

# Impact of B2B E-Business on the Industry Structure

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## I. Introduction

This paper focuses on the convergence of the on-line and off-line business to draw business strategies. There are still some problems in spite a lot of Korean firms have made every effort to invest in IT and e-Business. According to a survey showing the constraints to B2B e-Business, infrastructure is the first, which is 32% of 228 respondents. The second is the recognition of the importance of the B2B, which is 31%. The third is the cooperation between the firms, which is 21%. While the first one is about the investment on the infrastructure, the second and the third are about the understanding the importance of the electronic commerce.

However the infrastructure problem has been resolved to a reasonable extent sooner or later. For example, Korean firms regard IT as a principal factor of the profitability and will increase the investment 27% this year. This result can be compared to those of US and Japan that will increase the investment 7% and below 7% each.

On top of that Korean government set up policies to encourage the B2B e-Business. Besides the information superhighway will be completed by 2005, 16 ministries formulated and implemented the e-Business policies. MIC announced that it would focus on 5 issues to promote e-business in Korea. One of them is related to the high quality infrastructure. MOCIE(Ministry of Commerce, Industry, and Energy) is promoting pilot projects in 20 industry sectors including small businesses.

In contrast to the infrastructure problem, there is still recognition problem of the

importance of the -Business. To persuade the CEOs and business firms to be cooperative, there should be reasonable benefits compared to costs required involving in B2B e-Business. Some studies show that off-line firms harvest the hybrid business model with the online. For example, Charles Schwab incubated its online separately and folded it in later. In some cases, the online and off-line operate as separate companies to allow capital markets to value the online business as a pure play. Barnesandnoble.com is an example of this kind. But this kind of study promotes the firms not involving in the B2B electronic commerce but designing the business models of its own.

This paper enlightens the stage of the change of relationship between buyers and sellers. The chemical industry would be incompatible until 2004 according to the result of our analysis. Some business strategies are suggested in connection with five forces and the incompatibility of the chemical industry. The result of this paper can be applied to the business sectors not only to maximize their profits but also to be ready for the electronic commerce era.

## **II. Model Set-up**

### **1. Definition**

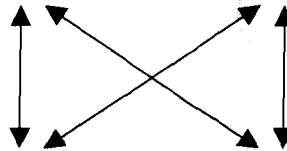
We divide commerce into three categories according to whether buyers and sellers are online or not. On-line commerce is conducted by buyers and sellers when both of them are online. Off-line commerce is conducted by both off-line buyers and sellers. The others are called hybrid on-line commerce.

In this sense online commerce is considered as all commerce conducted electronically, regardless of platform, technology, or system. This definition concerns with e-business including Internet e-commerce, Electronic Document Interchange (EDI), externally focused application integration, and electronic supply chain connectivity. While off-line commerce is

regarded as all traditional commerce conducted through mail, fax, phone, or in person.

## 2. Model Set-up

[Figure 1] shows the B2B system composed of online and off-line commerce of any industry. It is assumed that industry X is composed of here categories of commerce, i.e. e-marketplace, hybrid on-line, and off-line commerce. They are divided into three types according to the definition described previously. This model was developed by N. Economides<sup>1</sup>, which was applied for the ATM and bank services.



[Figure 1] B2B system in the industry X

$A_i$  = buyers,  $B_i$  = sellers

[Table 1] shows the four goods in the market of industry X with the prices and demands. Four B2B types have different willingness to pay and demand. Two buyers have  $p$  as willingness to pay, while two sellers have  $q$  as willingness to pay. Hybrid online commerce has  $R$  as adapter cost needed additionally.

