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Collaboration Strategy of Business-to-Business Enhancing Customer Satisfaction

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ABSTRACT

This paper focuses on demand chain management, which accomplishes the synchronization of demand with supply through collaboration of buyer and supplier across the chain. And the purpose of it is to find the relationship between four integration strategies produced by combining supply integration and demand integration and its impacts on two performances, operating efficiency and customer satisfaction. The relationship is analyzed with respect to manufacturing and services respectively. Interestingly, our results show that the strength of integration affects differently two performances.

Keywords: Supply chain; Web-based Integration Strategy; Demand integration; Supply integration; Efficiency; Customer satisfaction

1. INTRODUCTION

A supply chain is composed of components involved in designed to produce products and services, procuring raw materials, transforming them into semifinished and finished products, and delivering them it end customer. In contrast, demand chain management (DCM) is defined a practice that manages and coordinates the whole supply chain, starting from the end customer and working backwards to raw material suppliers(Vollmann et al., 2000). For more specific, DCM is focusing on synchronizing demand with supply through customer and partner collaboration across multiple channels, while supply chain management(SCM) is managing and optimizing the sourcing, production and distribution operations of the enterprise to match a given demand (Woods, 2002).

Why Demand Chain Management is important? It is because three market dynamics are increasing the complexity and criticality of intelligently executing upon supply and demand chain processes: increased demand volatility, accelerating product changes and highly distributes supply. It is virtually impossible to 100% accurately forecast demand. Today the volatility of market demand for most products has increased. The costs of inaccurate forecasts have increased due to smaller profit margins, more rapid product price drops, and shorter product lifecycles. Demand volatility has also increased due to the expansion of distribution and sales channels. Companies continue to innovative and develop more advanced and sophisticated products that serve consumers' and businesses' appetite for technology and its uses. The supply-side network for many manufacturing companies has experienced fundamental changes. Companies have increased their manufacturing outsourcing and have become more reliant upon a broader network of component and customer suppliers. Demand volatility, product innovation and distributed supply networks are creating new business challenges for manufacturing companies and their supply and demand chain partners. Information latency and lack of visibility across this chain of partners result in a situation where the manufacturing companies can not effectively manage the new market volatility.

To be efficient and contribute to high customer satisfaction is one of important challenges in manufacturers and services. Through e-business, it is possible to serve customers individually with customized bundles of goods and services. However, it is difficult to improve both operational efficiency and customer satisfaction. Implementing a rigid approach in management would lose customer satisfaction. On the other hand, getting customization would decrease efficiency. For a supply chain, demand-side companies enhance high customer satisfaction composed of fill rate, customer's perception of the service from them, etc., whilst supply-side ones try to increase operational efficiency composed of lead-time, inventory level, inventory turnover, etc.

In order to achieve higher operational efficiency and customer satisfaction, DCM should be extensive up- and downstream integration between companies involved in the chain. Throughout the Internet, the integration has only become possible nowadays. And the tradeoffs between low cost, speedy transaction, diverse service, broad networks and rich content across the chain are resolved effectively through the web.

To be successful implementation of DCM, it is necessary that DCM has three components: Integrate, Exchange and Synchronize (Woods, 2002). Firstly, Integrate is performing data integration over the chain; secondly, Exchange is enabling collaboration with trading partners

to share intellectual capital about demand. Finally, Synchronize is creating business processes, not just data synchronization, that integrates knowledge about the chain performances to shape demand in this extended value network. Also, web-based technologies are increasingly indispensable for not only exchange and integration but also knowledge synchronizing.

Korea firms are mostly on the level of high position in infrastructure of the Internet. But it is not for e-business or business process. It correctly says that they are now struggling in integration of the Web with their business processes. So we sampled the companies posted in higher level on e-business processes.

By using supply-side or demand-side integration across the chain, demand and supply integration strategies address four strategic alternatives (Frohlich and WestBrook, 2002). They are shown in Fig. 1. Whilst model A indicates a strategy of little or no web-based integration of both sides, model D is oppositely a strategy with high levels of web-based integration collaborating with both sides partners. In between the other dimensions are strategies with supply-side integration of companies (model B) and demand-side integrations (model C). Adopting a web-based integration strategy requires collaborative agreements of problems on sharing information, benefit, knowledge of industry and market, etc. with suppliers and customers. Throughout the agreements, a company could decide a long-term plan for implementing strategies. To generate the plan effectively, a company should investigate how much the performances, operational efficiency or customer satisfaction, are increased through adoption of each strategy.

