

Analysis of Beneficial Result of Supply Chain Management within Partner Relationship Management

Tzu-Chun Weng

Department of Information Management
National Taiwan University of Science and Technology
Taipei
Taiwan

Abstract

This study simulates three experiments to examine whether the management of partner relationships in electronic commerce could strengthen the collaboration capabilities and overall competitiveness of companies under the electronic purchase ecosystem. The result demonstrates that apply the partner relationship management concept in the electronic purchase ecosystem can improve the service level to the clients and increase income, and that the effect on service level in the dynamic partner relationship management concept is higher than the fixed partner relationship management concept. Through our simulation process, industries could know the supplier selection procedure under the partner relationship management concept. By continuously simulating trades within the supply chain, enterprises in various industries will find their most valuable partners, and can engage them in long term relationships.

Keywords: Partner Relationship Management (PRM), Electronic Purchase (EC), Computer Simulation

1. Introduction

With the increasingly fierce competition in the market situation, the model of business operation and methods of value creations which transfer from the production-oriented of push-based activities to the demand-oriented of pull-based activities. In order to create long-term competitive advantage, enterprises must grasp and manage the development and maintenance of the supply chain. Rely on information communications technology (ICT) integrating the various members of the supply chain can improve competitive advantage. For long term survival, enterprises must have innovations, and also must work together to co-evolve with buyers.

Supply chain management (SCM) is management of a network of interconnected businesses. It pursues that the potential benefits of integrating internal business functions of purchasing, manufacturing, sales and distribution (Harland, 1996). The relationship between buyers and suppliers was hostile in the past. Buyers and suppliers were in a zero-sum competition; they built fortifications in order to survive the competition. A relationship of mutual trust between enterprises and their suppliers is not easy to establish; the relationship will increasingly become tenser than ever. Even if an enterprise has the best competitive advantages, the rocky relationship will damage long term development of the enterprise, and that enterprise will be unable to deal with challenges of the changing world. Hostile relationships between buyers and suppliers become rare, replaced by the establishment of common interdependence and mutual trust. More and more enterprises develop more in-depth cooperation with their buyers because they recognize that they should truly focus on the customer instead of product prices and should focus on how to increase their ability to meet the customer's expectations.

There are many researches on partner relationship management (PRM). Mohr and Spekman (1994) indicated that the primary characteristics of partnership success factors between manufactures and retailers. Ellram (1995) presented a guide to develop partner relationship for enterprises. Brinkerhoff (2002) addressed a framework to evaluate partner relationship and the evaluation challenges of integrating process and institutional arrangements. PRM systems has been that they can help suppliers improve revenues and improve profits (Lee et al., 2011). Akhavan (2014) showed that PRM are very important for business.

Enterprise dominance in the competition depends on the use of the resources of the entire supply chain. If the enterprise integrates their supply chain and further builds mutual trust in the entire supply chain, long term cooperative partnerships will be able to bring management, technical and financial benefits. Therefore, we develop an electronic purchase system prototype which includes the concept of PRM. After that, we design three system simulations to deal with the research problem. The simulations are: 1) the transactions in the electronic purchase system without PRM, 2) the transactions in the electronic purchase system with fixed PRM, and 3) the transactions in the electronic purchase system with dynamic PRM. Under this assumption, this paper attempts to answer the following research questions.

- 1) Will the management of partner relationships in electronic commerce strengthen the collaboration capabilities and overall competitiveness of enterprises?
- 2) How to determine the order choices with the concept of PRM for enterprises?

The remainder of this paper is organized as follows. In section 2, some related literature is reviewed. Next, the assumptions and notation are presented in section 3.

Simulation process and experiments are described in detail in section 4 and section 5. Finally, the conclusions and future research are made in section 6.

