namely, the pattern that answers the question of who to reach and how to reach their partners (Nahapiet and Ghoshal 1998) and individuals or organizations, and how these can be used (Burt 1997; Villena et al. 2011). Frequently interacting at many different levels and functions allow for timely information and resource exchange, which works as an opportunity and motivation for fortifying the relationship between two individuals or organizations (Ioppolo et al. 2016). The interaction between two organizations facilitates cooperation and collaboration in the supply chain. Structural social capital recognizes the advantages that are derived from the arrangement of the network of contacts, continued communication, information sharing, and social interaction ties (Koka and Prescott 2002).

Second, the cognitive dimension of social capital regards respective common goals, shared vision, and values among actors within the social network that deliver common representations, mutual understanding of norms, values, attitudes and even beliefs (Tsai and Ghoshal 1998; Wasko and Faraj 2005). Cognitive capital describes suitable ways for suppliers and buyers to trade and share each other's thinking processes, which may facilitate the development of same goals and shared mutual understandings as shared vision (Schiele et al. 2015). These rules and norms provide a peaceful atmosphere and reduce the possibility of opportunistic behaviors, leading to lower monitoring costs and higher commitment. Supply chain partners will work under a distinct corporate culture to comply with their common goals (Gulati and Sych 2007).

Finally, the relational dimension is related to the moral aspect of personal relationships between actors, such as trust, respect, obligations, and friendship (Granovetter 1985; Nahapiet and Ghoshal 1998). For example, trust is one of the important elements of relational social capital (Inkpen and Tsang 2005). Trust derived from repeated interactions and established channels of communication to prevent the expectation of opportunistic behavior, promotes frequent communication, and improves behavioral transparency between both parties and alliances (Blau 1964; Dyer and Singh 1998). Relational social capital concentrates on the partnership-based relationship in the long term to build trust, respect, friendship, and reciprocity through the repeated transaction. Furthermore, Trust truly plays a key role in relational social capital when it is developed for reducing those opportunistic behaviors of others and increasing the willingness to engage in open communication to and show greater behavioral transparency between each partner and alliances (Bernardes 2010).

Value Co-creation

Nahapiet and Ghoshal (1998) presented a theoretical model of how social capital may facilitate value co-creation by firms. The model builds on Moran and Ghoshal's (1996) formulation of value creation as arising from the combination and exchange of resources. Moreover, Prahalad and Ramaswamy (2004) proposed value co-creation occurred inside the firm (through its activities) and outside markets. The concept of the "value chain" characterized the unilateral role of the firm in creating value (Porter, 1980). In addition, Prahalad and Ramaswamy (2000) introduced co-creation by acknowledging the changing roles in the theater of the market: Customers and suppliers interact and largely collaborate beyond the price system that traditionally mediates supply-demand relationships. It is the joint, collaborative, concurrent, peer-like process of producing a new value, both materially and symbolically of the co-creation (Marco and Daniele 2014)

In this study, supply chain collaboration helps firms reduce the costs of opportunism and monitoring as value co-creation that are inherent in market transactions through process integration and mutual trust, thus increasing the probability that partners behave in the best interest of the partnership (Croom 2001). Supply chain collaboration also helps firms avoid internalizing an activity that may not be aligned with their competencies for value co-creation (Cao and Zhang 2011).

Firm Performance

The firm performance in this study mainly focuses on the performances of the focal firm in the supply chain. It should lead to enhanced organizational performance. Hence, it should be referred to how the effectiveness of the focal firm to perform its responsiveness to its customers (Katri and Claire 2017; Rai et al. 2006). Moreover, the study focuses

on the competitive performance of the firm in the supply chain (Chan et al. 2017) while the study concentrates on the value co-creation of supplier and focal firm to the firm performance on the supply chain. The study is also likely to comprehend the co-value creation with suppliers (upstream) and focal firm to the firm performance especially on their effectiveness from focal firms to their customers (downstream). Therefore, the study adopted effective responsiveness to the firm performance of customer responsiveness.

Conceptual Development

Research Framework

This research aims to study the moderation of system integration between the up-stream firms in the supply chain. The application of IT in the supply chain ranged from email, electronic data interchange (EDI), application to application ex: web platform, system to system ex: logistic system, business to business (B2B) ex: business process and inter-organizational collaborative commerce ex: as the same organization unit (Chong et al., 2009). The influences of social capital have been proved by (Tsai and Ghoshal 1998) while structural, cognitive and relational social capital affects value creation by resource exchange and combination and other researches have also explored the relationship. This study tries to explore the moderating effects of system Integration on the relationship between social capital (structural, cognitive and relational) on value co-creation with upstream suppliers. Moreover, the study also tries to comprehend the effects of co-value creation to firm performance for downstream customers in order to explore the firm performance while value creation is made by up-stream suppliers. It is quite important to comprehend the cause effects of co-value creation to firm performance. Therefore, the research framework as shown in Figure 1.

