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701 E. Chocolate Avenue, Hershey PA 17033-1117, USA
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ITP4177

Reengineering Supply Chain Management: An E-Commerce Approach

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ABSTRACT

The emergence of E-commerce technologies has created innumerable opportunities for businesses to develop and streamline their supply chains. Electronic data interchange (EDI) has been used to facilitate business-to-business communication and coordination among supply chain partners. The key to managing a supply chain, however, is to view it as a single entity—and not simply as a series of one-to-one links between firms along the chain. Accordingly, there are problems with the use of EDI in supply chain management (SCM). The benefits that E-commerce technologies have to offer towards developing and maintaining a truly holistic approach to SCM are now being realized. This paper first delves into problems with the use of EDI in SCM. The main thrust is to show how E-commerce technologies can help overcome these problems and effectively be used in SCM. It ends by identifying some managerial and technical issues corporations will face in order to e-enable their SCM.

INTRODUCTION

The past couple of decades have seen much attention given to *supply chain management (SCM)*. Managing the supply chain involves transcending the traditional, legal boundaries of entities along that chain—such as between the manufacturer and its suppliers, or between the manufacturer and its distributors—and viewing the entire chain as a single entity.

The early literature (e.g., Jones and Riley, 1985) defined SCM as the planning and control of total materials flow from suppliers through customers. Later literature referred to the management of both materials *and* information flows. SCM is currently understood in terms of integrating and managing the key business processes associated with the flow and transformation of goods and services, as well as the attendant information flows, both within and between the various organizations along the supply chain (e.g., Lambert and Cooper, 2000; Ballou et al., 2000).

The emergence of E-commerce technologies such as the Internet, World Wide Web, intranets, and extranets have created innumerable opportunities for businesses to develop and streamline their supply chains. The present paper delves into problems with the use of electronic data interchange (EDI) in SCM. The main thrust is to show how E-commerce technologies can help overcome these problems. It ends by identifying some managerial and technical issues corporations will face in order to e-enable their SCM.

The next section discusses EDI and its problems. The following section describes the role of E-Commerce technologies in SCM. This is followed by a review of technical and managerial issues in the successful deployment of e-enabled SCM. The final section concludes the article by providing suggestions for future research.

EDI AND ITS PROBLEMS

A good number of firms have used Electronic Data Interchange (EDI) beginning in the 1980s. EDI is, by definition, the direct computer-to-computer exchange between two business partners (e.g., a manufacturer of finished goods and a supplier of raw materials) of standard business documents such as purchase orders and invoices.

EDI can help businesses save time and money by reducing transaction processing and data entry costs while gaining faster access to information. Studies suggest that EDI reduces the human element in communication while improving both speed and accuracy of data flow (e.g., Carter and Ragatz, 1991). Reductions in both leadtimes and inventory levels, using EDI, have been reported (e.g., Dobler and Burt, 1996; Monczka and Carter, 1988).

Unfortunately, EDI is not living up to its promise for a number of reasons. First, the participating companies must agree on the format of a standard, and it is not as easy for them to do so since many of them use different standards. Second, software is too expensive and too proprietary. Specialized software must be developed by participating businesses to convert incoming and outgoing messages in a common format that is understandable to other businesses. Traditional EDI works better between two large organizations with a high volume of transactions (Barret and Hogenson, 1998). Third, the transaction fees are too high. Again, only large organizations can afford EDI. Fourth, EDI addresses one-to-one, business-to-business links between entities without holistically tackling the problem of end-to-end efficiency along the entire supply chain.

The bottom line is this: EDI will remain in SCM, at least for the time being, since it has the advantage of higher data security than the Internet and it can carry large transaction volumes. However, a growing number of experts agree that the economics of the Internet versus EDI appear overwhelming (Bartholomew, 1997).

THE ROLE OF E-COMMERCE TECHNOLOGIES IN SCM

The benefits offered by EDI pale in comparison with those available via E-commerce-based technologies (Cross, 2000). Some may even view the Internet's impact on SCM as rivaling that of the interstate highway system on the transportation industry (Carter el al., 2000). E-commerce-based technologies are capable of delivering a holistic system that incorporates what EDI is already capable of accomplishing—combining it with broad-based access and cost effective, real-time document transmission and distribution (e.g., Larson and Kulchitsky, 2000). This section discusses how E-Commerce technologies can help achieve these and other objectives, and how some businesses are actually using these technologies to realize these goals.

The evidence of e-enabled SCM is especially visible in the high technology environment where product life cycles are often measured in months or even days. Corporations like Cisco, Dell, and IBM lead the revolution by developing comprehensive and global supply chains characterized by low inventory levels, lean production, demand collaboration, and deferred assembly—resulting in lower costs and greater responsiveness to changing market conditions (Cross, 2000).

> A case in point is IBM. It has realized significant benefits from e-enablement. Since 1994, IBM has reduced inventory write-offs by $800 million, increased on-time delivery from 90% to 98%, and reduced order time from two weeks to real-time. On the supply side, the big blue has reduced the cost of purchasing goods and services by $4.2 billion (Cross, 2000).

Extranets link various partners in the supply chain using a public or private communications infrastructure. The availability of the Internet to electronically transfer massive amounts of information over the extranets with minimal time and effort has resulted in effi-

cient and effective sharing of information among business partners. Companies have used the Internet and extranets to, among others, reduce delivery costs and increase the number of deliveries.

A case in point is General Electric. GE has used the Internet to schedule shipments out of its warehouses in metropolitan areas. The numbers of deliveries per hour has increased significantly while transportation costs per order have dropped dramatically (Lancioni et al., 2000).

