«دانش مدیریت»

سال سیزدهم - شماره ۵۱ - زمستان ۱۳۷۹

ص ص ۱۲۵ - ۱۵۰

Supply Chain Management

An Integrative Perspective

Ahmad Jafarnejad (Ph.D.) [1]

Abstract

Supply chain Management (SCM) has recently attracted the attention of many researchers and practitioners. With the increase in global competition resulted from free trade agreements, Companies are increasingly inclined toward establishing and maintaining efficient material and informaion flows with their upstream and downstream partners, such as suppliers, manufacturers, distributers, transportation carriers, third-party logistics companies and information providers.

Three major developments in global markets and technologies have brought SCM to the forefront of management's attention:

1- Information revolution

2- Customer demands in areas of products and service cost, quality, delivery, technology and cycle time because of global

---

1 - Academic Member of Tehran University

competition.

3- The emergence of new forms in interorganizational relationships.

Therefore, this paper is organized as following:

first the concepts and differences of SCM and logistics are discussed.

In the next section, the significance of SCM is addressed. Important elements of SCM and designing considerations are discussed, consequently the integrative approach to supply chain management illustrated.

Introduction

Today implementing supply chain management is not an easy task, but the benefits can be substanital for companies that make it work. Many industries are using SCM principles to turn things around and run their supply chains in a "demand pull" manner. They are using customer demand informaion to drive the production / supply side of their business and they are reaping many significant benefits in the process. Such as improved customer satisfaction, lower operating costs, increased throughput and dramatically reduced inventory are just a few of the advantages offered by SCM." Companies need to abandon the traditinal functional approach to managing their businesses in favor of a process - oriented approach. In short, they have to manage their entire supply chain, not just specific parts along it. The key to effecively managing a company's supply chain is

utilizing information regarding the flow or supply of product and customer demand. "This information needs to be managed back and forth across entire supply chain. An information technology solution provides on paralleled opportunities for the integration and coordination of such information" (Scott Mc lean 1999). The topic of supply chain management is not new. The term has been around for about 20 years. Several decades ago industry concern was simply getting final products to customer. Schofield states "the next stage was introduction of logistics" (Schofield, 1995), which factors upstream operations in to decision making. He indicates that the main problem with logistics is the fact that it is considered to be a separate function, its operations being distinct from the rest of the organization.

According to Schofield "supply chain management implies an unbroken line between customer and production which touches on several different departments and which can branch out to include many different suppliers". This is where supply chain management truly makes sense. The integration of activities seems to be the value that supply chain managemenet adds, to allow an organization to make decisions considering all affected areas (Higginson, 1996), that are optimal for the whole organization.

Definition

There are many definitions of supply chain management, but it

the emphasis will be on several of them. For example, (Simchi-Levi and et al, 2000) define "supply chain management is a set of approaches utilized integrate suppliers, manufacturers, warehouses, and stores, so that merchandise produced and distributed at the righ quantities, to the right locations, and at the right time, in order to minimize system wide costs while satisfying service level requirements." There are several observations in this definition:

(a) Supply chain management takes into consideration every facility that has an impact on cost and plays role in making the product conform to customer requirements; from supplier and manufacturing facilities through warehouses and distribution centers to retailers and stores. Indeed in some supply chain analysis, it is necessary to account for suppliers' suppliers and the customers' customers because they have impact on supply chain performance.

(b) The objective of supply chain management is to be efficient and cost effective across the entire system, total system wide costs, from transportation to distribution to inventories of raw materials. The work in process, and finished goods are to be minimized. Thus the emphasize is not on simply minimizing transportation cost or reducing inventories, but rather

taking a system approach to supply chain management.