2. Literature Review

The concept of supply chain management (SCM) was risen to prominence during the past ten years (Cooper et al., 1997). SCM is a synthesis of art and science which improves the methods of finding raw materials needed by the companies for productions or services. In globalized competitive environment, the question how to enhance SCM capacity has become an important concern for the enterprises. SCM operates a series of efficient methods to integrate suppliers, manufacturers, warehouses and shops, and then to distribute the commodities to the right place at the right time in the right quantities in order to achieve customer satisfaction (Chong et al., 2009; Lin et al., 2009). SCM is an integrative approach for planning and control of materials and information flows with suppliers and customers. Its objective is to assist enterprises in developing appropriate competitive strategies and creating customer value (Stefan, 2003; Seuring and Muller, 2008). In the supply chain, partners need to have a close collaboration to make continuity operations of the supply chain system. In order to reduce costs, improve product quality, and increase competitive advantage (Barratt and Oliveira, 2001). The partners must establish a high degree of trust between all the relevant cooperation partners to create the mutually beneficial situation (Chandra and Kumar, 2001).

With the rise of information technology and Internet, enterprises have imported information technology into the business processes to improve the efficiency of business cooperation. Business-to-Business (B2B) refers cooperation or transactions between enterprises and e-B2B mentions to link through the internet, extranet network, internal network or virtual network (Mahadevan, 2003; Humphreys et al., 2006). The e-B2B can allow enterprises with information technology to become more efficient through overall business process. The e-B2B not only brings benefits for the organization, but also can improve the trust relationship between enterprises. Enterprises develop from simple progress of B2B transactions to collaboration between enterprises (Dyer, 1996). In this paper, we will explore partner relationship in E-commerce of supply chain.

PRM is a business strategy for improving communication between companies and their channel partners. In the book "Getting Partnering Right: How Market Leaders Are Creating Long-Term Competitive Advantage" described the partner relationship as follows, "True enterprise transformation is an activity, participants are unity and cooperation in the organization together to create value to change, to work together to create a new cooperative mode of operation in order to assist enterprises to achieve unprecedented profitability and competitiveness. Even if the partners still in the initial stage of a relationship, the effectiveness of many companies from this new relationship will be far more than the reduction of the cost-effectiveness of organizational downsizing or tissue reconstruction." The relationship is called a "Partner Relationship" (Rackham et al., 1995). When both partners agree to change the individual mode of operation, mutually integrating control of a portion of total enterprise system and the shared interests, the "Partner Relationship" is formed. Mansoor et al., (2014) indicated that PRM can improve organization's supply chain performance to provide the highest value to customers and maintain their competitive advantage against competitors.

Morgan & Hunt (1994) proposed four types of partner relationships from the perspective of relationship marketing, which are showed in Figure 1. According to the cooperative relationship with the object, the partnership is divided into four main categories: supplier partnerships, buyer partnerships, internal partnerships, and partnerships formed with other companies. Physical goods suppliers and service providers are two major actors in supplier partnerships. Final customers and intermediate customers play important roles in buyer partnerships. The roles in the internal partnerships are employees, business units and sub-companies. Partnerships formed with other companies include members such as governments, non-profit organizations and competitors. Thus, when companies face a variety of different types of partners, they must apply a different PRM strategy to each other.