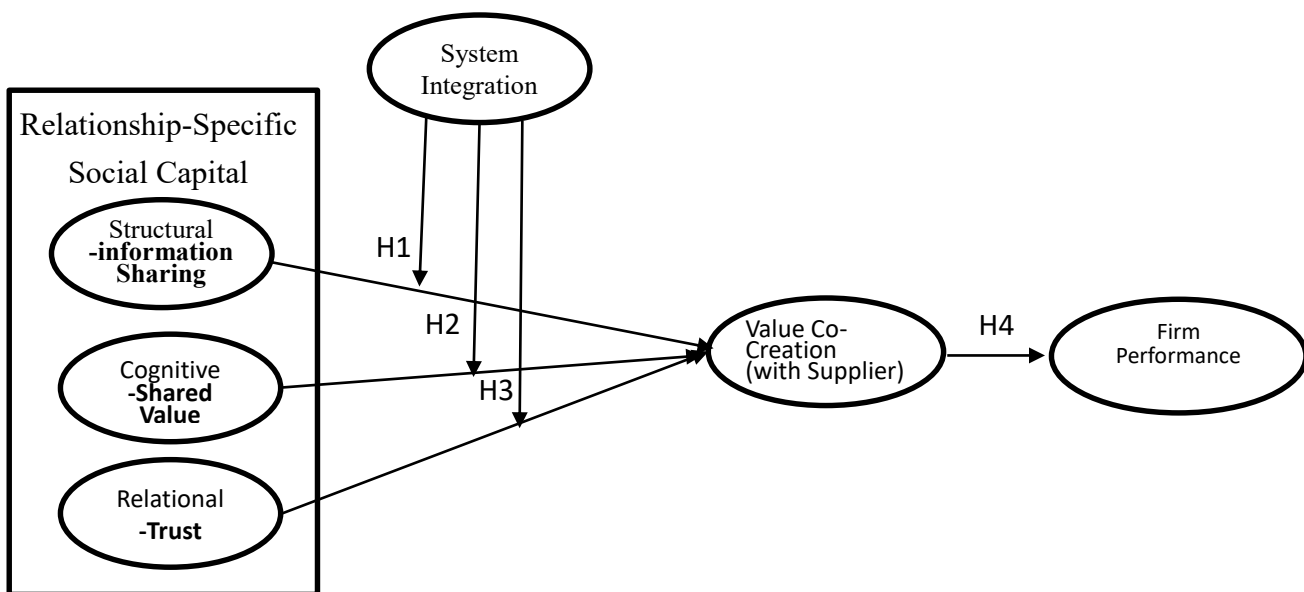


Figure 1. Research Framework

Research Hypotheses

Many researchers have suggested that information sharing can considerably improve overall supply chain performance because information sharing enhances the effectiveness and efficiency for the firm's and performance of a supply chain (Ball et al. 2002). Moreover, Huang et al. (2008) and Chong and Ooi (2009) have discussed that the formation of inter-organization relationships is an important factor influencing the adoption of the inter-organizational system (IOS)

such as EDI, Rosetta Net standards and Internet (Prajogo and Olhager 2012). Fawcett et al. (2007) proposed information sharing requires firms to exchange strategic supply chain information and not only transactional data, such as materials or product orders. High level of information sharing requires frequent and intense communication between firms and suppliers. The intensity of communication constitutes high degrees of cooperative behavior between supply chain partners which leads to a high degree and symmetry of strategic-information flows between them (Klein et al. 2007). In addition, some studies have demonstrated various logistics benefits of having information sharing with supply chain partners improving inventory management (Zhao et al. 2002), agility and flexibility (Swafford et al. 2008), and the bullwhip effect (Bayraktar et al. 2008). System integration helps firms to facilitate the information sharing with supply chain partners and finally positively moderating influences value co-creation with supply chain partners (Prajogo and Olhager 2012). Therefore, the study suppose:

H1: System integration positively moderates the relationship between structural social capital (information sharing) and value co-creation.

Intra-organizational information sharing (described as collaboration in the prior section) can bring together suppliers, customers and the focal company toward achieving decision consensus with shared goals (Ball et al. 2002). In addition, Barratt (2004) argued that supply chain collaboration is a significant element for reducing cost structure and satisfying customer demand. Ramanathan and Gunasekaran (2014) proposed the critical factor in creating flexible supply chain is the essence of collaborative relationships, which can facilitate a mutual decision-making process directed toward achieving common goals across their partners (Wu et al. 2014). Hence, while supply chain partners share the same goal or value, it may make more value co-creation for each other even enhancing and improving the whole supply chain performances. Therefore, the IT implementing with its advantages for information exchange, sharing the same value and enhance the logistic improvement, will positively moderate the relationship between a shared goal and value co-creation.

H2: System integration positively moderates the relationship between cognitive social capital (shared value and shared goals) and value co-creation.

He et al. (2014) proposed a partnership, in essence, is characterized by a long-term commitment and mutual trust between the collaborators (Morgan and Hunt 1994). Vargo et al. (2008) argue that manufacturing flexibility is one effective way of enhancing competence trust since it is a core competence against the uncertain environment for a manufacturer, and service capability is one effective way of improving goodwill trust because of the social and interacting nature of service. Moreover, Ryssel et al. (2004) found the trust and commitment have a significant impact on value creation in the supplier's relation value. In addition, Klein et al. (2007) found that the greater the mutual trust, the greater the IT customization, and the greater the strategic information flows (Prajogo and Olhager 2012). Hence, following the decreasing the hardware cost and more advanced and accurate collaborating IT, the study may assume system integration in the supply chain may benefit and positively moderates the relationship between trust and value co-creation of supply chain performance. Therefore, the study suggests:

H3: System integration positively moderates the relationship between relational social capital (inter-firm trust) and value co-creation.

Closs et al. (2005) announced this importance of flexibility in supply chain and claimed that the link between a value chain with complementary strategies could improve a firm's competitiveness, quickly adapting the company to an uncertain environment or creating uncertainty for competitors as a result in the success for the firms of the whole supply chain adopted. Moreover, recently the Internet of Things (IoT) refers to the idea that manufactured products will be part of the extended Internet since they will be tagged and indexed by the manufacturers during production. The customer can read tags through mobile applications and use the information connected to products to inform their purchases, product use and disposal (Zhou et al. 2015). It also implies the goods or products' information even quality will be disclosed inter-firms and help to improve the efficiency, inventory, quality control and logistics in the whole supply chain. Firms in the whole supply chain may also benefit from the implement of IOT. Furthermore, Singh and Power (2009) found that effective supplier collaboration has a direct effect on firms' competitive performance (Prajogo and Olhager 2012). The study propose the value co-creation is made from the focal firm and its main supplier, and the value co-creation positively influences the firm performance for the focal firm and its main customer. Hence, the study proposes:

H4: Value co-creation positively influences the firm's performance.