(c) Because supply chain management revolves around efficient integration of suppliers, manufacturers, warehouses, and stores, it encompasses the firm activities at many levels, from the strategic level through tactical to operational level. (Figure 1)

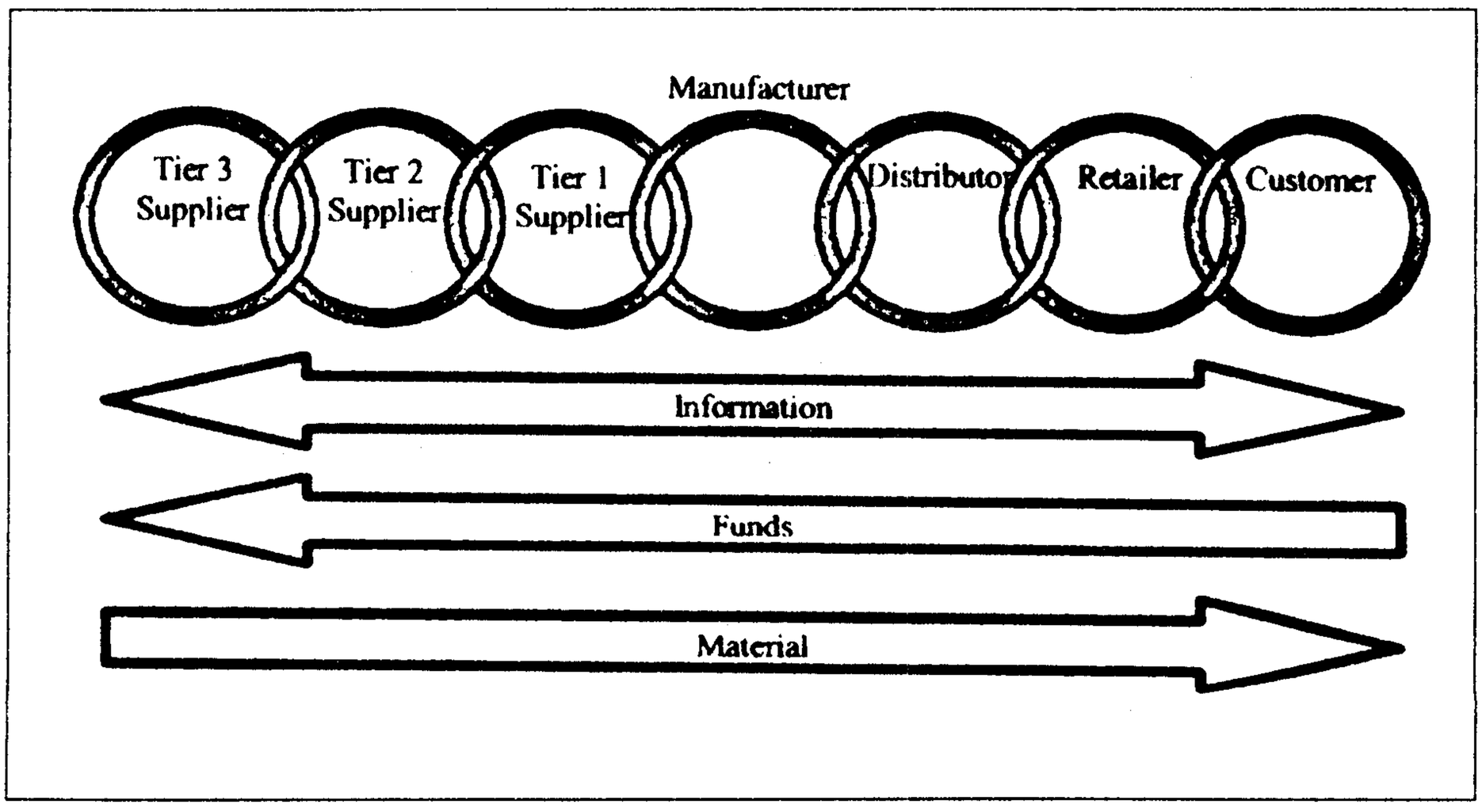

Figure 1 - The integrated framework of supply chain management

Indeed it is only through supply chain integration that the firm can significantly reduce costs and improve service levels. Logistics and supply chain management refer to the art of managing the flow of materials and products from source to user. The logistics system includes tha total flow of materials, from the acquisition of raw materials to delivery of finished products to the ultimate user (as well as related counter - flows of information that both control

and record material movement). (Copacino, William, C 1997)

As such SCM, includes activities of sourcing and purchasing, conversion which also (Manufacturing) includes capacity planning; technology solutions, operations management, production scheduling, and materials planning (MRP II); distribution planning, management of industry, warehousing operations; inventory management and inbound and outbound transportation; and the linkage with customer service, sales promotion, and marketing activities. In practice, many professionals use the term "logistics" to refer to supply chain activities, transportation, warehousing, and finished goods and inventory management. We use it here in a broader context for full supply chain activities.