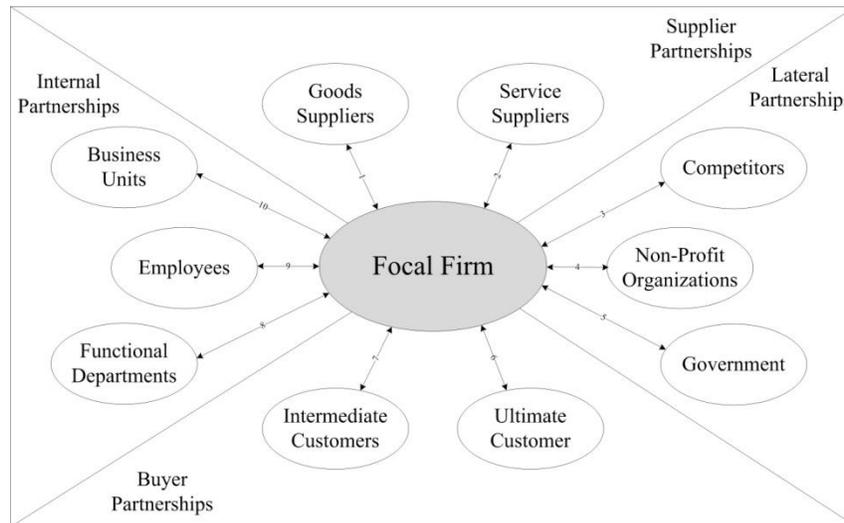


Figure 1: Four Types of Partner Relationships

The establishment of the partnership can be roughly arranged into five stages from the perspective of the buyer: awareness, exploration, expansion, commitment and dissolution. In the awareness stage, the buyer will be the first to identify a group of potential suppliers. In the exploration stage, enterprises assess potential suppliers and conduct the negotiations of the contract, and place orders for small quantities of product. Enterprises begin to sign long term contracts for bulk purchases in the expansion phase. Enterprises will realize that there is a gap between the value brought from partner suppliers and the value brought from other suppliers in this stage. In the commitment stage, the buyers and sellers are willing to make sacrifices and concessions in order to maintain long-term partnerships and will continue creating a win-win situation. Finally in the dissolution stage, the relationship will be terminated when the original goals of cooperation have been reached or no longer exist (Dwyer et al., 1987). Liljander & Strandvik (1995) used 10 “bindings” to measure the strength of customer relationships. Those ten are the binding forces of: law, economics, science, technology, time, geography, knowledge, society, culture, consciousness, and mind. In the system simulations in our study, we adopted the economic, technology and time bonds proposed by Liljander & Strandvik (1995).

1. Economic Bond: Companies will select the best product prices and will trade with their most interested vendors in order to achieve the maximum business profit.
2. Technology Bond: Both sides, providers and consumers, have interdependent science, technology or products. Once lacking supply or support results in the inability to complete jobs, patents are often transferred between business partners in order to eliminate the problems.
3. Time Bond: Most of the companies have existing restrictions on time or systems to provide service. Customers use the service only during service hours.

3. Model Assumptions and Notation

This study is to examine whether the management of partner relationships in electronic commerce will strengthen the collaboration capabilities and overall competitiveness of companies under the electronic purchase ecosystem. Therefore, we develop an electronic purchase system prototype which include the concept of PRM. Then we design three system simulations to examine the research problems.

- Simulation 1: The transactions in the electronic purchase system without PRM. The priority of shipment to buyers is FCFS (First Come First Served). That means shipments are delivered in sequence according to the order of receipt of the order forms.
- Simulation 2: The transactions in the electronic purchase system with fixed PRM. The bonding scores of buyers are listed first and the shipping order is in accordance with the order of the bonding scores. The word “fixed” means once the sequence of buyers is sorted in the list, the list is not changed.
- Simulation 3: The transactions in the electronic purchase system with dynamic PRM. At the beginning, the priority of shipment is FCFS (First Come First Served). Then, the priority is changed every half year according to the bonding scores of buyers.

3.1 Assumptions

System simulation must not include all parameters in the real world. In order to facilitate this study, we make the following assumptions:

1. There is only one seller with 10 products, and there are 10 buyers.
2. The unit of time in this study is one week.
3. There may be multiple orders per unit time. The distribution of the orders is Poisson distribution, $Poi(3)$. This means that each buyer will place three orders on average during each unit of time.
4. Each order belonging to only one buyer. The probability of each order belonging to a particular buyer is 0.1. $U(1,10)$.
5. There is only one kind of product in each order. The probability of each product belonging to a particular order is 0.1. $U(1,10)$.
6. The quantity in each order is in a normal distribution with a mean of 30,000 and a standard deviation of 5,000. $N(30,5)$.
7. The cost of each product is in a normal distribution with a mean of 90 and a standard deviation of 20. $N(90,20)$.
8. The price of each product is in a normal distribution with a mean of 200 and a standard deviation of 20. $N(200,20)$.
9. All orders come from the same unit time are acknowledged together.
10. The upstream supplier will immediately supply all required raw materials.
11. There is no price discount in our scenario.