Control Variables

Prior research on e-supply chain studies and feedback from informed participants suggests some additional factors are included because of their potential influence on organizations for e-SC adoption to take consideration. First, organization size is used as a surrogate measurement for total resources, slack resources, and organization structure in many innovation studies (Rogers, 1995). Second, the firms' establish years: It represents the firms possess the technical resources to effectively assimilate an innovation because the larger the IT department size, the broader the technological knowledge base of firms for implementing and applying IT (Teo et al., 2003). Thrid, the collaborative history of both supplier and research firm may also influence the supply chain performance(Sheu et al. 2006).

Data Collection

The study applied a survey method. This survey was conducted from May to June in 2016 for approximately two months. The questionnaire with a postage paid returning envelope was mailed to one of the top managers for each CSD firm, and accordingly, each firm only received one questionnaire. In addition, in order to increase the returning rate of the survey, a follow-up procedure was carried out by mailing reminders for non-respondents after 2–3 weeks.

Results and Analysis

Descriptive Statistics

The valid samples are for 165. For the descriptive statistics, chemistry and petroleum, electronic and semiconductor and Metal and machinery are three major industries in this survey as 22, 27 and 75 respectively. For the firm size, less 50, 50-100 and 100-249 are the three major samples for 75, 53 and 30 samples. Collaborative years are for 11-15, 16-20 and more than 20 years are three major samples.

Reliability and Validity

The study followed the scale-development procedures suggested by Churchill (1979). The conducted data analysis using structural equation modeling (SEM) implemented in partial least squares (PLS) (Hair Jr et al. 2017). The

construct measurements, including questions, loadings, and sources are shown in Table 1. All of this measurement has standardized loadings ranging from 0.712 to 0.922. A higher value represents a stronger relationship between the item and its corresponding construct, and values of the item loadings are larger than 0.7 are considered acceptable (Chin 2010).

Table 2 Measurement Items

Constructs	Item	Questions	Loadings	Source
Structural Social Capital (Information Sharing)	SC1	It is expected that the parties will provide proprietary information if it can help the other party.	0.866***	(Krause et al. 2007)
	SC2	Exchange of information in this relationship takes place frequently.	0.811***	
	SC3	It is expected that we keep each other informed about events or changes that may affect the other party.	0.811***	
Cognitive Social Capital (Shared Value)	CC1	Both firms share the same business values.	0.712***	(Krause et al. 2007)
	CC2	The parties often agree on what is in the best interest of the relationship	0.741***	
	CC3	This supplier shares our goals for this business	0.812***	
Relational Social Capital (Trust)	RC1	Cooperative vendors are willing to provide fully real trading information.	0.746***	(Anderson and Narus 1990)
	RC2	The company believes that the cooperation vendors are very honest and very real.	0.794***	
	RC3	Partner manufacturers will not hide certain facts and get them what they need.	0.861***	
	RC4	The information provided by the partner manufacturers is useful.	0.788***	
	RC5	The company believes that the partner company is trustworthy.	0.772***	
Value Co- Creation	VC1	After cooperating with partner manufacturers, the market share has increased.	0.778***	(Chen et al. 2015; Prahalad and Ramaswamy 2004; Wang and Wei 2007)
	VC2	After cooperating with partner manufacturers, profitability has improved.	0.736***	
	VC3	After cooperating with partners, the company's earnings growth has increased.	0.892***	
	VC4	The company's products are lower in price than competitors' products	0.835***	
Firm Performance (Customer Responsiveness)	CS1	Our company is able to fulfill customer orders on time	0.819***	(Jayanth et al. 1999; Lee et al. 2014)
	CS2	Our company is capable to maintain short customer order cycle time.	0.881***	
	CS3	Our company is willing to respond to customer requests fast.	0.915***	
System Integration	II1	Our company has strategic linkages with suppliers in our supply chain.	0.878***	(Chang Won et al. 2007)
	II2	Our company involves suppliers during the design stage for our new products.	0.910***	
	II3	Our company involves suppliers in production planning and inventory management.	0.895***	
	II4	Our company has a rapid response ordering processing system with our suppliers.	0.836***	
	II5	Our company has a supplier network that assures reliable delivery.	0.865***	
	II6	Our company uses information technology well to exchange information with suppliers	0.858***	

Note: *: p<0.1 **:p<0.05 ***: p<0.01

Table 3. CR, AVE, the Correlation between Constructs, and Square Roots of AVE

Latent Variable	CR	AVE	1	2	3	4	5	6
1. Structural (Information Sharing)	0.899	0.691	0.831					
2. Cognitive(Shared Valued)	0.816	0.599	0.465	0.774				
3. Relational (Trust)	0.912	0.676	0.553	0.422	0.822			
4. Value Co-creation	0.917	0.734	0.467	0.376	0.418	0.857		
5. Firm Performance	0.947	0.748	0.569	0.452	0.524	0.564	0.865	
6. System Integration	0.866	0.684	0.563	0.362	0.373	0.499	0.597	0.827

Notes: CR=Composite Reliability; AVE=Average Variance Extracted; Numbers on the diagonal (in boldface) are the square root of the average variance extracted (AVE). Other numbers are the constructs' correlation.