The objective of our study is to find the relationship between adopting web-based integration strategy and its impacts on two performances with manufacturing and services in Korea. For more specific, this research investigates whether there is a difference between the impacts of each selected strategy on two performances: operational efficiency and customer satisfaction, and also a difference between the impacts in manufactures and services.

2. LITERATURE REVIEW

Substantial previous research highlights many opportunities separately associated with either supply and demand integration in supply chain (Table 1). As Handfield (1993) mentioned, supply integration means "obtaining frequent deliveries in small lots, using single or dual sources of supply, evaluating alternative sources on the basis of quality and delivery instead of price, establishing long term contracts with suppliers, reducing buffer inventories and eliminating formal paperwork." The supply integration does not only reduce costs but also improve lead times. Through the Internet, other benefits include improved supplier reliability (Carr and Peason, 1999) and communication (Freeland, 1991).

In terms of the demand-side of companies, major challenges are improving demand visibility and planning in supply chains (Fisher et al., 1994). As Lee et al. (1997) noted, distorted demand information in a supply chain would incur tremendous inefficiencies: excess inventories, poor customer service, lost profits, misguided capacity plans, ineffective transportation and missed production schedules. One trend is integrating up- and downstream information to coordinate non-vertically integrated firms (Marbert and Venkataramanan, 1998). Due to magnification of unstable planning over supply chains, it needs controlling this amplification, which is essential to good demand management. Information technologies involving the web would make the demand integration successfully, which could include shared data between planning and control systems (Bowersox and Daugherty, 1995).

In demand chains, other interested issues are improving delivery efficiently and rapidly (Bhatnagar and Viswanathan, 2000; Cachon and Fisher, 2001; Heikkila, 2002) and logistics communication (Corbett et al., 1999). Basics of the core of demand-driven supply chain integration strategy are demand forecast integration, inventory reductions and the elimination of non-valued added activities.

E-business— the use of Internet-based computing and communications to execute both front-end and back-end business processes — has emerged as a key enabler to drive supply chain integration (Lee and Whang, 2001). The Internet creates a new environment for exchanging information and conducting business transactions. The most direct effect of the Internet is to create new opportunities to improve the efficiency and effectiveness of the operation of the supply chain. This is because of the cost-effective capacity to generate visibility across all aspects of the supply chain, including point-of-sale information, manufacturing schedules, vendor stocks, customer inventories, demand patterns, sales/marketing initiatives, and carrier schedules.

And the Internet is an enabler to actually combine customers and suppliers over a supply chain. Pre-internet, real-time demand information and inventory visibility were almost impossible to achieve and most supply and demand integration involved a patchwork of telephoning, faxing, and EDI. Web-based technologies allow customers and suppliers to co-operate each other for inventory planning, demand forecasting, order scheduling, target marketing, and customer relationship management. And the greatest potential of the Internet is being realized by speeding up communication between customers and their suppliers, improving service levels, and reducing logistics costs (Lancioni et al., 2000). Lee and Whang (2001) have offered a view emphasizing e-business applications to the supply chain: planning and

execution of the front-end and back-end operations in a supply chain using the Internet.

Throughout the Internet, traditional demand and supply integration practices present four strategic alternatives (Frohlich and WestBrook, 2002). The worst is a strategy of little or no web-based integration (model A). Next, two models are introduced groups whose strategies involve web-based integration with either their suppliers (model B) or customers (model C). And last is a strategy with high levels of web-based integration, which requires being cooperative among the whole demand chain members from customers backwards to suppliers called DCM (model D). Frohlich and WestBrook(2002) suggests that the higher the level of integration intensity with suppliers and customers, the greater the benefits. Our study involves above four strategies.

Through the Web, firms are able to obtain global visibility across their extended network of trading partners and respond rapidly to diverse customer demand. Applying the Web into their demand chain makes them more beneficial to efficiency in internal view and customer satisfaction in external view.

Web-based DCM strategy performs the highest operational efficiencies; faster delivery time, reduced transaction costs, greater profitability and enhanced inventory turnover (Frohlich and Westbrook, 2002). And customer satisfaction is composed of higher fill rate, customer loyalty, recommendations, and enhancing customer's perception on pricing and the quality of a product. Heikkila (2002) studied on a demand chain of mobile telecommunication technology capable of increasing operational efficiency and customer satisfaction. In the chain, high customer satisfaction is more important rather than efficiency. The problem of focusing one of both would depend on a company's situation: type of its role as a component in the chain, type of a product, etc.