3.2 Measurements

Seven measurements are used in our simulations as follows:

1. Income: The income of the company in the simulations is defined as the price of the product item multiplied by the quantity on the order sheet.
2. Net Income: Net income of the company in the simulations is defined as per the following formula: $\text{Net Income} = (\text{Price of product item} - \text{Cost of product item}) * \text{Quantity on order sheet}$.
3. Net Loss: In the simulations, the company's net loss occurs only when the orders come from buyers are not fulfilled is defined as per the following formula: $\text{Net Loss} = (\text{Price of product item} - \text{Cost of product item}) * \text{Unfulfilled portion of Quantity on order sheet}$.
4. Service Level: We measure the service level by the percentage of order fulfillment. A higher service level indicates the higher customer satisfaction. Service level is defined as per the following formula: $\text{Service level} = (\text{The number of order sheets} - \text{The number of unfulfilled order sheets}) / \text{The number of order sheets}$.
5. Score of Economic Bond: The concept of Economic Bond is that companies will select the best product prices and will trade with their most interested vendors in order to achieve maximum business profit. Thus, we define the score of economic bond as the count of order sheets which bring the highest net income for a particular buyer.
6. Score of Technology Bond: There are common goods and high technology goods in simulation scenarios. We measure the score of technology bond by the quantity of high technology product items on all order sheets.
7. Score of Time Bond: There are time or system restrictions on the service provided. Customers use the service only during service hours. We measure the score of time bond by the count of order sheets within the service hours.

4. Simulation Process

This research is a systematic approach to simulate experiments, which describes as follow and Figure 2 depicts the experimental design.

- Stage 1: Initialization. The purpose of this stage is to set up the parameters of productions and buyers. The details are as follows: 1) initialize the bonding scores of buyers, 2) set the selling price and the cost of each product, and 3) set the weekly production capacity for each product. The trading period is set to 6 years in the simulations.
- Stage 2: Running Simulations. There is no PRM concept in Simulation 1. The bonding scores are never changed in Simulation 2. We adjust the bonding scores based on the trading results every half year of simulation time in Simulation 3.
- Stage 3: Analysis and comparison. The service Level, income and loss of the three experiments are analyzed and compared finally.

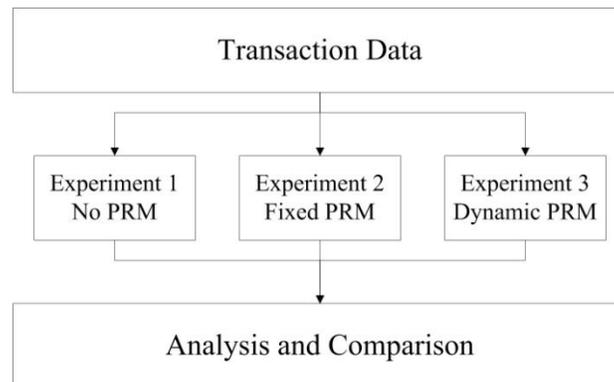


Figure 2: Experimental Design

The simulation of these experiments is during six years and each transaction is on a weekly basis. Simulation process is shown in Figure 3 and each step is described as follows:

1. Data Initialize: first step initialize the simulation data.
2. Simulate: The experiments are simulated with a fixed-increment time advance. The initial time is set to zero and each unit of time is set a fixed increment.
3. Order: Each order of buyer follows the Poisson distribution.
4. Order Determine: After receiving the order, the inventory will be checked. If the inventory is enough, the order will be received to process, otherwise rejected.
5. Inventory Determine: After the shipment, inventory always should be checked. If the inventory level is less than the safety stock, the product process will begin, otherwise next order will continue to deal with.
6. Product: If the stock is below safety stock, the product process will begin. The study assumed that suppliers can supply raw materials immediately.
7. Inventory Store: the manufactured product will be store into the stock immediately. This study is assumed that inventory is without delayed delivery.

