THE ROLE OF INFORMATION TECHNOLOGY IN INTEGRATION OF SUPPLY CHAIN ENTITIES

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ABSTRACT

Today's business environment is characterized as one of hyper-competition: products are developed faster than ever before and have shorter life cycles, customers have higher expectations regarding the capabilities of products and services, and firms must respond to these demands while they are aggressively cutting costs. In terms of advances in technology and globalization of markets, organizations have had to improve their internal processes in order to remain competitive. However, organizations ask for more and finally, they realize that these internal improvements were not enough. Where once information technologies allowed businesses to reengineer and streamline their internal business processes, nowadays, contrastingly, streamlining the global supply chain will require internal information systems extended beyond the capabilities of a firm, and include electronic connections between each of the global supply chain partners.

KEYWORDS: *Globalization, Supply Chain Management, Enterprise Resource Planning, Electronic Data Interchange, Information Technology*

ARTICLE

Today's business environment is characterized as one of hyper-competition: products are developed faster than ever before and have shorter life cycles, customers have higher expectations regarding the capabilities of products and services, and firms must respond to these demands while, on the other hand, are aggressively cutting costs. Furthermore, the global nature of today's business environment allows firms to move into new markets since many historical entry barriers have been transcended.

During the last few years, several options have been examined for determining optimal operations and logistics strategies for competing in the global marketplace. Due to advances in technology and globalization of markets, organizations have had to improve their internal processes in order to remain competitive. While the speed of business is getting faster, the scope is getting wider. As a result of these evolving changes, organizations are now discovering that improvements of internal processes are not enough. To cope with this more intensive dynamic competitive environment, many firms are strengthening and more formally managing the relationships they have with supply chain partners in order to reduce uncertainty and increase company performance. Organizations must therefore get more involved in the management of their supply chain network of all upstream firms that provide the inputs as well as the network of all downstream firms which provide the outputs of the product to the final customer. Thus, the concept of supply chain, supply chain management, and now global supply chain management can no longer be defined at a local level but must be defined

in terms of a global integrated information network so as to include both upstream supplier networks and downstream distribution channels.

Fundamentally, global supply chain management can be defined as the synchronization of demand and supply across all the nodes of supply chain by reducing the uncertainty in demand or supply and trying to maintain a permanent optimal balance between them. For most firms, this is managing the activities that transform raw material into intermediate goods and final products, which are ultimately delivered to a final customer using the three fundamental flows of material, funds and information, where information is the most critical piece. In the past, companies have implemented many transactional systems to integrate various functional entities within the organization so as to translate the end item demand to individual components and then determining the optimal utilization of material and capacity to match the demand and supply. However, these transactional systems have only integrated the functions within the organization and have not taken into account the capacity constraints as well as variations in the supply. This resulted in an optimization of a sub-system whereas the overall system (the global supply chain) still remained disjointed and un-optimized.

With the flow of information focused on integrating business and production management process, manufacturing management systems have evolved from early introduction of materials requirement planning batch data processing to manufacturing resource planning employed as a useful tool to address the mid-to long- range planning at independent locations. The users develop production plans that are based on sales orders and some kind of static forecast. However, as competition increases, this type of static information becomes less adequate to meet the customer's expectation of quick response leading to the changes in planning and control systems. In order to balance the customer's expectation of quick response, enterprise professionals needed more real-time information.

The requirement for more demanding relationships to enable firms to respond to the challenges of globalized operations and increased competition heightens the importance of leveraging the capabilities of information systems. Information systems play a critical role in integrating the processes and information that facilitate the creation of value within firms and across the supply chain. Information integration between firms enables the entire supply chain to become responsive to end-customer needs, potentially replacing inventory with information as a means to satisfy customer needs. Thus, effective information system investments can create competitive advantage for a firm within and across the supply chain as a capability for creating value.