To high operational efficiency or customer satisfaction, DCM is required extensive up- and downstream integration between companies involved in the chain. Throughout the web, the integration could be very speedy, and also, it can effectively resolve the tradeoffs between low cost, speedy transaction, diverse service, broad networks and rich content across the chain.

3. RESEARCH METHOD

3.1 Research model and hypotheses

As Narasimhan and Jayaram (1998) studied, a low integration strategy (model A) in the Internet era should deliver the fewest benefits among four integration strategies. The DCM strategy (model D) should deliver the highest levels of performance. The higher the level of traditional integration with suppliers and customers the greater the benefits, as Frohlich and Westbrook (2001) noted, and the Internet should only reinforce this relationship. The performance for the supply integration (model B) and the demand integration (model C) strategies should logically fall between the low integration (model A) and DCM (model D) approaches. Fig. 1 shows the research model and study hypotheses.

The following arguments lead to the set of hypotheses.

H1a. Manufacturers and services adopting a web-based DCM integration strategy (model D) will have the highest levels of operational efficiency.
H1b. Manufacturers and services adopting a web-based supply (model B) or demand (model C) integration strategy will have medium levels of operational efficiency.
H1c. Manufacturers and services adopting a low web-based integration strategy (model A) will have the lowest levels of operational efficiency.
H2a. Manufacturers and services adopting a web-based DCM integration strategy (model D) will have the highest levels of customer satisfaction.
H2b. Manufacturers and services adopting a web-based supply (model B) or demand (model C) integration strategy will have medium levels of customer satisfaction.
H2c. Manufacturers and services adopting a low web-based integration strategy (model A) will have the lowest levels of customer satisfaction.

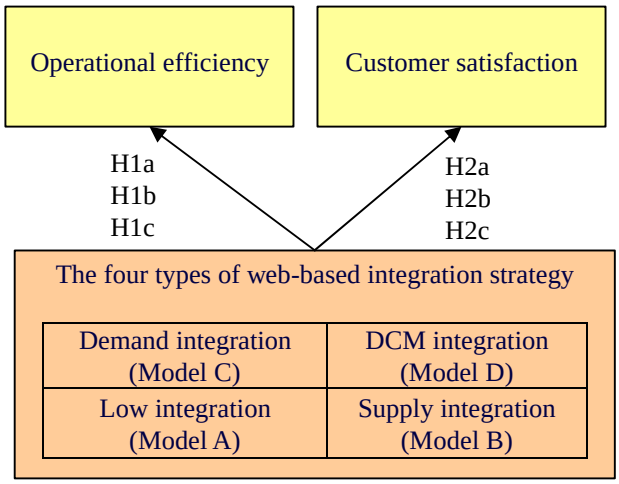

Fig. 1. Research model and hypotheses

3.2 Operational definitions and measure items of variable

Some factors mentioned in this research are extracted through existing studies of Table 1. The others, especially related to customer satisfaction factor, are through the relevance of demand chain factor. Operational definitions, measure items of variable and sources of variables are described in Table 1.
As it mentioned in Section 2, it generates four integration strategies by using the two types of integration. While the factor of operational efficiency describes company’s

performance: delivery time, transaction cost, profitability, and inventory turnover, through the web-based integration, the factor of customer satisfaction shows customer's perceptions for a company: information support for products and services, intent to continuous transaction, satisfaction of price, quality and delivery, and likelihood to recommend supplier to other customers. The scale for all measure items depicted in Table 1 is a 7-point Likert scale with 1 indicating not agreed at all, 4 indicating so-so and 7 indicating fully agreed.

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Table 1. Operational definitions and measure items of variable