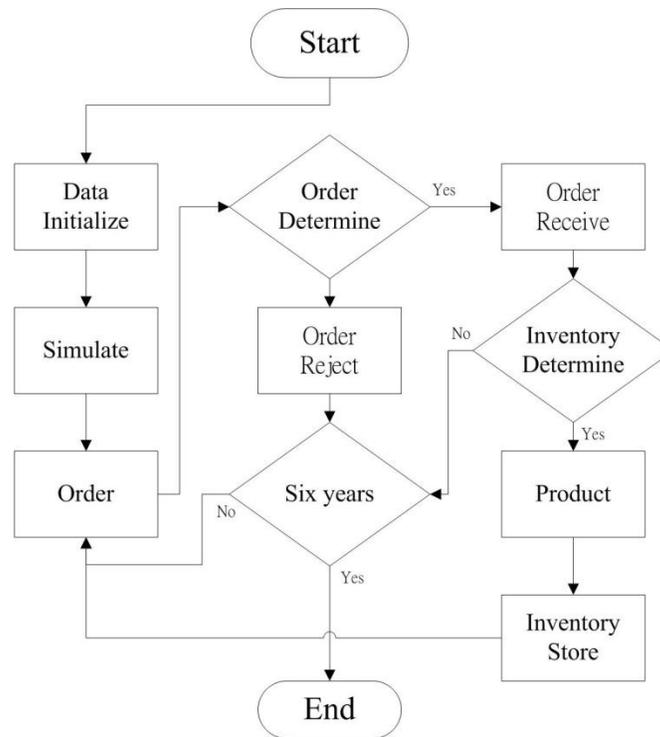


Figure 3: Simulation Process of Experiment

5. Experiments

Experiment 1: Because the FCFS rule is applied, the service levels are highest for the first buyer and the lowest for the last buyer. The average service level is 0.574. We also found that buyers A, B, C, D, E and F brought positive net income and buyers G, H, I and J were brought a net loss. Thus, if we change the sequence of shipment to buyers, it will bring more business profit.

Table 1: Experiments 1

Company	Order Quantity	Receive Order	Reject Order	Service Level	Income	Net Income	Net Loss
Company A	482	464	18	0.963	2,698,122	1,260,269	47,593
Company B	474	405	69	0.854	2,322,024	1,067,830	184,743
Company C	472	346	126	0.733	1,998,267	932,959	355,885
Company D	473	309	164	0.653	1,798,430	840,911	454,324
Company E	473	278	195	0.588	1,603,988	751,794	555,398
Company F	472	242	230	0.513	1,403,908	660,153	643,788
Company G	470	190	280	0.404	1,100,744	522,332	762,072
Company H	466	179	287	0.384	1,008,796	472,871	790,086
Company I	465	152	313	0.327	861,754	417,291	871,087
Company J	462	138	324	0.299	808,993	383,030	881,329
Total	4709	2703	2006	0.574	15,604,026	7,309,440	5,546,305

Experiment 2: The average service level increased to 0.594 and the service levels of the 10 buyers are closer than the service levels in Simulation 1. In this simulation, we demonstrated that the concept of fixed PRM could increase the customer satisfaction average.

Table 2: Experiments 2

Company	Order Quantity	Receive Order	Reject Order	Service Level	Income	Net Income	Net Loss
Company A	461	313	148	0.679	1,818,410	852,002	411,372
Company B	464	275	189	0.593	1,615,761	763,460	531,230
Company C	465	244	221	0.525	1,425,291	676,970	617,184
Company D	464	347	117	0.749	2,020,889	953,672	334,829
Company E	454	395	59	0.870	2,260,239	1,042,249	171,551
Company F	448	431	17	0.962	2,549,525	1,197,425	46,912
Company G	448	199	249	0.444	1,145,668	535,394	678,885
Company H	448	176	272	0.393	1,007,099	472,645	764,136
Company I	444	166	278	0.374	935,773	428,755	765,298
Company J	444	150	294	0.338	841,343	396,232	814,945
Total	4540	2696	1844	0.594	15,619,998	7,318,804	5,136,342

Experiment 3: The average service level significantly increased to 0.646. That meant the dynamic PRM significantly increased customer satisfaction, and the increase from dynamic PRM is greater than the increase from fixed PRM.