Table 3 lists the results in which Composite Reliability (CR) ranged from 0.816 to 0.947, and Average Variance Extracted (AVE) ranged from 0.599 to 0.748. Composite Reliability represents the ratio of a scale's estimated true

score variance relative to its total variance, and AVE measures the reliability for the latent variable component score. These values all exceeded the recommended score of 0.7 for CR and 0.5 for AVE (Fornell & Larcker 1981), indicating the study has reliability and convergent validity. For the discriminant validity, the square root of AVE for a given construct was compared with the correlations between the construct and another construct (Fornell & Larcker 1981). The square root of AVE, the numbers on the diagonal, was greater than the off-diagonal elements in the corresponding rows and columns, demonstrating an adequate discriminant validity for the study.

According to Harmon's testing for measuring CMV (Common Method Variance)(Babin et al. 2016), all of the indicators are measured by factor analysis and set to one factor. If the extraction sums of squared variance are more than 50%, it may have CMV problems. The extraction sums of squared variance for all of the items of constructs in the study is 38.22 %, indicating that common method biases are unlikely a contaminant of our results.

Model Fit Evaluation and The Hypotheses Testing Results

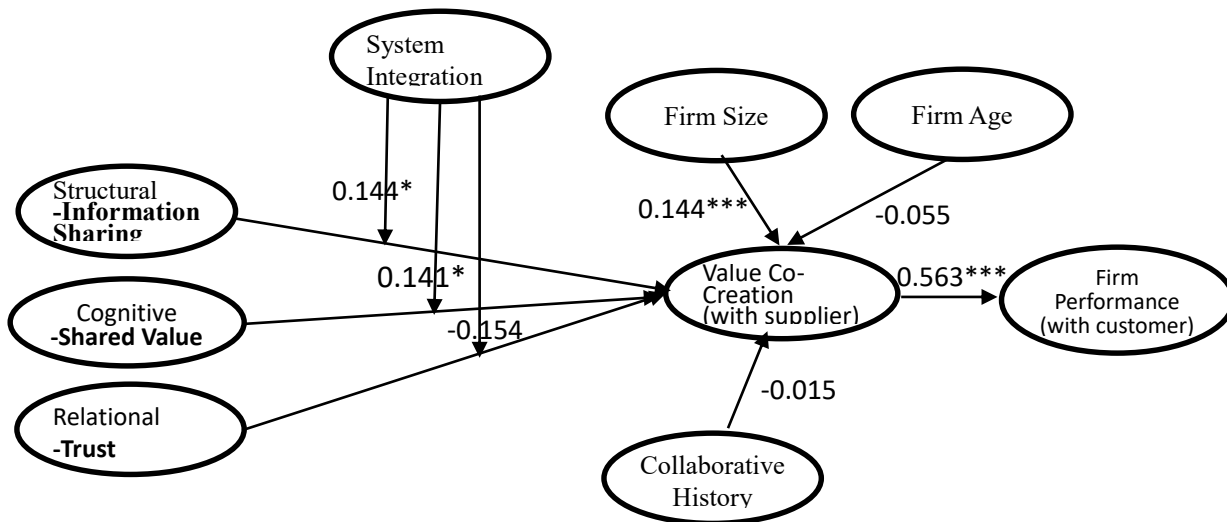
A non-parametric bootstrapping procedure with 3000 re-samples was performed to get the path coefficients, their respective standard errors, and t-statistics for their path coefficients. The most widely applied way to measure the structural model is the coefficient of determination (R^2 value)(Hair Jr and Hult 2016). It is a measure of the research model's predictive accuracy and is calculated as the squared correlation between a specific endogenous construct's actual and predicted values. Moreover, R^2 values of 0.19, 0.33, and 0.67 in PLS path models as weak, moderate, and, substantial levels, respectively (Chin 1998). Furthermore, if inner path model structures explain an endogenous latent variable by only a few (e.g., one or two) exogenous latent variables, "moderate" R^2 may be acceptable. Although the R^2 of Value Co-creation and firm performance are 0.370 and 0.317 at the moderate level for the study and it also acceptable by the criterion proposed by Henseler et al. (2009).

Table 4 Research Results of PLS

Model	Model 1	Model 2	Model 3
Main Effects			
Social Capital			
Structural Social Capital (SSC) Information sharing		0.133* (1.766)	0.064 (0.809)
Cognitive Social Capital (CSC) Shared value		0.130** (2.359)	0.079 (1.525)
Relational Social Capital (RSC) Trust		0.191*** (2.582)	0.291*** (3.362)
System Integration (SI)		0.306*** (4.561)	0.239*** (3.224)
Interaction			
SSC*SI (Knowledge Sharing*SI)			0.144* (1.655)
CSC*SI(Shared Value*SI)			0.141** (2.000)
RSC*SI (Trust*SI)			-0.154 (1.541)
Control Variable			
Firm Size	0.111* (1.654)	0.148*** (3.470)	0.144*** (3.510)
Firm Age	-0.009 (0.125)	-0.052 (0.986)	-0.055 (1.136)
Collaborative History	-0.046 (0.597)	-0.009 (0.172)	-0.015 (0.273)
Model Summary			
R Square for Value Co-creation	0.015	0.361	0.370
Firm Performance	0.566*** (11.839)	0.563*** (14.035)	0.563*** (13.369)
R Square for Firm Performance	0.320	0.317	0.317

Note: *: $p < 0.1$ **: $p < 0.05$ ***: $p < 0.01$ The value of parenthesis is T-value.