Factor	Operational definition	Measure item	Studies
Supply integration	Levels of web-based supply chain integration with suppliers	Integrated inventory planning with suppliers	Frohlich and Westbrook(2001), Lancioni et al. (2000), Lee and Whang(2001), Rahman(2003)
		Integrated supply chain management with suppliers	Frohlich and Westbrook(2001), Lancioni et al.(2000), Lee and Whang(2001), Rahman(2003)
		Integrated demand forecasting with suppliers	Frohlich and Westbrook(2001), Lancioni et al. (2000), Lee and Whang(2001), Rahman(2003)
		Integrated order scheduling and tracking with supplier	Frohlich and Westbrook(2001), Lancioni et al. (2000), Lee and Whang(2001), Rahman(2003)
Demand integration	Levels of web-based supply chain integration with customers	Targeted marketing/customer profiling	Heikkila(2002)
		Online order taking/receipt	Lee and Whang(2001)
		Integrated demand forecasting with customers	Frohlich and Westbrook(2001), Heikkila(2002), Lancioni et al.(2000), Lee and Whang(2001), Rahman(2003)
		Customer relationship management	Heikkila(2002), Lee and Whang(2001)
Operational efficiency	Levels of achievement by web-based integration with suppliers or/and customers	Faster delivery time	Frohlich and Westbrook(2001), Heikkila(2002), Lancioni et al. (2000), Lee and Whang(2001), Rahman(2003)
		Reduced transaction costs	Lancioni et al. (2000), Lee and Whang(2001)
		Improved greater profitability	Chien et al.(2003), Frohlich and Westbrook(2001), Lee and Whang(2001)
		Enhanced inventory turnover	Frohlich and Westbrook(2001), Heikkila(2002), Lancioni et al. (2000), Lee and Whang(2001)
Customer satisfaction	Levels of satisfaction for purchasing producer's products or services	Information support for products/services	Chien et al.(2003), Frohlich and Westbrook(2001), Heikkila(2002), Lee and Whang(2001), Lancioni et al. (2000)
		Intending to continuous transaction (customer royalty)	Chien et al.(2003), Heikkila(2002)
		Satisfaction of price, quality and delivery	Chien et al.(2003), Frohlich and Westbrook(2001)
		Recommending producer to other customers	Chien et al.(2003)

3.3 Data collection

The survey was developed in three stages. In the first stage, we identified relevant measures of web-based demand and supply integration, operational efficiency, and customer satisfaction in the literature and drafted the instrument. In the second stage, we pre-tested the survey with 90 manufacturers and service firms to further gauge its content validity and overall readability. In the final stage, we executed the survey.

Data were collected from random samples of manufacturing and services from across Korea. Questionnaires were divided of two types. One is for company; the other is for his customer. We sampled from 7 regions of Korea including Seoul and Busan and, in the external validity, the companies sampled in Korea do well in e-business and the infrastructure of the Internet of Korea is ranked higher. 640 questionnaires are sent to company of manufacturing or services, and his customer by e-mail for convenience. And company's respondents were mostly managers with enough seniority to know about their companies' up- and downstream integration, and operational efficiency. Customers responded the level of customer satisfaction about his supplier. In our study, to gather more accurate response with consideration of Korean characteristic, all of variables in Table 2 were measured by a 7-point Likert scale: 7 = fully agreed, 4 = middle, and 1 = not at all. Returned usable questionnaires were totally 209 and the survey response rate was 32.7%. Responses of company are 118 cases; 40 manufacturers, and 78 services. And responses of customer are 91; 29 manufacturers and 62 services.

4. HYPOTHESES TEST AND RESULTS

This study analyzed the differences, concerning relationships between web-based integration strategies and performance in manufacturing and services, using ANOVA and the Scheffé method. Table 2 shows the results. In the table, demand chain integration strategy (model D) was archived the highest performance, and then demand integration strategy (model C) and supply integration strategy (model B) were next. Low integration strategy (model A) was the lowest.

And in Table 2, the manufacturers that employed demand chain integration strategy (model D) have archived the highest operational efficiency than the other strategies. While there is significant in between adopting model C and model D, they were not significantly different from other strategies. The manufacturers with model B had higher operational efficiency than model A and lower operational efficiency than model D. In services, model B, model C and model D had not been significantly different each other, but they were significantly different from model A. Using the results of ANOVA, we tested the set of hypotheses. Table 3 represents the results for hypothesis test by manufacturers and services. As a further evaluation of H1a, H1b and H1c for operational efficiency, and H2a, H2b and H2c for customer satisfaction, the total of manufacturers and services were merged together and regression was run to test effect of web-based integration (models A-D) on performance for operational efficiency and customer satisfaction separately.