Importance of SCM

All organizations are parts of one or more supply chains. Whether a company sells directly to the end customer, provides a service, manufactures products, or extracts material from the earth, it can be characterized within the context of supply chain. Until recently, however, organizations focused primarily on their direct customers, and internal functions, and placed relatively little emphasis on their organizations within their supply chain network. However, three major developments in global markets and technologies have brought supply chain management to the forefront of management's attention:

1- The information revolution.

2- Customer demands in areas of products and service cost, quality, delivery, technology, and cycle time brought about by increased global competition.

3- Emergence of new forms of interorganizational relationships.

Each of these developments has fostered the emergence of a integrated supply chain approach. Figure 1 illustrates the nature of supply chain management and integrates all three developments mentioned above. The model also provides an integrated framework.

With the explosion of the internet, the world - Wide Web, a company's Intranet future system will possess the following set of characteristics (Dubois and Carmel, 1994):

- Centralized coordination of information flows.
- Total logistics management; integrating all transportation, ordering, and manufacturing systems.
- Order change notices that trigger a cascading series of modifications in production schedules, logistical plans, and warehousing operations.
- Global visibility into tranportation resources across business units and national boundaries.
- Global inventory management; ability to locate and track the movement of every item.
- Global sourcing; consolidation of the purchasing function across organizational lines; facilitating purchasing leverage and

component standardization across business units.

- Intercompany information access; clarity of production and demand information residing in organizations both upstream and downstream throughout value chains.

- Data interchange; between affiliates and nonaffiliates through the Standard telecommunication channels

- Data capture; ability to aquire data about an order at the point of origin and to track products during movement and as their characteristics change.

- Transformation of the business from within; managers who can see the big picture, and accept the new form of business processes and systems.

- Improvements in supplier - customer relationships; to justify investments in technology linkages.

Another major trend facing organizations today is the demand for ever - greater levels of responsiveness and shorter difined cycle times for deliveries of higher quality goods and services. A variety of changes occurred through markets have resulted in an increasingly competitive environment. As Pine says" the rapid rate of changes, leads to a condition in which managers must make decisions on shorter notice and less information, with higher penalty costs. At the same time, customers are demanding quicker delivery repoksiveness. These same customers require production that incorporate state-of-art technology and features. Products are becoming less standardized and customers are demanding options

that are tailored to their uniqe requirements. In many segments of the marketplace, only those firms that have ability of "mass-customization" are successful". (Pine, 1993)

Managers throughout the supply chain are feeling the full effect of these changes. Cutbacks in staffing are forming managers to handle a greater number of channels with fewer people, while cost pressures requir that they do so with less inventory because of ever-increasing levels of competition found in many market supply, chain-related mistakes leading to lost sales can not be easily dismissed and written off. Furthermore, both customers and suppliers are becoming better at measuring performance, so that these mistakes are more easily detected "perfect orders" are being demanded, requiring a supply chain that is quick, precise, and provides a top quality products everytime.

Despite the imposing challenges of today's competitive environment, some organizations are thriving. These firms have embraced changes and have integrated quick response and flexibility into their day to day culture. They are managing by paying attention to time. For example the reduction of delivery times both in the marketplace and throughout the supply chain has earned such firms as Hewlett-Packard, Northern Telecom, Toyata, and Xerox a reputation as time-based companies. Entire industries have changed to reflect time-based capabilities. A number of "buzzwords" have emerged to describe time-based capabilities: throughput reduction, delivery speed, fast cycle

capability, quick response or resupply time, lead time reduction, and time compression (Schemenner, 1988). Unlike many management fads, however, time-based competition is a phenomenon that is here to stay because of its direct linkage to profits. The advantages achieved by time-based competitors, enable them to grow faster, earn higher profits relative to other firms in their industry, increase market share through early introduction of new products and control overhead and inventory costs, and move to positions of industry leadership (Handfield & Pannesi, 1992).