The results of the PLS are in Table 4. In model 1, the study testified the influences of the control variable, and it appeared the firm size influences value creation. Also, model 2 testified main effects of social capital and control variable in the model. The results showed the main effects of social capital (structural, cognitive and relational) and system integration have significant influences on value co-creation. For model 3, it testified main effects of social capital and system integration, moderating effects of social capital and system integration and control variables for firm size, firm age and collaborative years. The results appeared that partly main effects of relational and system integration significantly influences value co-creation. For moderating effects, system integration moderated the relationship significantly between the structural, cognitive, social capital and value co-creation for 0.144 (1.655)* and 0.141 (2.000)** separately.



Note: *: $p < 0.1$ **: $p < 0.05$ ***: $p < 0.01$

Figure 2 Results of the PLS Analysis

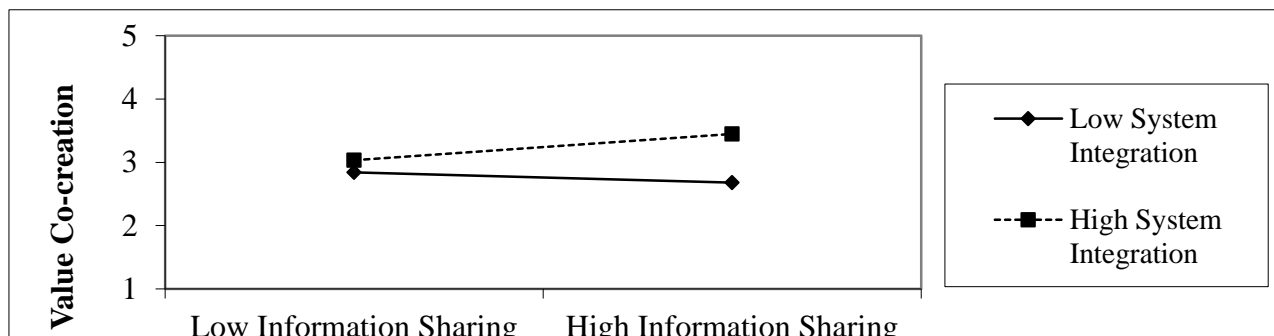


Figure 3 The moderation of System Integration on Value Co-creation

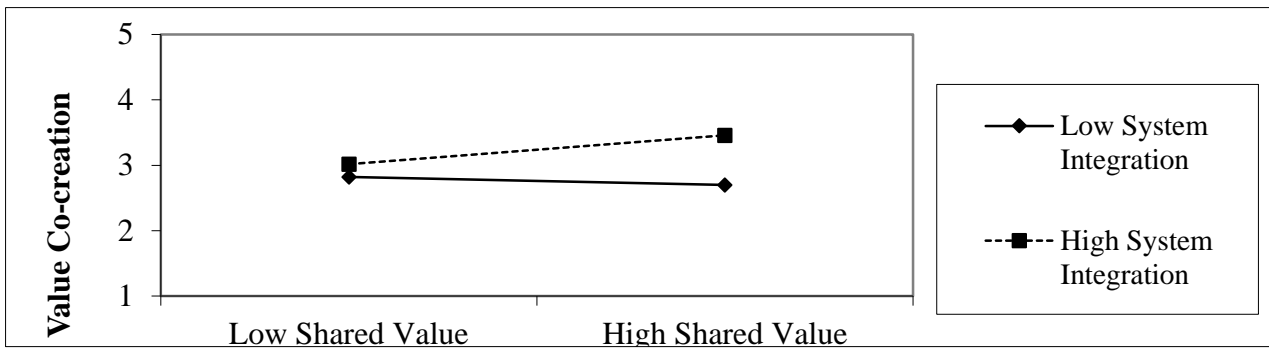


Figure 4 The moderation of System Integration on Value Co-creation

For Figure 3 and Figure 4, the study pointed out the high system integration has moderation to high information sharing and shared value on value co-creation positively. It supports the study hypotheses.

Discussion

Table 5 Results of the Hypotheses

Hypothesis		Results
H1	System Integration Moderates Structural capital and Value co-creation	Supported
H2	System Integration Moderates Cognitive capital and Value co-creation	Supported
H3	System Integration Moderates Relational capital and Value co-creation	Not Supported
H4	Value Co-creation Influences firms performance	Supported

According to the PLS research results. SI significantly moderates the relationships among structural, cognitive social capital and value co-creation. For H1 and H2, the PLS results indicate structural and cognitive social capital positively moderated by system integration. For H3, However, system integration has no moderation between the relationship between relational social capital and value co-creation. In addition, SI positively moderates the relationship among structural social capital (information sharing) and cognitive social capital (shared value) and value co-creation. The study may propose that SI increase the structural and cognitive social capital to value co-creation. Implementing system integration will enhance and facilitate the information sharing between each other and also increase to share the same value and to think across the two firms. With system integration that adopting more information technology efficiently and effectively stimulate information sharing and share the goal and value between two collaborating firms. Hence, the value co-creation significantly affects firm performance. It appears value co-creation between two firms with the moderation of SI also increase the firm performance. The study may propose that two firms have been collaborated for a long time and built firmly and steady trust between each other. Therefore, implementing system integration between two firms may not positive moderates the relationship between relational social capital (trust) and value co-creation. For H3 that the reasons that system integration doesn't significantly moderate the relationship between trust and value co-creation, the study proposed because the main supplier and the focal firm chose has already established high-level trust while they collaborate in the supply chain. Therefore, although system integration may enhance the information flow to value creation and firm's performance (Prajogo and Olhager 2012), system integration has limited influence on the relationship between trust and value co-creation.

