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Development Stages of Supply Chain Management in E-Business Environment

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ABSTRACT

The emergence of electronic Business, or e-Business, has changed the operations and contents of traditional supply chain management or SCM. e-Business not only makes the operation of SCM more effective, but also plays the role of a major driving force to induce the development of new features of SCM by destroying the rules and orders that once governed and controlled SCM in the past. Based on this understanding, this paper focuses on studying how e-Business has changed the ways SCM creates added values in the following areas: the nature and contents, steps, fields and structures of value chains comprising SCM. To this end, this paper first divides overall development of supply chains into three stages. Then, detailed analysis of the features, development processes and characters of each development stage shall be discussed to identify the factors driving the changes. In addition, the types of developments shall be identified and discussed.

Keywords: e-Business, Supply Chain Management, Development Stages

1. INTRODUCTION

How does the e-Business change Supply Chain Management? e-Business does not simply enable customers to purchase goods and services over the Internet. The new form of Business backed by the Internet technology has profoundly changed the structure and meaning of supply chains. In this regard, this paper will look at how e-Business influences supply chains and how the influence actually changes the shape of overall supply chains.

Researches on supply chains have uncovered a number of diversified findings. Despite the diversified studies on supply chains, few studies have been performed on how e-Business changes supply chains, what would be root causes and driving forces to the change, and what it would look like after the change is done. This paper aims at establishing the development theory of supply chain evolution according to e-Business environment. In addition, two main themes are touched upon in this paper. e-Business based on the Internet platform changes supply chains. In this regard, this paper firstly classifies the structures of development stages leading to the evolution of supply chains in order to study the features and characteristics of changes by development stage. Secondly, this paper will look at the types of changes and the factors causing such changes.

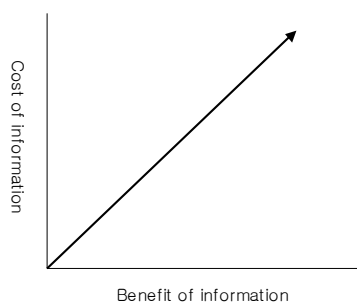
2. STAGES OF SCM DEVELOPMENT UNDER E-BUSINESS ENVIRONMENT

The advancement of e-Business has a profound impact on the development of supply chains. What are the specific impacts of e-Business on supply chain management? To answer this question, this paper looks at the influence of e-Business (or the advance of e-Business) on the development of supply chains by dividing the developments into three stages.

2.1. 1st Stage – Phase of Continuous Improvement

In principle, all developments start with a stage to improve parts which are currently unsatisfactory. Improvement refers to activities to analyze current status to come up with a better condition. Thus, an improvement is inevitably found on the continuity of existing conditions. Familiar examples of such improvements are: How can we minimize the level of inventory?; How can we accelerate the delivery of demand to customers?; How can we harmonize and match demand and supply ?; And how can we enable members of supply chains to share accurate information on a real time basis and to utilize needed information in a timely manner? As the examples indicate, the stage of improvement is to address such issues as bullwhip effect, excessive inventory, mismatches between demand and supply, delayed response to customers, and silo mentality of functional areas. Such improvement is motivated by current unsatisfactory status within an organization and is performed to resolve the issues by utilizing new environment and methodologies supported by e-Business. The phase of continuous improvement can ultimately be defined as the process of eliminating wastes and non-value added works in supply chain operation. In other words, the 1st development stage is the process of achieving maximum efficiencies and effectiveness to operate supply chains.

Examples of continuous improvement stage such as to eliminate errors and redundancies in supply chain operations, to lower inventory levels, to shorten product development cycle, to eliminate bullwhip effect and so on can be found in many companies. All components of supply chains share information to maintain optimal level of inventory and to support the fastest logistic movement; and users are able to utilize analytic information required for the operations of supply chains at the time they want.