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<sup>1</sup> N. Economides, Electronic Services Networks, M.E.Guerrin-Calvert and S.S.Wildman(eds), Praeger, New York, 1991

B2B Types			Willingness to pay	Demand
	Off-line	A <sub>1</sub> B <sub>1</sub>	p <sub>1</sub> +q <sub>1</sub>	1-r
Online	Hybrids	A <sub>1</sub> B <sub>2</sub>	p <sub>1</sub> +q <sub>2</sub> +R	r(1-e)/2
		A <sub>2</sub> B <sub>1</sub>	p <sub>2</sub> +q <sub>1</sub> +R	r(1-e)/2
	e-marketplace	A <sub>2</sub> B <sub>2</sub>	p <sub>2</sub> +q <sub>2</sub>	r*e

[Table 1] Commerce types and corresponding WTP and demands

The last column of [Table 1] shows demands represented accessible parameters.  $r$  is online penetration ratio, ratio of the on-line to the total commerce.  $e$  is e-marketplace ratio, the ratio of pure online to the hybrids. Here it is assumed that both hybrids have the same demand.

$$D^{11} + D^{12} + D^{21} + D^{22} = 1$$

$$D^{12} + D^{21} + D^{22} = r; \text{online}$$

$$D^{12} = D^{21}; \text{hybrids}$$

$$e = D^{22} / (D^{12} + D^{21} + D^{22}); \text{e-marketplace}$$

$$\therefore D^{11} = 1 - r$$

$$D^{12} = D^{21} = r(1 - e) / 2$$

$$D^{22} = r * e$$

### III. Research Analysis

#### 1. B2B e-Business in Chemical Industry

Chemical industry is thought of one of the major fields that electronic commerce can affect widely. According to the Forrester Research, 'chemical and allied products' is expected to rank the third in the market size of B2B electronic commerce, following 'electronic and other electric equipment' and 'motor vehicle and equipment'. This is because of the characteristics of chemicals. First, chemical products are ubiquitous all around the world. The market size is huge

and applied to almost every industries and countries.

Secondly, chemical products are well standardized with the quality. For example, PVC of Korean firms has the same quality with that of the US as long as the purity is verified. This standardized quality makes the buyers sensitive to the price of the products.

Thirdly, buyers and sellers are finely fragmented according to the area, makers. For example, fine chemicals and biochemical products have different prices with respect to the makers and purity. If those products are traded online, buyers can save much by auction, and/or comparison of products.

In US, Chemconnect started its online business in 1995, and matches over 500 trades daily nowadays. CheMatch.com and e-chemicals are leading e-marketplaces. DuPont, BASF, and Bayer are involving in consortium to run the e-marketplace while they have their own private shopping mall. For example, DuPont runs a shopping mall ([www.lyra.com](http://www.lyra.com)) for the sale of lycra. Meanwhile the number of domestic e-marketplaces is over 10 as of last year. Chemcross.com ([www.chemcross.com](http://www.chemcross.com)) and Chemround.com ([www.chemround.com](http://www.chemround.com)) are leading firms targeting global business. This is because large domestic chemical firms export over 80% of their product. Other e-marketplaces except ichemnet.com ([www.ichemnet.com](http://www.ichemnet.com)) and finechemsource.com ([www.finechemsource.com](http://www.finechemsource.com)) are made of consortium. Almost of e-marketplaces make their profits through the auction fee, catalogue fee, and transaction fee.

## **2. Impact of B2B e-Business on Industry Structure**

[Table 2] shows the summary of the five forces in petrochemical industry. Based on the expected trends in each of these competitive forces, the chemical industry appears to be increasing in its level of competitive intensity. That means profit margins will likely fall for the industry as a whole. Of those five forces, the bargaining power of buyers and sellers are to

increase which can be regarded as threats. Those threats are likely to reduce profits of the companies in the industry.

Rivalry among existing competitors		Threat of new entrants		Threat of substitute products and service		Bargaining power of buyers		Bargaining power of suppliers	
Number of competitors	+	Economies of scale	=	Customer's taste	=	Price sensitivity	+++	Price sensitivity	+++
Rate of industry growth	=	Product differentiation	=	Quality to price	+	Relative bargaining power	+++	Relative bargaining power	+++
Product or service characteristics	=	Capital requirement	+						
Amount of fixed costs	+	Switching costs	=						
Capacity	=	Access to distribution channels	=						
Height of exit barriers	+	Learning curve	=						
Diversity of rivals	+	Government policy	=						

[Table 2] Summary of the impact of B2B electronic commerce on chemical industry

= Almost same, + a little increase, +++ large increase

### 3. Compatibility of industries

[Figure 2] shows the scheme how we conclude whether the industry merges into a shared network having full compatibility or not. First of all, the four demands are calculated. First of all, the four demands are calculated using  $r$  and  $e$  shown in the following [Table 3] and [Table 4]. [Table 3] shows the online penetration of 'chemicals and allied products' industry of US and Korea published by the Goldman Sachs Global Equity Research and the e-bizgroup. Then  $L$ ,  $k$ ,  $k/k_1$  are calculated from the four demands under the following equations.