Conclusion

Theoretical Contribution

In the previous study, Tsai and Ghoshal (1998) have confirmed the indirect relationship between social capital and value creation although their study applied resource exchange and combination as a mediator between social capital and value creation. The study applied social capital theory with structural, cognitive and relational dimension for explored the relationship with value co-creation while utilizing system integration as a moderator. The research result confirmed the system integration positively moderates the relationships between structural, cognitive, social capital to value co-creation of supply chain partners. However, system integration doesn't significantly moderate the relationship between relational social capital and value co-creation. Therefore, applying social capital theory in this study for value co-creation partially supports system integration moderates the value co-creation. The study also proposes value co-creation is a critical factor for supply chain partner collaboration and effectively influences the firm performance of customer responsiveness to downstream (Cao and Zhang 2011; Rai et al. 2006).

Managerial Implication

According to research findings, firms adopted system integration between each other will increase the information sharing and sharing the same goal and value and value creation. Hence, firms in the supply chain may consider implement system integration to enhance their structural (information sharing) and cognitive (shared value) social capital for value co-creation with supply chain partners although system integration may not increase trust between each firm. The study may propose before firms to implement system integration; they have already had steady trust between while they are upstream and downstream partners in supply chains. Hence, system integration may not significant moderately influence the relationship between trust and value creation. The study also selects the CSD industry in Taiwan as our research sample because the characteristics of Taiwan's CSD industry include the short product lifecycle, uncertainty of market demand and delivery on time, etc. More importantly, CSD firms in Taiwan are always required by the brand firm for cost down, fast delivery and high quality of the products. Therefore, under such pressure, firms have to adopt some methods to help them in the all supply chain to respond more efficiently and quickly to meet the brand firms' requirement. Our study gives some implication for firms especially in the highly competitive industry to take value co-creation with its partners in the whole supply chain.

Reference

- Adler, P. S., and Kwon, S.-W. 2002. "Social Capital: Prospects for a New Concept," *The Academy of Management Review* (27:1), pp. 17-40.
- Anderson, J. C., and Narus, J. A. 1990. "A Model of Distributor Firm and Manufacturer Firm Working Partnerships," *Journal of Marketing* (54:1), pp. 42-58.
- Babin, B. J., Griffin, M., and Hair Jr, J. F. 2016. "Heresies and Sacred Cows in Scholarly Marketing Publications," *Journal of Business Research* (69:8), pp. 3133-3138.
- Baker, W. E. 1990. "Market Networks and Corporate Behavior," *American Journal of Sociology* (96:3), pp. 589-625.
- Ball, M. O., Ma, M., Raschid, L., and Zhao, Z. 2002. "Supply Chain Infrastructures: System Integration and Information Sharing," *SIGMOD Record* (31:1), pp. 61-66.
- Bayraktar, E., Koh, S. C. L., Gunasekaran, A., Sari, K., and Tatoglu, E. 2008. "The Role of Forecasting on Bullwhip Effect for E-Scm Applications," *International Journal of Production Economics* (113:1), pp. 193-204.
- Bernardes, E. S. 2010. "The Effect of Supply Management on Aspects of Social Capital and the Impact on Performance: A Social Network Perspective," *Journal of Supply Chain Management* (46:1), pp. 45-56.
- Blau, P. M. 1964. *Exchange and Power in Social Life*. Transaction Publishers.
- Burt, R. S. 1997. "The Contingent Value of Social Capital," *Administrative Science Quarterly* (42:2), pp. 339-365.
- Cao, M., and Zhang, Q. 2011. "Supply Chain Collaboration: Impact on Collaborative Advantage and Firm Performance," *Journal of Operations Management* (29:3), pp. 163-180.
- Carr, A. S., and Hale, K. 2007. "Communication Methods, Information Sharing, Supplier Development and