[Figure 1 : Proportional Relationship between benefit and cost of information]

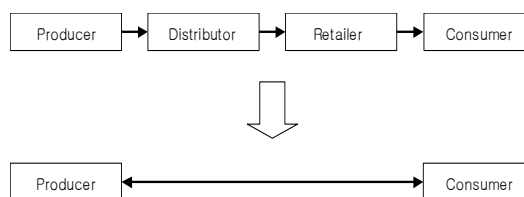
Traditionally, there has been a trade-off relationship between cost and effect of information. For instance, accurate information would have been shared through all supply chain members if value added networks or VAN was used to connect all supply chain members but this had not been realized because the costs were huge. However, the advancement of the Internet enabled automatic linkage of all members of supply chains to allow the members to exchange real-time information without accompanying large investment, as was the case in the past. At the same time, the accuracy and timeliness of information have improved greatly.

2.2. 2nd Stage – Phase of Structural Change

Customers have exerted to achieve what they wanted from traditional supply chains. The emergence of e-Business environment, however, has lifted the boundaries of thoughts of customers. In other words, once unthinkable in the traditional supply chains has turned into realities. For example, customers have become able to directly purchase goods from manufacturers without going through complicated distribution transactions. A company can act with another company located in a remote region as if they are one. These changes are not attributable to the operational efficiency intrinsic to supply chains. Rather, new environmental developments due to the emergence of e-Business have turned things that were once regarded difficult or impossible into possible features. These are not continuous or evolutionary changes from the past but disruptive or discontinuous ones. When faced with the limitations of improvement efforts that have been achieved in the 1st stage – phase of continuous improvement, companies start to recognize that the gradual improvements can no longer be used for development. Then they start to seek new ways of development or evolution. Sometimes, external shocks may transform on-going improvement activities into new types of activities or a new framework that are discontinuous from the past and out of the track of improvement projections. Both the cases of discontinuous improvement symbolize the 2nd stage – phase of structural change. In the stage of structural change, you can find:

(1) Disintermediation

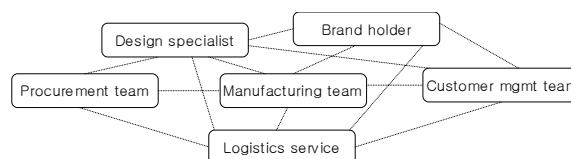
e-Business provides an environment in which customers can directly interact with producers. In other words, customer and producers do direct transactions via the Internet without utilizing traditional distribution channels.



[Figure 2 : Disintermediation]

(2) Virtual Supply Chain

Virtual supply chain refers to a system in which physically separated unit companies with unique core competencies collaborate to achieve a single target. A good example would be a collaborative shoe making network comprised of the followings: a German shoe producer which owns brand; an Italian company performs shoe designs; a Korean company takes charge of producing; a Singaporean company carries out global logistics; and a U.S. company provides customer services. As this example shows, a virtual supply network is a system in which a number of different companies gather together without regarding the limitations of time and space to act as a one entity.



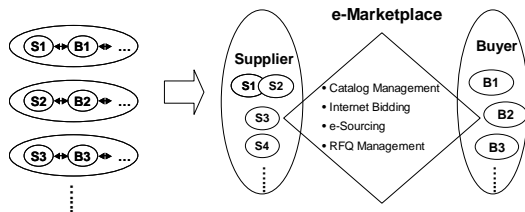
[Figure 3 : Virtual Supply Chain]

(3) e-Marketplace

Traditional relationship between suppliers and manufacturer was based on almost-fixed one-to-one ties between a supplier and a manufacturer. e-Marketplace changed ways of doing businesses of buyers and suppliers and allows them to overcome the limitations of traditional relationships by creating a single cyber marketplace where multiple suppliers do transactions with multiple buyers.

To sum up structural changes occurring in the 2nd stage: Collaboration of supply chain members has been pursued to reduce the total cycle time from customers to producers and to share information in a more efficient manner. These efforts have been discussed in the 1st stage of continuous improvement. In the 2nd stage of structural change, however, the focus of such efforts has shifted from the efficiency of a supply chain to the change of overall structure of a supply chain. In this stage, supply chains undergo discontinuous changes, not gradual improvements as are the case in the 1st stage. In this regards, we call changes occurring in this stage “structural changes” to reflect the fact that the overall framework of supply chains are subject to change.