Strategic Design of SCM

The central component of the strategic planning is a goal or set of goals. In supply chain management, before goals can beestablished, it is necessary to know what the current performance is and what possible after improvement or reengineering. In Total Quality Management (TQM) this is referred to as benchmarking, measuring where the company (and / or competitor) is now and using that as a guidline as to where the company wants to be in the future. However, a company must measure its performance and set goals in terms of supply chain as a whole, not only itself. A company may set goals for itself for minimizing inventory, but if the inventory levels of its suppliers are required to be excessively high just so the company can achieve its own local goals without regard to the suppliers' costs

of high inventory will eventually be passed on the company as higher delivery materials and parts costs. Anyway, if a company achieves its own quality goals and ignores quality programs of its suppliers, then its quality will adversely affected. Thus the supply chain must be designed to minimize inventory and achieve high quality for both suppliers and customers (Russell & Taylor III, 2000).

This level of interdependnce and goal sharing makes the selection of suppliers, also called sourcing, and the purchasing process, also called procurement, important strategic decisions for a company. Suppliers must be reliable in terms of quantity, timeliness, and quality. An effective means for reducing uncertainty is to strategically apply the principles of TQM, along the supply chain. This means that suppliers use TQM to insure quality products are delivered on time to customers distribution centers employ TQM to make sure that products are packaged, handled and shipped on time with no damage and processing errors; and shippers deliver products undamaged to the right place on time. Another strategic aspect of supply chain design is communication and informationa flow. If every entity along the supply chain has access to information at them same time and at the same place, it enables them all to coordinate so closely and thus reduce uncertainty which in turn allows tem to reduce inventory levels. The types and number of facilities to construct or acquire and where to locate them are strategic design issues, for

transportation and distribution costs can be a significant part of supply chaing management costs. Some companies, like for example Wal-Mart that, have incorporated these various characteristics into an effective and successful supply chain's strategy are providing quality products for their customers at a lower price. The key to achieving these strategic goals has been a feature of supply chain design known as "cross-docking". In this system, products are delivered to warehouses on a continual basis where they are sorted, repackaged and distributed to stores without sitting in inventory. Goods cross from one loading dock to another in forty eight hours or less.

Retailers don't all use corss-docking because it is difficult to coordinate and manage. To make it work Wal-Mart has invested heavily in an integrated support system that provides continuous contact between all of its suppliers, distribution centers, and every point-of-sale in every store via its own satellite communication system. This information system sends out point-of-sale (bar code) data directly to Wal-Mart's 4000 suppliers. In addition, Wal-Mart owns 2000 trucks to service its 19 distribution centers; this allows the company to ship goods from warehouses to stores within 48 hours and restock store shelves with an average of twice a week, compared with the industry average of once every two weeks.

Cross-docking also requires close management cooperation at all levels. Store managers are connected to each other and to corporate headquarters via a video link that allows for frequent

information exchanges about products, pricing, sales, and promotions (Stalk and et al, 1992). Figure 2 illustrates the relationship between facilities and functions along the Wal-Mart supply chain.

If the cross docking strategy works so well for wal-mart, shouldn't all companies use the same strategy? Clearly, different retail chains use other distribution strategies. This include strategies such as:

- The traditional distribution strategy in which inventory is kept at the warehouses.
- Direct shipping in which goods are distributed from the suppliers directly to the retail stores (Simchi-Levi & et al, 2000).

There are a number of major issues concerning supply chain management such as:

1- The supply chain is a complex network of facilities and organizations with different, conflicting objectives.

2- Matching supply and demand is a major challenge.

3- System variations over time are also an important consideration.

4- Many supply chain problems are new and there is no clear understanding of all of the issues involved.