The next generation change is Enterprise Resource Planning (ERP) systems, which focuses on business and production management processes : enterprise resource planning systems linking the firm's multiple divisions into one enterprise database. The search for improvements in the global supply chain management activities is made by streamlining forecasting, distribution management, production planning, and transportation planning. Additionally, Enterprise Resource Planning system adds the ability to interface with all processes within the firm, with respect to the overall multiple manufacturing system requirements. Communication between the suppliers, enterprise, and its customer-base is the key for putting demand and supply information into balance.

The general push in industry is to increase integration throughout the entire supply chain with consistent and timely information, and visibility for all participating stakeholders (i.e., suppliers, distributors, customers), with the goal of reducing inventories and ultimately making a better investment on working capital. Theoretically, relevant material and information flow from all of the business units are structured and shared with all its suppliers, manufacturers, and customers. However in practice,

extending ERP to all suppliers is generally impossible. Most of the time integration is achieved through data warehouses, extensible markup language and is aimed to lesser extent electronic data interchange.

Among the drivers for global supply chain management are the lower prices of material, products, and labor; availability of products that are domestically unavailable; the firm's global attitude; advanced technology available in other countries; the high quality of the available products; intensification of global competition which drives companies to cost-cutting ; the need to develop a foreign presence; and fulfillment of counter-trade. In the forefront of enabling technology, re-shaping the global supply chain management integration is the extranet that is now being used as a vehicle allowing customers direct access (as an interface) to the suppliers' ERP system to check order status, inquire on availability, and verify pricing. Many ERP systems are integrated with Supply Chain Management software, providing an integrated solution.

There are two trends that are distinctly visible in today's manufacturing world - one, offloading some of the generic manufacturing operations to contract manufacturers and second, wide geographic distribution of these contract manufacturers, primarily to the locations where the cost of manufacturing is relatively low. Both these trends are driven by the need for the companies to reduce the cost of manufacturing, but they add tremendous complexity to the global supply chain. The complexity lies in the materials flow as well as information exchange. However, the challenge lies in overcoming this complexity in such a cost effective manner that the benefits accrued from this globalization far outweigh the complexity of globalization as well as the cost of doing it in-house.

One way to overcome these challenges is to implement a solution that allows the trading partners to be aware of the demand signal, and take immediate corrective action based on real time information of the variation in demand and supply. The real time exchange of information between these global trading partners requires tight integration between the planning and execution systems of organization and contract manufacturers. The concept methodology is that as firms evolve, so does global supply chain management operations with mutual access to both the customer's and supplier's planning system as extensions of the enterprise. The nature of this information relationship is a close linkage between the partners, forcing the extended ERP systems to become more flexible to accommodate these types of inputs.

Significant technological advances in the web-based tools are considered by many organizations to be a primary facilitator for streamlining the global supply chains for products and services. In the effective and efficient management of marketing and operations activities related to a global supply chain, information technologies play a critical role in providing a broad view of an entire supply chain revealing full product and component life cycle. By integrating supplier, manufacturing and product data, not only does it reveal opportunities for cost reduction, but also it also stimulates revenue growth. A dynamic chain links and optimizes the cross-operations and logistics flows of all parties involved as each coordinates its needs and demands.

The e-business phenomenon seems very fundamental, since it creates an immediate and intimate connection with customers, vendors and suppliers. It is very difficult to develop an appropriate e-business information system if the senior management has not formulated an e-business strategy or if it has been articulated in such fuzzy terms that no one understand. Moreover, it is very difficult to deliver a successful e-business information system if the associated business processes have not been re-engineered.

Among the barriers to achieving Web-based, real-time data visibility through supply chains are trust issues, the complexity of existing procurement processes and the lack of scalable technology to handle the huge volumes of data involved. The biggest bottleneck to enabling this real-time data visibility is that there are no common data standards or systems across the supply chain. More standards are needed so global firms can transact business more efficiently. The cost of complete visibility can also be prohibitive in time and money and only those companies whose business demands such flexibility are going to pay the price for end-to-end visibility.