Table 3: Experiments 3

Company	Order Quantity	Receive Order	Reject Order	Service Level	Income	Net Income	Net Loss
Company A	451	189	262	0.419	1,075,798	497,269	739,961
Company B	452	220	232	0.487	1,274,452	597,321	656,176
Company C	433	222	211	0.513	1,284,590	609,416	593,002
Company D	413	163	250	0.395	934,934	436,534	696,622
Company E	412	285	127	0.692	1,626,511	757,971	352,894
Company F	397	327	70	0.824	1,937,419	915,221	209,168
Company G	397	358	39	0.902	2,101,743	998,536	117,965
Company H	405	237	168	0.585	1,376,129	640,997	477,106
Company I	407	301	106	0.740	1,707,883	790,071	313,306
Company J	403	391	12	0.970	2,309,112	1,081,000	35,896
Total	4170	2693	1477	0.646	15,628,571	7,324,33	4,192,096

Based on those experiment results, we could claim that supply chain with PRM will bring more business profit than the supply chain without PRM, and a supply chain with dynamic PRM contributes more business profit than a supply chain with fixed PRM.

Table 4: Paired Samples Test

	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		t	df	Sig. (2-tailed)
				Lower	Upper			
(Income)								
Pair 1 Ex.1-Ex.2	-188.8897	4180.71592	64.74148	-315.8175	-61.9619	-2.918	4169	.004
Pair 2 Ex.1-Ex.3	-501.1434	4137.48082	64.07195	-626.7586	-375.5282	-7.822	4169	.000
(Net Income)								
Pair 1 Ex.1-Ex.2	-88.5693	2044.01019	31.65301	-150.6261	-26.5125	-2.798	4169	.005
Pair 2 Ex.1-Ex.3	-234.6542	2026.29562	31.37869	-296.1732	-173.1352	-7.478	4169	.000
(Net Loss)								
Pair 1 Ex.1-Ex.2	80.0470	2038.75159	31.57158	18.1499	141.9441	2.535	4169	.011
Pair 2 Ex.1-Ex.3	205.0456	2056.67513	31.84914	142.6043	267.4869	6.438	4169	.000

In this study, transaction data of three experiments input SPSS Paired Samples Test. In income, $P = 0.004$ for Experiment 1 and Experiment 2 and $P = 0.000$ for Experiment 1 and Experiment 3, which means that PRM can indeed import increase revenue. In net income, $P = 0.005$ for Experiment 1 and Experiment 2 and $P = 0.000$ for Experiment 1 and Experiment 3, which means that import PRM can really improve the net.

Finally, in net loss, $P = 0.011$ for Experiment 1 and Experiment 2 and $P = 0.000$ for Experiment 1 and Experiment 3. These results also indicate that the partnership is a dynamic relationship between supplier and buyers. The relationship should be monitored and frequently modified in order to maximize business profits.

Our study findings echo the B2B Partnership Lifecycle which was proposed by Heffernan (2004). At the early stages of trading, the relationship is weak and the bonding score is low. After more and more transactions are accomplished, the relationship between the company and buyers becomes closer, and the company gets more profit.

6. Conclusions and Future Research

In this era of global economics, the competition between companies has been changed. Competitions do not exist only between companies but also extend to the supply chain or business alliances. In the trend of global economics, if operational performance within the supply chain is lower than other competitors, the consequences will damage the company's chances of survival. PRM emerges from this competitive situation. Regardless of the industry, PRM has become a critical issue for enhancing total performance in the supply chain. Even traditional industries or high-tech industries have to adapt the concept of PRM in order to maintain their competition advantage.

This study is to examine whether the management of partner relationships in electronic commerce will strengthen the collaboration capabilities and overall competitiveness of companies in the electronic purchase ecosystem. First, we developed an electronic purchase system prototype which included the concept of PRM. Then we ran three system simulations to examine the PRM concept in the system prototype. Based on the result of this study, we could claim that a supply chain with PRM can bring more business profit than the supply chain without PRM, and a supply chain with a dynamic PRM contributes more business profit than a supply chain with a fixed RPM.

Through this study, enterprises could know the buyer selection procedure under the PRM concept. By continuously simulating trades within the supply chain, enterprises in various industries will find their most valuable partners and engage them in long term relationships.