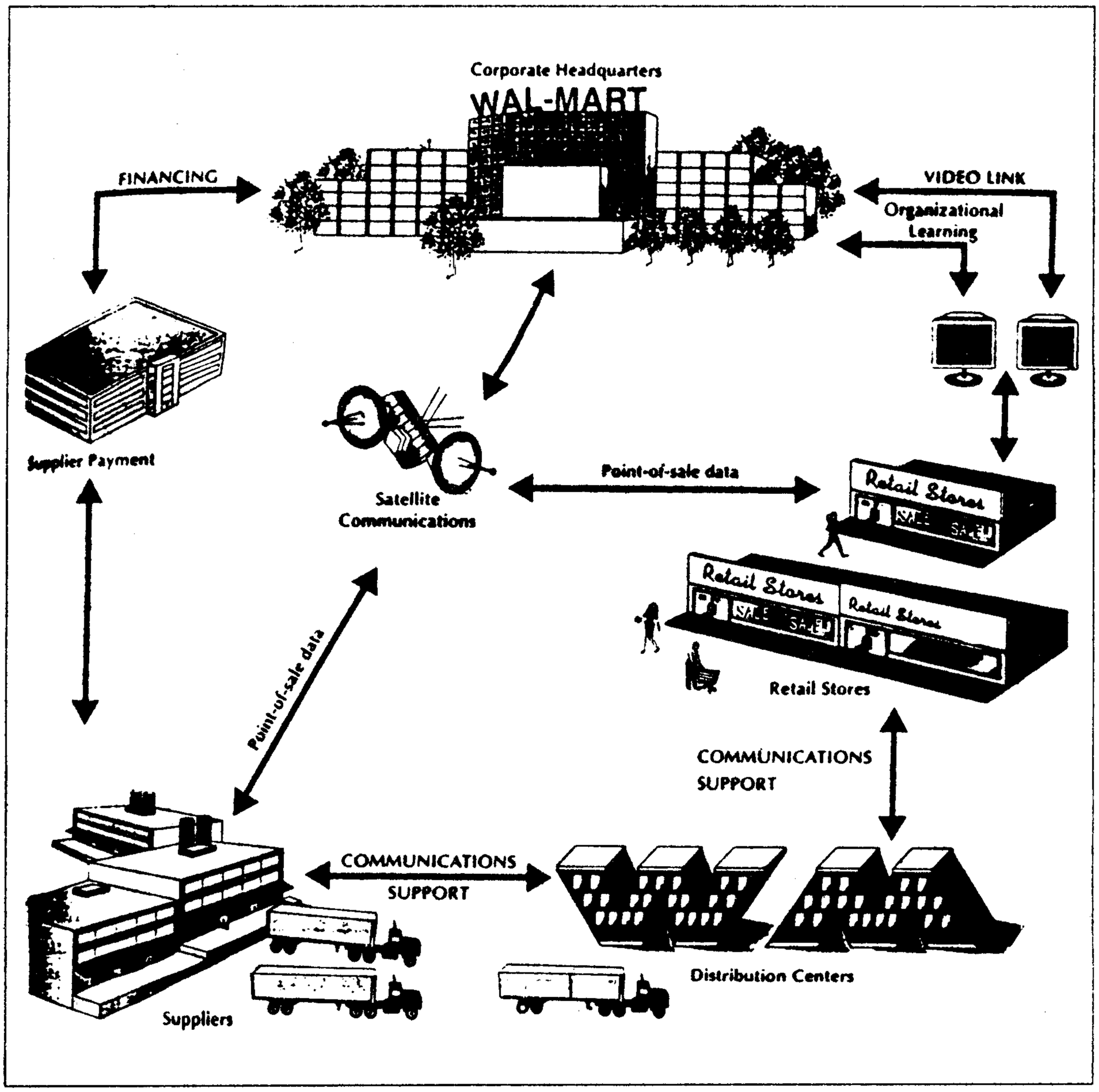

Figure 2- The relationship between Facilities and functions along the Wal-Mart Supply Chain (Wieland, 1992)

Information Systems & technologies throughout SCM

Information technology infrastructures today may be quit complex and comprehensive, supporting the firms communication networks, databases and operating systems. In fact "IT

infrastructure capabilities underpin the competitive positioning of business initiatives such as cycle time reduction, implementing redesigned cross functional processes, utilizing cross-selling opportunities and capturing the channel to the customer" (Broadbent & Weill, 1997).

These infrastructures also support the development, management and maintenance of interorganizational supply chains.