$$k = D^{12} / D^{11} = D^{21} / D^{11}$$

$$L = D^{22} / D^{11}$$

$$k_1 = k / L = D^{12} / D^{22} = D^{21} / D^{22}$$

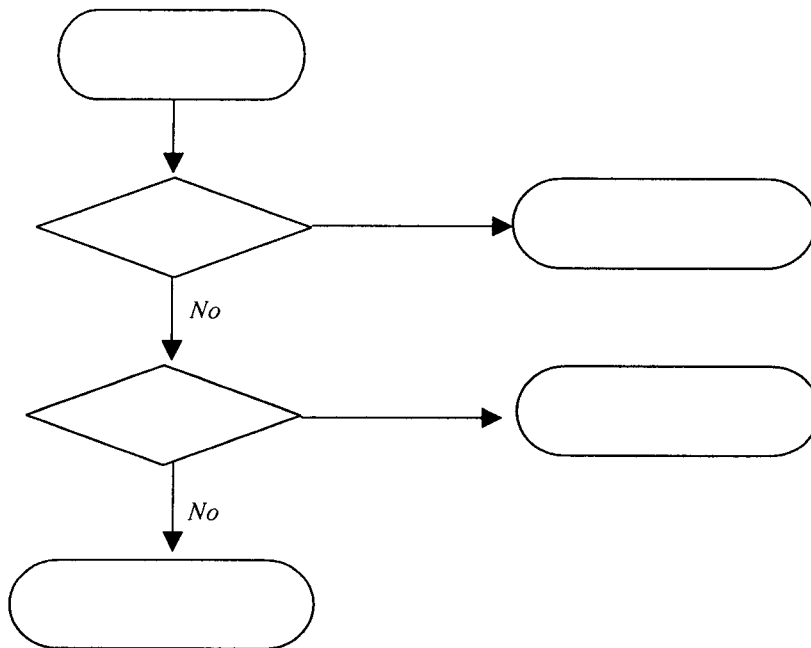
	1999	2000	2001	2002	2003	2004	2005
US Chemical	1.5	4.0	8.0	11.0	1.60	21.0	26.0
US Average	1.4	3.1	5.3	7.7	10.9	14.8	18.6
Korea Chemical	0.1	1.0	2.0	2.8	4.0	5.3	6.5
Korea Average	0.7	1.7	2.8	4.2	5.9	8.2	10.7

[Table 3] Online penetration ratio  $r$  (%) of US and Korea, 1999-2005

	B2B e-Business (\$)		e-marketplace (\$)		Via e-marketplace (%)	
	2000	2004	2000	2004	2000	2004
Chemicals and allied products	27.0	299.2	0.0	147.1	0.1	49.2
Construction	6.3	141.0	0.0	43.7	0.0	31.0
Electronic and other electric equipment	230.2	592.9	0.1	437.0	0.1	73.7
Motor vehicles and equipment	35.1	411.5	0.1	210.6	0.2	51.2
Utilities (electric/gas/sanitary services)	29.9	266.4	0.3	243.0	1.0	91.2

[Table 4] US e-marketplace ratio in 2000 and 2004

Then the four parameters are compared to judge the compatibility decision of the online and off-line commerce in a given industry X.



[Figure 2] Flowchart to judge the creation of the shared network in the industry

## IV. Results

### 1. Implications of Analysis

[Table 5] and [Table 6] show the result of the compatibility test of the chemical industry. We find that chemical industry would be incompatible until 2004.

What can be implied by this result about the bargaining power of buyers and sellers? First, the price sensitivity and relative bargaining power of the buyers and sellers would remain almost the same degree as that of today. Unless the partial compatibility at least, the bargaining power has not changed. Because the relationship between buyers and sellers has not changed under the incompatibility of the network.