Disintermediation, virtual supply networks or e-marketplaces are understood as types of such structural changes.



[Figure 4 : e-Marketplace]

Major driving force leading to the structural changes in the second stage would be the destruction of trade-off relationship between the richness and the reach of information where richness of information means that information contains sufficient contents to enable decision-making and reach of information means the scope within which information can be shared. For more details about the reach and richness, see Evans and Wurster (1999).

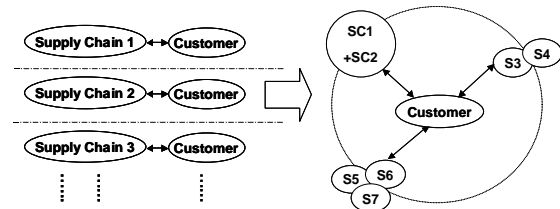
2.3. 3rd Stage – Phase of Convergence/Chaos

If the rate of structural change exceeds a certain level, such change becomes no longer controllable and starts to create spontaneous changes. This paper defines the 3rd stage as the phase of convergence/chaos changes. In this stage, the traditional definition of supply chains becomes meaningless and chaotic revolution starts to prevail. For the purpose of this paper, the chaotic revolution is defined to be a stage in which new types of converged supply chains emerge and all industries are combined with other industries, followed by the creation of new types of industries.

Values once provided by a single industry for customers come to lose their competitiveness. Thus, industries start to converge with new industries to overcome the borders of traditional industries and to provide comprehensive values to customers. For instance, on-line stock trading is a financial industry combined with IT industry. Similar examples are: mega-markets supporting purchasers to buy various products of various industries in one marketplace; integrated and converged financial service markets which have seen segmented among banks, non-banking financial institutions, insurance companies, credit union; and also the crossover competition and cooperation between credit card companies and cell phone carriers caused by the addition of credit card functional service provided by cell phone terminals. These cases manifest disappearing distinctions between traditional industries.

The speed and severity of such changes further move supply chains forward to have more and more new features. Customers come to demand all their requirements to be met at one place and the demarcations among traditional industries become

indistinct. Primary activities and supporting activities of value chains become no longer separated and the boundaries dividing industries start to disappear. Thus, the one and only yard stick of supply chain is: which supply chain delivers goods or services to customers with the highest level of customer satisfaction? When these are considered, major competitiveness of traditional supply chains, the capability of creating unique values, may become meaningless.



[Figure 5 : Converged Supply Chains]

As the figure shows, industries A, B, and C secure their own customers. These supply chains, however, start to be integrated to form a new network by integrating what customers want. As a result, supply chains by industry and by companies become no longer meaningful and, ultimately, a combination of values meeting customer needs would win the competition.

The major force driving this change is the transition of information ownership from producers to consumers. Up until now, a number of people have remarked that the paradigm has shifted from a producer's market to a consumers' market. Nevertheless, industry paradigms remained the same and the new market was not a truly consumer-oriented market although consumers could exercise more influence than before. The information revolution induced by e-Business, however, allows consumers to hold power of having complete and integrated information, which in turn enables them to select goods and industries that they want, to combine or transform producers as they want. Here, such change is defined to be chaos because it is not clear which direction the change will take. The only clear thing is that a converged and integrated supply chain which ensures the maximum customer satisfaction will become a winner in the competition.

3. SCM UNDER E-BUSINESS – TYPES AND FEATURES OF DEVELOPMENT STAGES

Previous sections have viewed how traditional supply chains change under e-Business environment. This section will analyze the types and features of such changes. The table below briefly touches upon the features of each development stages.