In a sense, the information technologies utilized in these systems represent one of the fundamental elements that link the organization of supply chain into a unified and coordinated system. In the current competitive climate, little doubt remains about the importance of information and information technology to the ultimate seccess, and perhaps even the survival of any supply chain management initiative.

Information requirements determination is indeed one of the most critical issues to be considered when developing interorganizational information systems (IOISs) to support a supply chain. In a study of 12 large IOISs, it was found that no organization had a formal sttucture in place to manage the IOISs, but all felt that such a mechanism should be in place to ensure the balanced and widespread exchange of information (Levinson, 1994). It was suggested that a steering committee with representatives from each organization be formed to identify the information to share across IOIS. This group also needs to dictate

standards and facilitate implementation of IOIS. (Levinson, 1988).

The four fundamental mistakes made when determining information requirements are:

1- Viewing systems as a functional instead of cross-functional.

2- Interviewing managers individually instead of jointly.

3- Not allowing for trial and error in the detailed design process.

4- Asking wrong questions during the interview (Wetherbe & Vitalari, 1994). Several information technologies have gained popularity recently due to their ability to facilitate the flow of information across the supply chain. Many of them are under the heading of "E-communication" such as Electronic Commerce (E-commerce); E-commerce is the term used to describe the wide range of tools and techniques utilized to conduct business in a paperless environment. Electronic commerce, therefore, includes electronic data interchance (EDI), e-mail, electronic funds transfers, electronic publishing, image processing, electronic bulletin boards, shared databases, and magnetic/optical data capture (such as barcoding), the internet, and Web sites (The IT committees, 1997). E-commerce, has a significant effect on how organizations conduct business. With the rise of internet and the ability to transfer information cheaply and effectively over the whole world, the E-commerce is becoming a major focus for organizations and represents a significant opportunity for integrated supply chain management efforts (Keeling, 1996). Recently, three big auto makers (Ford, G.M. and Chrysler) are

joining forces to create an electronic commercial comapny that would connect the rival auto makers to their suppliers through a single internet portal, and slash their $240 billion (U.S) annual purchasing costs. At a news coference the Big Three announced that they are giving up on their separate e-commerce stragegies to set up the world's "largest" virtual marketplace. (Walton, Feb. 26, 2000)

Role of Benchmarking in SCM

In developing understanding of existing supply chains and their associated processes, benchmarking analysis has been shown to be an effective means of determining the supply chain's performance relative to those of other organizations. Cook (1995) defines benchmarking as "the process of identifying, understanding, and adopting outstanding practices from within the same organization or from other businesses to help improve performance". This involves a process of comparing practices and procedures to those of the "best" to identify ways in which an organizaion (or organizations) can make improvements. Thus new standards and goals can be set which, in turn, help better satisty the customer requirements for quality, cost, product and services. The steps typically found in the benchmarking process includes:

1- Identify and understand current processes

2- Form a benchmarking team

3- Determine what to benchmark

4- Identify benchmarking partners

5- collect data

6- Analyze data and identify performance gaps

7- Take actions for improvement

8- Review results.

Benchmarking provides a means of focussing the supply chain management efforts on those areas most in need of improvement. Identification of these high priority areas is also useful prior to undertaking initiatives.

Logistics & SCM

Superior logistical performance is one of the primary opportunity areas where organizations participating in an integrated SCM initiative can make significant improvements. Logistical management is vital not only in manufacturing and assembly industries which are goods-oriented, but also to retailing, transport, and other distribution or service-oriented industries. Due to intensive competition in global markets, logistical management is considered as an important source of competitive advantage. David Gertz, the author of Grow to BE Great: Breaking the downsizing Cycle, says "supply chain and logistics are critical components of any successful growth strategy" (Richardson & et al, 1996).

A study done by CLM found that "world-class firms are more apt to exploit logistics as a core competency than their less

advanced competitors". This logic can be extended to interorganizational supply chains. The Clm study identified what the "best of the best" logistics firms do to achieve world-class status (Trunick & et al, 1995) The key focus areas include:

1- Positioning concerning the selection of strategic and structural approaches to guide logistic operations.

2- Integration internal achievement of logistical operating excellence and boundary-spanning development of solid supply chain relationships.