Reference

- Akhavan, P. (2014). A framework for determining and prioritizing relational capitals: the case of Iran e-business. *International Journal of Commerce and Management*, 24(2), 2-2.
- Barratt, M., & Oliveira, A. (2001). Exploring the experiences of collaborative planning initiatives. *International Journal of Physical Distribution & Logistics Management*, 31 (4), 266-289.
- Brinkerhoff, J. M. (2002). Assessing and improving partnership relationships and outcomes: a proposed framework. *Evaluation and Program Planning*, 25 (3), 215-231.
- Chandra, C., & Kumar, S. (2001). Enterprise architectural framework for supply-chain integration. *Industrial Management & Data Systems*, 101 (6), 290-303.
- Chong, A. Y. L., Ooi, K. B., & Sohal, A. (2009). The relationship between supply chain factors and adoption of e-Collaboration tools: An empirical examination. *International Journal of Production Economics*, 22 (1), 150-160.
- Cooper, M. C., Lambert, D. M., & Pagh, J. D. (1997). Supply Chain Management: More Than a New Name for Logistics. *The International Journal of Logistics Management*, 8 (1), 1-14.
- Dyer, J. H. (1996). How Chrysler Created an American Keiretsu. *Harvard Business Review*, 74, 42-56.
- Dwyer, F. R., Schurr, P. H., & Oh, S. (1987). Developing buyer-seller relationship, *Journal of Marketing*, 51(4), 11-27.
- Ellram, L. M. (1995). A managerial guideline for the development and implementation of purchasing partnerships. *Journal of Supply Chain Management*, 31 (2), 9-16.
- Harland, C. M. (1996). Supply Chain Management: Relationship, Chains and Networks. *British Journal of Management*, 7, 63-80.
- Heffernan, T. (2004). Trust formation in Cross-Cultural business-to-business relationships, *The International Journal Qualitative Market Research*, 7(2), 114-125.
- Humphreys, P., McIvor, R., & Cadden, T. (2006). B2B commerce and its implications for the buyer-supplier interface. *Supply Chain Management: An International Journal*, 11 (2), 131-139.
- Lee, N., Gilliland, D. I., Bello, D. C., & Osmonbekov, T. (2011). When electronic management tools work—and don't work—in social-based distribution channels: A study of IT manufacturers and resellers. *Journal of Business Research*, 64(10), 1017-1024.
- Liljander, V., & Strandvik, T. (1995). The relation between service quality, satisfaction and intentions in managing service quality. In P. Kunst, & J. Lemmink (Eds.), *Managing service quality*, 45-63. London: Paul Chapman Publishing
- Lin, R. H., Chuang, C. L., Liou, J. J. H., & Wu, G. D. (2009). An integrated method for finding key supplier in SCM. *Expert System with Application*, 36 (3), 6461-6465.
- Mahadevan, B. (2003). Making sense of emerging market structures in Business to Business E Commerce. *California Management Review*, 46 (1), 86-100.
- Mansoori, S., Jamshidinavid, B., & Hashemi, S. R. (2014). The Impact of Supply Chain Integration on Supply Chain Performance. *Journal of Applied Environmental and Biological Sciences*, 4(3), 229-237.
- Mohr, J., & Spekman, R. (1994). Characteristics of partnership success: partnership attributes, communication behavior, and conflict resolution techniques. *Strategic Management Journal*, 15 (2), 135-152.
- Morgan, R. M. & Hunt, S. D. (1994). The Commitment-Trust Theory of Relationship Marketing, *Journal of Marketing*, 58(3), 20-38.
- Rackham, N., Friedman, L., & Ruff, R. (1995). *Getting Partnering Right: How Market Leaders Are Creating Long-Term Competitive Advantage*, McGraw-Hill.
- Seuring, S. and Muller, M. (2008). From a literature review to a conceptual framework for sustainable supply chain management. *Journal of Cleaner Production*, 16 (15), 1699-1710.
- Stefan, M. (2003). Multiple-supplier inventory models in supply chain management: A review. *International Journal of Production Economics*, 81-82 (11), 265-279.