EMERGING OVERVIEW ON GLOBAL RETAIL SUPPLY CHAIN MANAGEMENT USING INFORMATION TECHNOLOGY

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Abstract

This paper aims to suggest how retailers can stay competitive ensuring smooth running of supply chain operations. As gone are those days where single channel of retailing and supply chain models developed for servicing the channel was adopted. Today, Retailers must use information technology to optimize their supply chains to deliver from any place where its consumers want to buy them in a quick and efficient manner. Retailers must have information in hand for knowing the place of supply available so that they can redirect shipments, rebalance inventories and respond to new unexpected demands with quick disposal of information with ease in handling business operations.

Keywords: Information Technology, Supply Chain Management, Customers, Retailers.

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Introduction

Supply chain management (SCM) is the management of a network of interconnected businesses involved in the ultimate provision of product and service packages required by end customers (Harland, 1996). The term was coined by Keith Oliver, a Booz Allen Hamilton executive in 1982. Supply Chain Management spans all movement and storage of raw materials, work-in-process inventory, and finished goods from point-of-origin to point-of consumption (supply chain). Supply Chain Management encompasses the planning and management of all activities involved in sourcing, procurement, conversion, and logistics management activities. Importantly, it also includes coordination and collaboration with channel partners, which can be suppliers, intermediaries, third-party service providers, and customers. In essence, Supply Chain Management integrates supply and demand management within and across companies. More recently, the loosely coupled, self-organizing network of businesses that cooperates to provide product and service offerings has
been called the Extended Enterprise (Ross 2006).

Figure 1: Depicts the Traditional Working Approach of SCM

Source: www.edibasics.com

The objectives of IT in SCM are (Simchi-Levi, 2003),

1. Providing information availability and visibility.
2. Enabling a single point of contact for data.

3. Allowing decisions based on total supply chain information and
4. Enabling collaboration with partners.

IT in SCM enables great opportunities, ranging from direct operational benefits to the creation of strategic advantage. It changes industry structures and even the rules of competition. IT is the key in supporting companies creating strategic advantage by enabling centralized strategic planning with day-to-day centralized operations. In fact supply chain become more market-oriented because of IT usage. Cisco reported savings of $500 million by restructuring its internal operations and integrating processes with suppliers and customers with the help of web-based tools (Berger, 2000). The Wal-Mart & P&G experiences demonstrate how information sharing can be utilized for mutual advantage. Through sound information technologies, Wal-Mart shares point of sale information from its many retail outlet directly with P&G and other major suppliers Anderson et al (1996). Celestica, one of the world's largest electronic manufacturing services companies, has applied a web based IT tool to regulate its global supply base (Shore, 2001). IT has helped Celestica to improve its responsiveness to customers, thus helping its customer, Dell to maintain its delivery promise to end-users.

Overview of IT in Supply Chain Management

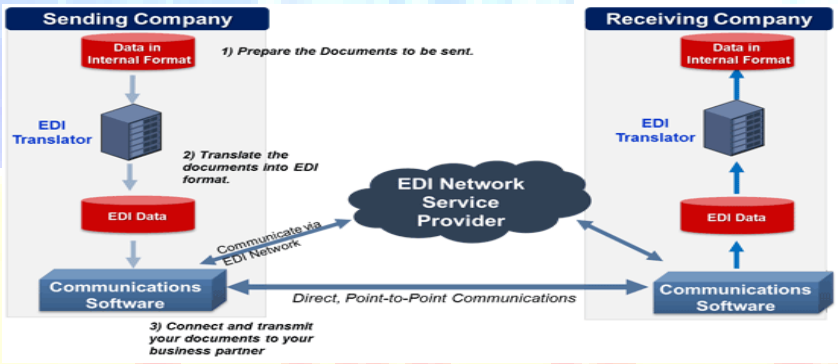
A) Electronic Data Interchange (EDI)

It was introduced in the 1970s and was popularized in the 1980's. Electronic Data Interchange (EDI) technology has been widely used by firms in supply chains to facilitate transactions and information exchanges. EDI is defined as computer to computer exchange of structured data for automatic processing. EDI is used by supply chain partners to exchange essential information necessary for the effective running of their businesses. These structural links are usually set up between organizations that have a long term trading relationship.