Table 2. ANOVA for performance by integration strategy and company type

Cluster	Manufacturers[a]						Services[a]						Total[a]					
	Operational efficiency			Customer satisfaction			Operational efficiency			Customer satisfaction			Operational efficiency			Customer satisfaction		
	m	s	n	m	s	n	m	s	n	m	s	n	m	s	n	m	s	n
Model A	2.40	1.19	5	4.13	1.59	2	3.13	1.65	14	4.71	0.93	8	2.93	1.54	19	4.60	1.01	10
	(B^{*}, D^{***})			-			(B^{***}, C^{**}, D^{***})			-			(B^{***}, C^{**}, D^{***})			-		
Model B	3.78	1.01	8	5.18	0.66	7	4.74	1.23	18	4.88	1.01	14	4.44	1.24	26	4.98	0.90	21
	(A^{*}, D^{***})			-			(A^{***})			-			(A^{***}, D^{*})			-		
Model C	3.50	0.40	5	4.90	0.72	5	4.65	1.39	17	5.13	0.71	15	4.39	1.32	22	5.08	0.70	20
	(D^{***})			-			(A^{**})			-			(A^{***}, D^{*})			-		
Model D	5.28	0.85	22	5.40	1.01	15	5.16	1.06	29	5.45	1.11	25	5.21	0.97	51	5.43	1.06	40
	(A^{***}, B^{***}, C^{***})			-			(A^{***})			-			(A^{***}, B^{*}, C^{*})			-		
Total	4.40	1.38	40	5.17	0.94	29	4.58	1.46	78	5.14	1.00	62	4.52	1.43	118	5.16	0.97	91

a. m: mean; s: standard deviation; n: number of cases; alphabets in parentheses show which other integration strategy type the cluster's means performance is significant different from.
*: $P < 0.10$, **: $P < 0.05$, and ***: $P < 0.01$ significance.

Table 3. Results of hypothesis test

Hypothesis		Decision
H1a	Manufacturers adopting a web-based DCM integration strategy (model D) will have the highest levels of operational efficiency.	Supported
	Services adopting a web-based DCM integration strategy (model D) will have the highest levels of operational efficiency.	Not supported
H1b	Manufacturers adopting a web-based supply (model B) or demand (model C) integration strategy will have medium levels of operational efficiency.	Partial supported (only Model B)
	Services adopting a web-based supply (model B) or demand (model C) integration strategy will have medium levels of operational efficiency.	Not supported
H1c	Manufacturers adopting a low web-based integration strategy (model A) will have the lowest levels of operational efficiency.	Partial supported
	Services adopting a low web-based integration strategy (model A) will have the lowest levels of operational efficiency.	Supported
H2a	Manufacturers adopting a web-based DCM integration strategy (model D) will have the highest levels of customer satisfaction.	Not supported
	Services adopting a web-based DCM integration strategy (model D) will have the highest levels of customer satisfaction.	Not supported
H2b	Manufacturers adopting a web-based supply (model B) or demand (model C) integration strategy will have medium levels of customer satisfaction.	Not supported
	Services adopting a web-based supply (model B) or demand (model C) integration strategy will have medium levels of customer satisfaction.	Not supported
H2c	Manufacturers adopting a low web-based integration strategy (model A) will have the lowest levels of customer satisfaction.	Not supported
	Services adopting a low web-based integration strategy (model A) will have the lowest levels of customer satisfaction.	Not supported

5. CONCLUDING REMARKS

About impacts of four strategies on two performances, it is not significant at level of 95% that there are differences of the impacts on customer satisfaction by four strategies regardless of industry, while it is significant in the difference of the impacts on efficiency by manufacturers and services. Through the mean values on performance of efficiency, the model D, for manufacturing companies, shows the highest value and next orders are B, C, and A. The result means that a manufacturing company focuses on supply integration of suppliers and thereby accomplishing the internal efficiency. In contrast, for services, the descending order of mean values is D, B, C and A, but there is no difference between B and C. This means that a service company focuses on demand integration of customer to enhance customer satisfaction rather than efficiency. And it is not common in services since some of them do not have the supply part. And an integrated company with supplier gains more efficiency than that with customer. In reverse, an integrated company with customer acquires higher customer satisfaction than that with supplier. Therefore, this research addresses important results as follows:

- Manufacturers and services to pursue operational efficiency or customer satisfaction are able to achieve the best performance model by adopting demand chain management integration among the integration strategies.
- Supply integration provides better performance for manufacturers than demand integration in pursuing operational efficiency or customer satisfaction.
- Supply integration provides better performance for services than demand integration in pursuing operational efficiency.
- Demand integration provides better performance for services than supply integration in pursuing customer satisfaction.
- A low integration delivers the fewest benefits to manufacturers and services.

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