[Table 1 : The features and characteristics of the stages in supply chain]

Development Stage	1 st stage	2 nd stage	3 rd stage
Characteristics	Continuous and gradual improvement	Structural and discontinuous change	Chaotic and unpredictable convergence
Features	Serial supply chain	Parallel and network supply chain	Integrated and converged supply chain
Change drivers	Destruction of trade-off relationship between cost and effect of information	Destruction of trade-off relationship between reach and richness of information	Transition of Information ownership from producers to consumers
Performance measures	Effectiveness and efficiency of supply chain operation	Optimal structure of supply chain design	Maximum customer satisfaction
Change pattern Predictability	High	Medium	Low

As is shown in the above table, the first stage focuses on enhancing efficiency and effectiveness of operations and decreasing non-value added activities in supply chain operations. Such development has been available because the cost of managing supply chain information is not costly as before. Because of the continuous nature of development, it is possible to predict the development of overall operations of supply chains and the level of improvement in terms of effectiveness and efficiency. Unfortunately, however, once substantial changes have been made through the first stage of continuous improvement, it becomes very difficult to gain more desirable impact although new efforts are exercised. In other words, it becomes clear that this kind of continuous improvement almost reaches the peak of the first stage's ideal status within the current structure of supply chain. Thus, it becomes inevitable to change the structure of supply chains - external factors, not internal factors - in order to create new stage of developments. Then it begins to initiate efforts to change the supply chain environment given. In the past, most external factors were given, so it was almost impossible to change. However, the emergence of e-Business features and the application of such features opened the ways for the structural changes of supply chains. In this second stage of structural changes, unlike in the first stage, supply chains started to be re-configured, and develop more innovative structural changes.

While the first stage focused on the continuous and gradual improvement of the ways of supply chain operations, the second stage has concentrated on discontinuous development in a way to innovate overall structure of supply chains. The second stage of structural change has re-designed and re-constructed supply chains in an innovative way by utilizing the features of the Internet environment. For instance, during the second stage of development, innovative change of performing direct linkage between producers and consumers emerged, if needed, by destroying the intermediary steps linking the two parties. In other words, the second stage was about re-structuring of operations of companies and supply chains in an

innovative manner through the destruction of the previous formats. In summary, full utilization of e-Business features in the Internet environment for re-designing and re-organizing new supply chains characterizes the second development stage.

Although innovative re-structuring change has been prevalent in the second stage, competition is still limited within supply chains performing similar businesses or within similar industries. As a result, winning a competition in the second stage means a success among companies or supply chains performing similar businesses or within the same industry. Further development of e-Business technologies in the third stage of convergence and chaos, however, accelerates the advance and establishment of an era of consumers. In the new era, consumers start to ignore the boundaries embedded in the traditional industries and supply chains and require the type of a company or a supply chain that best fits their needs. In this case, however, the competitiveness of supply chains improved through innovative re-structuring activities in the second stage would be meaningless unless customers select such supply chains. Thus, consumers drive the convergence and integration of industries as they want. In other words, the convergence and integration of industries are made in a way to maximize customer satisfaction. In addition, as the development is led by customers, it is very chaotic to predict the development directions in the third stage. Thus, the convergence between companies, supply chains or industries would render a brand-new industry or supply chain.

4. CONCLUSION

This paper reviews how the emergence of e-Business changes supply chains. In this regard, features of development stages are classified, actual cases of the features are identified, driving forces of each stage are studied and analyzed, and the types of possible evolutions are suggested.

e-Business first acts as a driving force for improving current status, supports information sharing on a

real-time basis, and allows paperless management through electronic document exchanges. As a result, e-Business makes supply chains more effective and efficient as a whole.

Further advancement in e-Business destroys the trade-off relationship between richness and reach of information. This causes a brand-new development happen, leading to direct linkage between customers and producers, emergence of virtual enterprises, and a new-marketplace utilizing cyber space. In this stage, e-Business stops being a stimulus to facilitate supply chain's operational efficiency but acts as an innovative driver for changing the structure and shape of overall supply chains. One-step further advancement in e-Business blurs the demarcation lines among industries and leads supply chains into the stage of convergence and chaos full of disrupted scope and contents of competition.

The development stages are triggered by unique forces driving changes in each stage and the speed of change is dependent upon the severity of the drivers. The progress of development is not gradual; rather, it shows a number of development types.

Further researches into the characteristics of each development stage are required along with the analyses of actual cases to be observed in the industries. By doing so, models representing each development stage and more in-depth and diversified analyses of actual progresses of each stage would be carried out to track actual developments and realization of changes.

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