3- Agility in terms of the firm's competency with respect to relevancy, accommodation, and flexibility.

4- Measuring of internal and external performance.

Integrated SCM will only increase the importance of logistical activities. SCM provides supply chain members with the opportunity to optimize logistical performance at the interorganizational level. At the limit, this means integrated management of the movement of materials from initial raw materials supplier across the chian to the ultimate end customer. This represents a major departure from current logistic practices that are often characterized by independent efforts with limited coordination between organizations logistics professionals will continue to be challenged to manage the movement of products across the supply chain in a timly and cost-effective manner that meets customers' required service level. In order to meet this challenge, a supply chain-wide logistics strategy is required, which

will be the primary driver for the specific logistics strategy within each of the supply chain member organizations. Distribution networks, transportation modes, Carrier management, inventory management, warehousing, order processing, and all other related activities will still have to be addressed. The scope ot the logisitics strategy is now the entire supply chain (not just each individual unit in the chain). It will no longer be nescessary or desirable for each supply chain member organization to manage its logistic activities on an independent basis.

SCM & Cycle Time Reduction

Increasingly, organizations are realizing that day are competing on the basis of time. Reducing the time require to provide the end customer with product or services is one of the major forces that is leading organizations to participate in supply chain management initiatives. Adopting an integrated supply chain management approach provides the means to make significant reduction in the cycle time required to move materials between supply chain members and to the end customer. Time has also been shown by several authors to be a higher effective area to focus on the overall improvement efforts within an individual organization. The interorganizational supply chain environment (Nichols, 1995).

Cycle time is defined as, the total elapsed time required to complete a business process. By focusing on key processes, supply

chain member organizations can make significant improvements in Cycle time performance, improvements that can provide a source of competitve advantage for the supply chain. An approach based on process improvement presented by Harrington (1991) is focused on the cycle time performance. It consists of six steps:

1- Establish a cycle time reduction team

2- Develop and understanding the given supply chain process and current cycle time performance.

3- Identify opportunities for cycle time reduction.

4- Develop and implement recommendations for cycle time reduction.

5- Measure process cycle time performance.

6- Conduct continuous improvement efforts for process cycle time reduction efforts.

In conducting a research with organizations that have successfully completed the cycle time reduction efforts in a variety of supply chain management areas; several major successful elements have been identified that include:

- Top management support
- A commitments to significant cycle time reduction goals
- Use of cross-functional team with team members that possess thorough process knowledge.
- Application of TQM tools (e.g; process mapping, Pareto analysis, fishbone diagram, ets).

- Training in cycle time reduction approaches
- Establishing, monitoring, and reporting formal cycle time - performance measures
- Application of information systems and technology; and
- Collaboration with supply chain members (Nichole, & et al, 1995).

In the next section, we discuss a key element in establishing a successful supply chain reengineering effort.

Customer Value Within SCM

In a short definition, the customer value is the way the customer perceives the eintire company's offerings, including products, services, and other intangibles. The customer perception can be divided into several dimensions (Simchi-Levi, 2000). The list of dimensions starts with the essentials, which include three items as follows:

1- conformance to requirements

2- product selection and

3- price and brand.

Then goes on to more sophisticated types of features that may not always be critical. However, the less critical features can be mined for ideas to create a unique way to add value and differentiation to a company's offering the last dimensions are:

4- value added services and

5- relationship and experiences (Hopp, 1996).

Supply chain management strategy affects customer value.

Such considerations affect every aspect of customer value and must be part of any strategy or plan, not an afterthought. It is important to choose the appropriate supply chain strategy to match customer value with the company's market. Excellence in supply chain management translates in many dimensions from availability and selection to influenceing the price at which product can be sold.

Customer access to information about the availability of products and the status of orders and deliveries is becoming an essential capability. This also creates opportunities to learn about customers and their preferences, and to create new modesof interaction (King, 1998).

There is no customer value without a close relationship with customers. Today, this is possible only through direct interaction, but also through information and communications technology. By allowing customers to state their preferences and learning from them, a true two-way interaction, a firm will develop the means of achieveing greater customer value and therefore loyality. Dell company has inadvertently been able to achieve this because of its direct supply chain model. The company has taken full advantage of close relationshipe with its customers.