For example, some multiple retailers will supply electronic point of sale (EPOS) data directly to suppliers, which in turn triggers replenishment of the item sold. Therefore, the consequence of this type of strong link those suppliers will be able to build a historical sales pattern that will assist their own demand forecasting activities. Because there is no need for employees to collate the information manually, EDI has many benefits, for examples, it is providing timely information about its customer's sales as well as highly accurate and very efficient. Moreover, it

is utilized for sending invoices, bills of lading, confirmation of dispatch, shipping details and any information that the linked organizations choose to exchange (Rushton et al., 2000). The main advantages of using EDI are to enter only informative needs on the computer system once, and then it is able to speed of transaction and to reduce cost and error rates. Other benefits of EDI are Quick process to information, Better customer service, reduced paper work, increased productivity, improved tracing and expediting, Cost efficiency and improved billing. Through the use of EDI supply chain partners can overcome the distortions and exaggeration in supply and demand information by improving technologies to facilitate real time sharing of actual demand and supply information. Although companies gain a lot of benefits from EDI, it is often the mismatch between EDI's expectations and the company's activities undertaken to achieve the desired performance. Also larger organizations are major adopters of EDI, whereas Small and Medium Enterprises (SME) often do not use EDI.

Figure 2: Depicts the Working of EDI



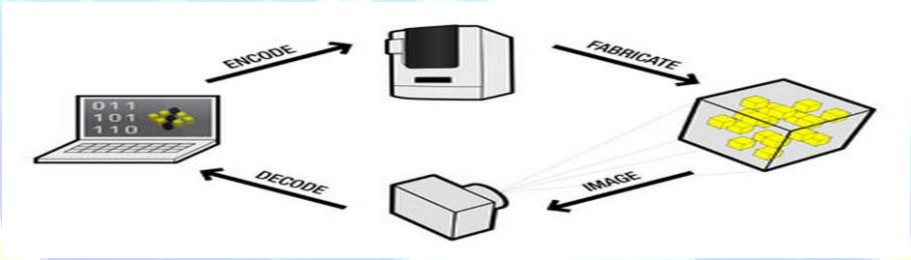
Source: www.edibasics.com

B) Bar Coding and Scanner

Bar Codes are the representation of a number or code in a form suitable for reading by machines (Rushton et al., 2000). Bar codes are widely used throughout the supply chain to identify and track goods at all stages in the process. Bar codes are a series of different width lines that may be presented in a horizontal order, called ladder orientation, or a vertical order, called picket fence orientation. For example, goods received in a warehouse may be identified by the warehouse management system and added to stock held in the warehouse. When put away, the bar code is used to associate the storage location with the bar-coded stock, and on dispatch the

stock record is amended. The use of bar codes can speed up operations significantly. On the other hand, the problems can occur if bar codes are defaced or the labels fall off in transit. The maintenance management must be applied for extending the long-life period of this equipment. Bar code scanners are most visible in the checkout counter of super markets and hyper markets. This code specifies name of product and its manufacturer. Other applications are tracking the moving items such as components in PC assembly operations, automobiles in assembly plants. In 1983, with barcodes printed on most goods, Wal-Mart introduced checkout scanners in all its stores. They updated inventory numbers for individual items at point of sale and enabled headquarters to easily aggregate sales and inventory data at its centralized IT department. Later in 1987, a satellite communications network installation linked all the stores with the headquarters with real-time inventory data.

Figure 3: Depicts the Working of Bar Coding and Scanner



Source: www.makebarcode.com

C) Enterprise Resource Planning (ERP) Systems

Enterprise Resource Planning (ERP) Systems are Enterprise-wide Information Systems used for automating all activities and functions of a business. These are transaction-based information systems that are integrated across the whole business. Basically, they allow for data capture for the whole business into a single computer package which gives a single source for all the key business information activities, such as customer orders, inventory and financials. Many companies now view ERP systems from vendors like Baan, SAP and People soft as the core of their IT infrastructure. ERP systems have become enterprise-wide transaction processing tools which capture the data and reduce the manual activities and task associated with processing financial, inventory and customer order information. ERP system achieve a high level of integration by utilizing a single data model, developing a common understanding of what the shared data represents and establishing a set of rules for accessing data. In addition to the huge

costs that are involved in procuring an ERP application, installation of such systems will entail widespread change within the organization. It will have implications in terms of Business Process Reengineering (BPR), changes in organizational structure, people and change management. Many companies have benefited from using this system whilst some have experienced severe problems with their application. Generally, they also require a lot of customization and training for each user.