Firms would benefit from increased use of the Internet in purchasing activities, and the potential for significant cost savings and productivity improvement suggests so (Deeter-Schmelz et al., 2001). The E-commerce technologies can also increase the value of the information that can be transmitted back and forth in the context of SCM.

A case in point is, again, General Electric. In 1996, GE decided to streamline, using the Web, its procurement process for certain products that require a formal request for proposal (RFP). GE believed that it can use the Web to reduce both the time and cost involved in the process. In fact, cycle time for the RFP process dropped from 29 days using the manual process down to 4 to 12 days over the Web (Cross, 2000).

E-commerce technologies increase the value of the information that can be exchanged. Previously, via EDI, only transactions could have been transmitted back and forth. E-commerce technologies are helping SCM become more of a global business-to-business phenomenon by greatly increasing the size of the audience that can be reached. The one-to-one nature of EDI in SCM has definitely been superceded by the many-to-many capabilities of E-commerce technologies.

A case in point is the Automotive Network Exchange (ANX) recently established by the big three automakers: General Motors Corporation, Ford Motor Company, and Daimler-Chrysler AG. Even though the project is presently in its infancy, it still makes the point. The goal here is to create a very large virtual marketplace using a reliable, secure, highly efficient extranet where all automakers can conduct business with suppliers and other business partners (Peters, 2000).

SUCCESSFUL DEPLOYMENT OF E-ENABLED SCM: SOME MANAGERIAL AND TECHNICAL ISSUES

This section identifies some of the managerial and technical issues corporations will face in order to e-enable their SCM.

Managerial Issues

The emerging environment in today's global marketplace is one where businesses no longer compete with each other as autonomous, individual firms. Rather than simply brand versus brand or store versus store, competition is now on a supply chain versus supply chain basis (Lambert and Cooper, 2000). The supply chain cannot be viewed merely as a series of one-to-one, business-to-business links between the entities along the chain. Even the early papers had emphasized that the entire supply chain needs to be viewed as a single entity—albeit a network of multiple legal entities and relationships. Management of the individual business firm should learn to identify, develop, and exploit synergies offered by coordination and integration throughout this network of entities and relationships along the firm's supply chain.

The people using the new E-commerce technologies and their willingness and ability to embrace changes may pose the biggest barrier to e-SCM collaboration (Taninecz, 2000). A detailed survey of Fortune 500 executives found that three main barriers to SCM are lack of functional expertise, lack of management expertise, and ineffective change management (Cottril, 2000). Top management can play a big role in alleviating these barriers by hiring people with appropriate technical, functional, and management expertise and by providing guidance and training to those employees who may have difficulty with organizational changes induced by e-SCM.

To encourage inter-organizational coordination and collaboration, it is necessary for the other firms along the supply chain to recognize that the application of E-commerce technologies would benefit not only the firm advocating the use of such technologies across supply chain entities. In particular, supply chain managers should ensure that the other entities involved do perceive the implementation of new technology as being not merely an added burden in terms of effort and cost, but actually translating into benefits that outweigh the additional cost.

Technical Issues

Many strategic managers have not embraced e-enabled management practices as a management concept. As a result, working towards an e-enabled SCM is being hindered by the lack of proper vision. Strategic managers should accept and encourage development and deployment of e-enabled management practices.

The majority of businesses do not yet have an e-strategy. To succeed in e-business, corporations must have an integrated e-business strategy considering both customer needs and corporate business objectives (Caldwell, 2000). The e-strategy must be integrated with the overall business strategy.

Many businesses do not also have an e-SCM strategy. Since E-commerce technologies are being used more and more in enhancing what supply chains have to offer, it is important for businesses to develop an e-SCM strategy especially if they want to play a proactive role in using e-enabled supply chains that take advantage of some of the benefits these technologies have to offer. In order to operate effectively, organizations moving to e-SCM will require access to a wide range of E-commerce technologies including intranets, extranets, and access to the Web. Top management must be willing to spend money to put the E-commerce technological infrastructure in place.

Security protection is still an issue in using E-commerce technologies. Before e-SCM reaches its full potential, security must be in place to give suppliers and other trading partners the confidence that information and communication are securely handled. Businesses must develop a strong information technology infrastructure that will establish appropriate security measures such as a "firewall," network integrity, authentication, and authorization. Top management must help develop such a strong IT infrastructure.

One of the biggest problems in making SCM more efficient and effective is the fact that many links along the supply chain are reluctant to swap information back and forth (Frederick, 2000). One of the basic premises of successful e-SCM is that organizations are willing to share information with their business partners on their internal operations including inventory, orders, and shipments. E-commerce technologies can help swap enormous amount of information back and forth quickly but cannot do so without help and approval of top management. Top management must help create a climate of trust and true partnership among the partners.

FUTURE RESEARCH

As use of the E-commerce technologies becomes more prevalent, researchers should reexamine traditional EDI-based vs. E-commerce-based systems to develop an understanding of the nature of changes an organization might have to go through to successfully convert an EDI-based SCM to an E-commerce technology-based SCM. Future research might also look into identifying the conditions under which an organization is most likely to benefit from e-SCM.

Future research should help top managers recognize and develop strategies for successfully adopting e-SCM. They should especially investigate how the new technologies are likely to impact organizational behavior and how best to manage this impact.

McCormack (1999) stresses that comparisons of SCM practices—e.g., the use of E-commerce technologies—among industries would be of particular interest, to determine which practices are apparently universal and which are actually industry-specific. One clear

limitation of existing studies is that samples have been too small to enable such comparisons, such as in the study of Lancioni et al. (2000).

Suppliers and other business partners play an important role in bringing about successful SCM. Future research should investigate the impact of E-commerce technologies on suppliers and other business partners, with a focus on not merely passing costs elsewhere along the supply chain as E-commerce technologies are implemented.

REFERENCES

References will be provided upon request.