- Performance," *International Journal of Operations & Production Management* (27:4), pp. 346-370.
- Chan, A. T. L., Ngai, E. W. T., and Moon, K. K. L. 2017. "The Effects of Strategic and Manufacturing Flexibilities and Supply Chain Agility on Firm Performance in the Fashion Industry," *European Journal of Operational Research* (259:2), pp. 486-499.
- Chang Won, L., Kwon, I.-W. G., and Severance, D. 2007. "Relationship between Supply Chain Performance and Degree of Linkage among Supplier, Internal Integration, and Customer," *Supply Chain Management* (12:6), pp. 444-452.
- Chapman, C. S., and Kihn, L.-A. 2009. "Information System Integration, Enabling Control and Performance," *Accounting, Organizations and Society* (34:2), pp. 151-169.
- Chen, D. Q., Preston, D. S., and Swink, M. 2015. "How the Use of Big Data Analytics Affects Value Creation in Supply Chain Management," *Journal of Management Information Systems* (32:4), pp. 4-39.
- Chin, W. W. 1998. "The Partial Least Squares Approach to Structural Equation Modeling," in *Modern Methods for Business Research*, G.A. Marcoulides (ed.). Mahwah, NJ: Lawrence Erlbaum Associates, pp. 295-336.
- Closs, D. J., Swink, M., and Nair, A. 2005. "The Role of Information Connectivity in Making Flexible Logistics Programs Successful," *International Journal of Physical Distribution & Logistics Management* (35:3/4), pp. 258-277.
- Coleman, J. S. 1988. "Social Capital in the Creation of Human Capital," *American Journal of Sociology* (94), pp. S95-S120.
- Croom, S. 2001. "Restructuring Supply Chains through Information Channel Innovation," *International Journal of Operations & Production Management* (21:4), pp. 504-515.
- Droge, C., Vickery, S. K., and Jacobs, M. A. 2012. "Does Supply Chain Integration Mediate the Relationships between Product/Process Strategy and Service Performance? An Empirical Study," *International Journal of Production Economics* (137:2), pp. 250-262.
- Dyer, J. H., and Singh, H. 1998. "The Relational View: Cooperative Strategy and Sources of Interorganizational Competitive Advantage," *Academy of Management Review* (23:4), pp. 660-679.
- Evans, P. 1996. "Government Action, Social Capital and Development: Reviewing the Evidence on Synergy," *World Development* (24:6), pp. 1119-1132.
- Fawcett, S. E., Osterhaus, P., Magnan, G. M., Brau, J. C., and McCarter, M. W. 2007. "Information Sharing and Supply Chain Performance: The Role of Connectivity and Willingness," *Supply Chain Management* (12:5), p. 358.
- Flynn, B. B., Huo, B., and Zhao, X. 2010. "The Impact of Supply Chain Integration on Performance: A Contingency and Configuration Approach," *Journal of Operations Management* (28:1), pp. 58-71.
- Frohlich, M. T. 2002. "E-Integration in the Supply Chain: Barriers and Performance," *Decision Sciences* (33:4), pp. 537-556.
- Fukuyama, F. 1995. *Trust: The Social Virtues and the Creation of Prosperity*. London: Hamish Hamilton.
- Granovetter, M. 1985. "Economic Action and Social Structure: The Problem of Embeddedness," *American journal of sociology*, pp. 481-510.
- Gulati, R., and Sytch, M. 2007. "Dependence Asymmetry and Joint Dependence in Interorganizational Relationships: Effects of Embeddedness on a Manufacturer's Performance in Procurement Relationships," *Administrative Science Quarterly* (52:1), pp. 32-69.
- Hair Jr, J. F., and Hult, G. T. M. 2016. *A Primer on Partial Least Squares Structural Equation Modeling (Pls-Sem)*, (2 ed.). Sage Publications.
- Hair Jr, J. F., Sarstedt, M., Ringle, C. M., and Gudergan, S. P. 2017. *Advanced Issues in Partial Least Squares Structural Equation Modeling*. SAGE Publications.
- He, Y., Keung Lai, K., Sun, H., and Chen, Y. 2014. "The Impact of Supplier Integration on Customer Integration and New Product Performance: The Mediating Role of Manufacturing Flexibility under Trust Theory," *International Journal of Production Economics* (147), pp. 260-270.
- Inkpen, A. C., and Tsang, E. W. K. 2005. "Social Capital, Networks, and Knowledge Transfer," *The Academy of Management Review* (30:1), pp. 146-165.
- Ioppolo, G., Cucurachi, S., Salomone, R., Saija, G., and Shi, L. 2016. "Sustainable Local Development and Environmental Governance: A Strategic Planning Experience," *Sustainability* (8:2), p. 180.
- Jayanth, J., K., V. S., and Cornelia, D. 1999. "An Empirical Study of Time-Based Competition in the North American Automotive Supplier Industry," *International Journal of Operations & Production Management* (19:10), pp. 1010-1034.
- Katri, K., and Claire, H. 2017. "Institutional Pressures and Sustainability Assessment in Supply Chains," *Supply Chain Management: An International Journal* (22:5), pp. 458-472.
- Klein, R., Rai, A., and Straub, D. W. 2007. "Competitive and Cooperative Positioning in Supply Chain Logistics Relationships," *Decision Sciences* (38:4), pp. 611-646.
- Koka, B. R., and Prescott, J. E. 2002. "Strategic Alliances as Social Capital: A Multidimensional View," *Strategic Management Journal* (23:9), pp. 795-816.
- Krause, D. R., Handfield, R. B., and Tyler, B. B. 2007. "The Relationships between Supplier Development, Commitment, Social Capital Accumulation and Performance Improvement," *Journal of Operations Management* (25:2), pp. 528-545.
- Lancaster, S., Yen, D. C., and Cheng-Yuan, K. 2006. "E-Supply Chain Management: An Evaluation of Current Web Initiatives," *Information Management & Computer Security* (14:2), pp. 167-184.
- Lee, H., Kim, M. S., and Kim, K. K. 2014. "Interorganizational Information Systems Visibility and Supply Chain Performance," *International Journal of Information Management* (34:2), pp. 285-295.
- Lee, H. L., Padmanabhan, V., and Whang, S. 1997. "Information Distortion in a Supply Chain: The Bullwhip Effect,"