References

1- Bausch, R. H. Business Logistics Management 3th ED. Englewood Cliffs, NJ: Prentice Hall, 1992.

2- Broadbent. M. and Peter Weill. "Management by Maxim: How Business and IT Managers Can Create Infrastructures", Sloan Managmeent Review, Spring 1997. p. 77.

3- Cook Sarah. Practical Benchmarking: **A Managers Guide to Creating a Competitive Advantage** (<biblio>). p. 13.

4- Copacino. William. C. Supply Chain Management: The Basics and Beyond. CRC. Press. 1997.

5- Dubois. F. L. and Carmel. E. "Information Technology and Lead time Management in International Manufacturing Operations", **in Global Information Systems and Technology** (London: Idea Group Publishing. 1994). p. 279.

6- Ernest L. and et. al, "Cycle Time Reduction: An Interorganization Supply Chain Perspective". Cycle Time Research 1. No. 1. 1995. p. 63.

7- Fisher. M. L. "What is the Right Supply Chain for Your Product?" Harvard Business Reveiw. March - April 1997. pp. 105-117.

8- Handfield, Robert. B. and Ernest Nichols. Jr. Introduction to Supply chain Management, Prentice Hall, 1999, p.2.

9- Harrington, H. J. Business Processes Improvement: The Breakthrough Strategy for Total Quality, Productivity, and Competitiveness, New York: Mc Graw-Hill, 1991.

10- Higginson. J. Business Logistics Management: An Applied Canadian Workbook, School of Business Wilfrid Laurier University, 1996.

11- Hopp. W., and M. Spearman. Factory Physics. Burr Ridge. IL: Richard D. Irwin, 1996.

12- King. J. "The Service Advantage." Computerworld, Oct. 28, 1998.

13- Levinson, N. s. " IOISs: New Approaches to global Economic Development", Information & Management 26, no. 5 May 1994, pp. 257-263.

14- Levinson, NS and R. Meier, "Toward the 1990s: Information Management Trends", Xerox Corporation, 1998.

15- Mc lean, Scott. Finding Strategic Advantage Through SCM, Pulp & Paper International, San Francisco, Oct. 1999.

16- Murphy, P. R. and J. Daley, "International Freight Forwarder Perspectives on Electronic Data Interchange and Informantion Management Issue". **Journal of Business Logistics 17**, No. 1, 1996, pp. 63-84.

17- Nichols, Frolick, and Wetherbe, "Cycle Time Reduction" Cycle Time Research 1, No. 1, 1995. p. 25.

18- Pine B. J. Mass Customization: The New Frontier in Business Competition (Boston: Harvard Business School press, 1993).

19- Pepper, D., and M. Rogers. Enterprise One to One, New York: Doubleday, 1997.

20- Pine, J. B. II, and J. Gilmore, "Welcome to the Experience Economy", Harvard Business Review, July-August 1998, p. 97.

21- Richardson, H. and et. al. "Breakthrogh Thinking in Logistics", Transportation & Distribution 36, No. 12, Dec. 1995, p. 34.

22- Reichheld, F. F., "Learning From Customer Defections", Harvard Business Review, March-April 1996, p. 57.

23- Russell. RS. and et al. "Operation Management" Prentice Hall. 2000, pp. 372-374.

24- Schofield, T. "The lost Horizon of Divergence Theory", Computer Weekly, p. 26, 1995.

25- Simchi Levi, & et al, Designing and Managing The Supply Chain: Concepts, Strategies, and Case Studies, Mc Graw-Hill, 2000, p. 3.

26- The IT Committees' Top 10 List, Journal of Accountancy 183, No. 2, Feb. 1997.

27- Wieland, G. "Wal-Mart's Supply Chain", Harvard Business Review, 70, No. 2,

March-April 1992, p. 61.

28- Wetherbe. J. C. and Nicholas P. Vitalari, Systems Analysis and Design: Best Practices. 4th Ed. (St Paul, MN: West Publishing, 1994).

29- Walton, Dawn. "Big Three auto Makers Partner on E-commerce Supply Site", The Globe and Mail, Feb. 26. 2000.