Secondly, the off-line firms should not invest in the B3B excessively until the B2B electronic commerce reaches at partial compatibility. Literally incompatibility means that off-line firms in the traditional marketplace have enough profits without the trade with the online firms. To do electronic commerce with the online firms, the off-line firms have to spend at least the catalogue fee. Although this is not high of its own, there is another transaction costs according to the transaction amount. So it is better off for the off-line firms not to invest in opening the e-marketplace, and to join e-marketplace indirectly.

Year	Given Data		$k$	$L$	$k/k_1$	$k_1$	Demand				$e$	$r$
	B2B	Off-line					D <sup>11</sup>	D <sup>12</sup>	D <sup>22</sup>	Total		
<i>Incompatibility</i>												
'99	0.001	1.000										0.001
'00	0.010	0.990	0.005	0.000	0.000	499.5	0.990	0.005	0.000	1.000	0.001	0.010
'01	0.020	0.980										0.020
'02	0.028	0.972										0.028
'03	0.040	0.960										0.040
'04	0.053	0.947	0.007	0.041	0.041	0.178	0.947	0.007	0.039	1.000	0.737	0.053
'05	0.065	0.935										0.065

[Table 5] Korean 'Chemicals and allied products' industry



Year	Given Data		$k$	$L$	$k/k_1$	$k_1$	Demand				$e$	$r$
	B2B	Off-line					$D^{11}$	$D^{12}$	$D^{22}$	Total		
<i>Incompatibility</i>												
'99	0.015	0.985										0.015
'00	0.040	0.960	0.021	0.000	0.000	499.5	0.960	0.020	0.000	1.000	0.001	0.040
'01	0.080	0.920										0.080
'02	0.110	0.890										0.110
'03	0.160	0.840										0.160
'04	0.210	0.790	0.068	0.131	0.131	0.516	0.790	0.053	0.103	1.000	0.492	0.210
'05	0.260	0.740										0.260

[Table 6] US 'Chemicals and allied products' industry

Thirdly, the firms in the e-marketplace (a pure intermediary site or a consortium of the off-line firms) have to keep on extending their business with the hybrid firms to an extent. After the hybrid grows some point (B2B online penetration grows higher), they had better contact the off-line firms who have stayed within the traditional marketplace. On the meanwhile online firms have to develop attractive business models and provide useful information to seduce the off-line and hybrid firms. One of the critical problems in B2B electronic commerce is the security of the trade. If competitors know the quality and quantity of the products, it means the disclosure of the business strategy. In this sense some e-marketplace sites keep their customers trade with anonymity while the feedback with the correspondents is real time.

Finally, the incumbents in chemical industry have to be prepared for the change. While the electronic commerce does not change the industry structure till 2004, it is expected that it will affect dramatically as shown in the five forces analysis. Many of factors of forces will change due to the B2B electronic commerce, though it is not occurring now. The business strategies should be manipulated with respect to the change of the industry structure. So the firms are ready for the electronic commerce era.

## **2. Further Study**

This paper has some contributions and limitations at the same time. Of its contributions, it presents a systematic method to analyze the relationship between buyers and sellers. Under the incompatibility, it is not expected to change although it is believed so.

Second contribution of this paper is it can be used to draw the business strategies. After analyzing the industry structure using five forces, SWOT analysis is following to draw the strategy. Instead of doing so, we focus on the bargaining power of the buyers and sellers under B2B electronic commerce. But this is applied to the business strategies also.

Third contribution of this paper is the suggestion of the extension of the network economics not only to the off-line but also to the online. Generally the network economics has been applied to the area within the physical networks. For example, the telecommunications and finance have been studied by the network externality or critical mass of the network. Our study builds a system of online and off-line firm. Although we introduced a lot of tricky assumptions in the paper, it marks a pioneer position in this field.

In spite of these contributions, this paper has some limitations that should be made up in the future. Firstly, we introduce a lot of assumptions that might deviate from the reality. We think the firms as elementary goods with prices and adapter costs. But this is too generalized model to follow the firm's profit-maximization. And the demands are not equal to the sales, which used in the online penetration and e-marketplace penetration.

And we have to mention that the demand for the network goods is a function of price and number of existing members. So if we want to elaborate the model of compatibility, we have to consider the e-marketplace as network goods. While the off-line firms can be treated as having demands of price only.

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