- Management Science* (43:4), pp. 546-558.
- Li, G., Yang, H., Sun, L., and Sohal, A. S. 2009. "The Impact of It Implementation on Supply Chain Integration and Performance," *International Journal of Production Economics* (120:1), pp. 125-138.
- Loury, G. C. 1976. "A Dynamic Theory of Racial Income Differences," in *Women, Minorities, and Employment Discrimination*, P.A. Wallace and A.M. LaMonde (eds.). Lexington, MA: Lexington Books, pp. 153-186.
- Loury, G. C. 1987. "Why Should We Care About Group Inequality?," *Social Philosophy and Policy* (5:1), pp. 249-271.
- Marco, G., and Daniele, D. 2014. "Theory of Value Co-Creation: A Systematic Literature Review," *Managing Service Quality: An International Journal* (24:6), pp. 643-683.
- Morgan, R. M., and Hunt, S. D. 1994. "The Commitment-Trust Theory of Relationship Marketing," *The journal of marketing*, pp. 20-38.
- Nahapiet, J., and Ghoshal, S. 1998. "Social Capital, Intellectual Capital, and the Organizational Advantage," *The Academy of Management Review* (23:2), pp. 242-266.
- Prahalad, C. K., and Ramaswamy, V. 2000. "Co-Opting Customer Competence," *Harvard Business Review* (78:1), pp. 79-87.
- Prahalad, C. K., and Ramaswamy, V. 2004. "Co-Creation Experiences: The Next Practice In Value Creation," *Journal of Interactive Marketing (John Wiley & Sons)* (18:3), pp. 5-14.
- Prajogo, D., and Olhager, J. 2012. "Supply Chain Integration and Performance: The Effects of Long-Term Relationships, Information Technology and Sharing, and Logistics Integration," *International Journal of Production Economics* (135:1), pp. 514-522.
- Putnam, R. 1993. "The Prosperous Community: Social Capital and Public Life," *The american prospect* (13:Spring), Vol. 4. Available online: <http://www.prospect.org/print/vol/13> (accessed 15 April 2015)).
- Putnam, R. D. 1995. "Bowling Alone: America's Declining Social Capital," *Journal of democracy* (6:1), pp. 65-78.
- Rai, A., Patnayakuni, R., and Seth, N. 2006. "Firm Performance Impacts of Digitally Enabled Supply Chain Integration Capabilities," *MIS Quarterly* (30:2), pp. 225-246.
- Ramanathan, U., and Gunasekaran, A. 2014. "Supply Chain Collaboration: Impact of Success in Long-Term Partnerships," *International Journal of Production Economics* (147:Part B), pp. 252-259.
- Ryssel, R., Ritter, T., and Gemunden, H. G. 2004. "The Impact of Information Technology Deployment on Trust, Commitment and Value Creation in Business Relationships," *The Journal of Business & Industrial Marketing* (19:3), pp. 197-207.
- Sahin, F., and Robinson, E. P. 2002. "Flow Coordination and Information Sharing in Supply Chains: Review, Implications, and Directions for Future Research," *Decision Sciences* (33:4), pp. 505-536.
- Schiele, H., Ellis, S. C., Eßig, M., Henke, J. W., and Kull, T. J. 2015. "Managing Supplier Satisfaction: Social Capital and Resource Dependence Frameworks," *Australasian Marketing Journal (AMJ)* (23:2), pp. 132-138.
- Sheu, C., HsiuJu, R. Y., and Chae, B. 2006. "Determinants of Supplier-Retailer Collaboration: Evidence from an International Study," *International Journal of Operations & Production Management* (26:1/2), pp. 24-49.
- Shi, Z., Kunnathur, A. S., and Ragu-Nathan, T. S. 2010. "Exploring the Impacts of Interdependent Relationships on Ios Use: The Roles of Governance Mechanisms," *The Journal of Computer Information Systems* (50:3), pp. 50-62.
- Singh, P. J., and Power, D. 2009. "The Nature and Effectiveness of Collaboration between Firms, Their Customers and Suppliers: A Supply Chain Perspective," *Supply Chain Management* (14:3), pp. 189-200.
- Swafford, P. M., Ghosh, S., and Murthy, N. 2008. "Achieving Supply Chain Agility through It Integration and Flexibility," *International Journal of Production Economics* (116:2), pp. 288-297.
- Swaminathan, J. M., and Tayur, S. R. 2003. "Models for Supply Chains in E-Business," *Management Science* (49:10), pp. 1387-1406.
- Tsai, W., and Ghoshal, S. 1998. "Social Capital and Value Creation: The Role of Intrafirm Networks," *Academy of Management Journal* (41:4), pp. 464-476.
- Vargo, S. L., Maglio, P. P., and Akaka, M. A. 2008. "On Value and Value Co-Creation: A Service Systems and Service Logic Perspective," *European Management Journal* (26:3), pp. 145-152.
- Villena, V. H., Revilla, E., and Choi, T. Y. 2011. "The Dark Side of Buyer-Supplier Relationships: A Social Capital Perspective," *Journal of Operations Management* (29:6), pp. 561-576.
- Wang, E. T. G., and Wei, H.-L. 2007. "Interorganizational Governance Value Creation: Coordinating for Information Visibility and Flexibility in Supply Chains," *Decision Sciences* (38:4), pp. 647-674.
- Wasko, M. M., and Faraj, S. 2005. "Why Should I Share? Examining Social Capital and Knowledge Contribution in Electronic Networks of Practice," *MIS Quarterly* (29:1), pp. 35-57.
- Woolcock, M. 1998. "Social Capital and Economic Development: Toward a Theoretical Synthesis and Policy Framework," *Theory and Society* (27:2), pp. 151-208.
- Wu, I.-L., Chuang, C.-H., and Hsu, C.-H. 2014. "Information Sharing and Collaborative Behaviors in Enabling Supply Chain Performance: A Social Exchange Perspective," *International Journal of Production Economics* (148), pp. 122-132.
- Zhao, X., Xie, J., and Zhang, W. J. 2002. "The Impact of Information Sharing and Ordering Co-Ordination on Supply Chain Performance," *Supply Chain Management* (7:1), pp. 24-40.
- Zhou, L., Chong, A. Y. L., and Ngai, E. W. T. 2015. "Supply Chain Management in the Era of the Internet of Things," *International Journal of Production Economics* (159), pp. 1-3.
- Zhou, W., Chong, A. Y. L., Zhen, C., and Bao, H. 2018. "E-Supply Chain Integration Adoption: Examination of Buyer-Supplier Relationships," *Journal of Computer Information Systems* (58:1), pp. 58-65.
- Zhu, K., Kraemer, K. L., Gurbaxani, V., and Xu, S. X. 2006. "Migration to Open-Standard Interorganizational Systems: Network Effects, Switching Costs, and Path Dependency," *Mis Quarterly*, pp. 515-539.