Many manufacturing operations have implemented ERP type systems in the effort to optimize their operations. However, they focus on optimizing the local function of production or financial reporting. Similarly, other functional departments within the firm's suppliers and distributors optimize their workflows. Unfortunately most of the time this set of local optimization does not result in an end-to-end (global) optimization of the added value process from raw material to the final customer. The lack of accurate information flow across supply chain partners' results in inefficient supply chains where inventory buffers and customer service are the tradeoff variables. The problems are emphasized even more in global supply chains due to the increased transportation time and uncertainties associated with crossing national boundaries.

The global perspective basically centers on the need to integrate the various information systems (ERP or otherwise) across the global supply chain to enable quick information flows between the trading partners. Within the company, ERP systems can achieve the desired integration of information. Inter-company systems can then be linked using electronic data interchange (EDI) or Internet to facilitate the information exchange between companies. Information infrastructure of ERP systems interconnected with the EDI or Internet enable optimal global supply chain strategies.

Intra and inter-firms integration become crucial elements to creating a supply chain structure that fits the supply chain strategy. Keys to creating this fit include structural elements such as:

- ✓ technology integration;
- ✓ communications;
- ✓ standardization;
- ✓ decision-making hierarchy; and
- ✓ metrics/reward systems that are in place across the firms within the supply chain.

Of the five structural factors from supply chain integration framework, at least three are related to information systems employed within and across supply chain firms. Firstly, technology integration relates to the coordination of information systems and relevant data as well as the flexibility to manipulate data sets for ease of linking with multiple supply chain members. Secondly, information systems often facilitate communication among supply chain members, creating a shared interpretation of goals and facilitating trust and enhanced working relationships among firms. Thirdly, standardization of information refers to the establishment of common terms and definitions, common approaches to data coding, and order notation across participating supply chain firms, resulting in more efficient and effective data sharing. As firms become increasingly focused on supply chain integration as a strategic goal, the issue of information systems fitting the overall supply chain strategy becomes critical. Information systems are one mean of integrating processes and activities across firms. Poorly integrated supply chains are typically characterized by distorted information that leads to both process inefficiencies and

increased costs. Investing in information systems which are appropriate to the objectives of supply chain integration, is therefore, a critical element of success.

Although information technologies allow businesses to reengineer and streamline their internal business processes, streamlining the global supply chain will require the internal information systems to be extended beyond a firm's enterprise and include electronic connections between each of the global supply chain partners.

Firms may set up barriers in order to make imitation difficult by continually investing to sustain or improve the advantage. In an ever-changing global marketplace, firms must be nimble and exercise strategic flexibility towards global markets as they try to accomplish this target. Nimble competitors learn to constantly adapt their offers, processes, and sometimes even their entire business models to capitalize on evolving opportunities and maintain their competitive advantage. Traditionally, the key to competitive advantage involves the choice of where to compete, and defending market share in these segments using price and product performance attributes.

Information systems integration in each supply chain relationship setting may be conceptualized along a continuous increased involvement and coordination across the range of supply chain relationships. As firms increase their commitment to a supply chain orientation, there will be an increased need to share information leading to the information integration. Similarly, firms participating in supply chains with greater complexity and uncertainty are likely to have a stronger supply chain orientation to better position the firm to strategically manage the lack of precision inherent in its business. Higher levels of supply chain complexity and uncertainty lead to greater investments in information integration.

Finally, companies seeking a competitive advantage are currently establishing private collaborative commerce networks with their own trading partners. Consequently, the business benefits of a strong supply chain facilitated by the ERP systems is that it allows suppliers to forecast their inventory needs, eliminating the situation when they had to acquire product from alternative sources. Moreover, the strength of a supply chain can reduce the need for emergency shipments, transforms customer relationships into supply chain partnerships, and allows suppliers to differentiate themselves from competitors on their added- value service offerings thus increasing revenue from existing accounts and obtaining new customer revenue streams.

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