Figure 4: Depicts the Working of ERP Systems

Source: www.aanaxagorasr.com

D) Warehouse Management Systems

Warehouse management systems are systems that control all the traditional activities of warehouse operations. Areas covered usually include receipt of goods, allocation or recording of storage locations, replenishment of picking locations, production of picking instructions or lists, order picking, order assembly and stock rotation. Some systems are used in conjunction with radio frequency (RF) communication equipment. This equipment can be mounted on fork-lift trucks. The warehouse management system communicates with the RF system and directs the activities of the warehouse staff (Thongchattu et al, 2007). For example, when picking that it will provide the tasks for the operative to carry out. Once the task is complete the operative updates the system and is directed to the next task. This has the advantage of updating the stock holding in real time. There are highly sophisticated systems that control the operations of fully automated

warehouses. This may include automated storage and retrieval systems (AS/RS), automated guided vehicles (AGVs), and the many other devices that are relatively common in today's modern warehouse such as, conveyors, carousels, sortation systems, etc. A number of computer models have now been developed to assist in the planning of warehouse design and configuration. These are generally very sophisticated 3D simulation models that provide a graphic, moving illustration on the computer screen of the layout of the warehouse.

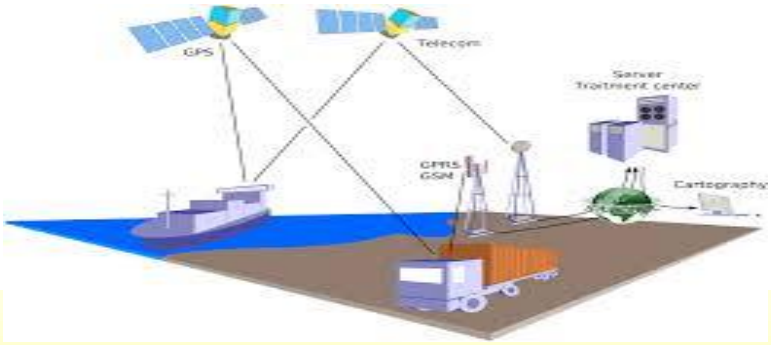
Figure 5: Depicts the Working of Warehouse Management Systems

Source: www.improsys.in

E) Transportation Management Systems

Transportation Management Systems provide more visibility into shipments and orders. Scheduling issues are also addressed on time. Multiple transportation options can be explored as a result of earlier visibility into the supply chain. Timely communication and status reports can also be obtained. By having control on its supply chain, businesses can make efficient routing decisions. An example of such a system is developed by Target Corporation and NTE. Initially Target was making transportation requests manually for inbound shipments. There was limited visibility for shipments and as a result of this there were more number of less-than-truckloads, which was not cost-effective. Implementation of the new system resulted in target vendors submitting the relevant freight information electronically with increased speed and efficiency. The new system resulted in improved cost controls, better labour planning and reduced administrative overheads.

Figure 6: Depicts the Working of Transport Management Systems



Source: en.wikipedia.org

F) Inventory Management Systems

During the mid to late 1990s, retailers began implementing modern inventory management systems, made possible in large part by advances in computer and software technology. The systems work in a circular process, from purchase tracking to inventory monitoring to re-ordering and back around again. Retailers such as Target, Lowe's and Best Buy stock tens of thousands of items from all over the world. Wal-Mart alone stocks items made in more than 70 countries, according to its corporate Web site. It is estimated that at any given time, the Arkansas-based retailer manages an average of $32 billion in inventory. With those kinds of numbers, having an effective, efficient inventory control system, or inventory management system, is imperative. Wal-Mart's system helps it maintain its signature "everyday low prices" by telling store managers which products are selling and which are taking up shelf and warehouse space. Inventory management systems are the rule for such enterprises, but smaller businesses and vendors use them, too.

The systems ensure customers always have enough of what they want and balance that goal against a retailer's financial need to maintain as little stock as possible. Mismanaged inventory means disappointed customers, too much cash tied up in warehouses and slower sales. Factors such as quicker production cycles, a proliferation of products, multi-national production contracts and the nature of the big-box store make them a necessity. Modern inventory management systems must have the ability to track sales and available inventory, communicate with suppliers in near real-time and receive and incorporate other data, such as seasonal demand.

They also must be flexible, allowing for a merchant's intuition. And, they must tell a storeowner when it's time to reorder and how much to purchase.

Figure 7: Depicts the Working of Inventory Management Systems

Source: www.improsys.in

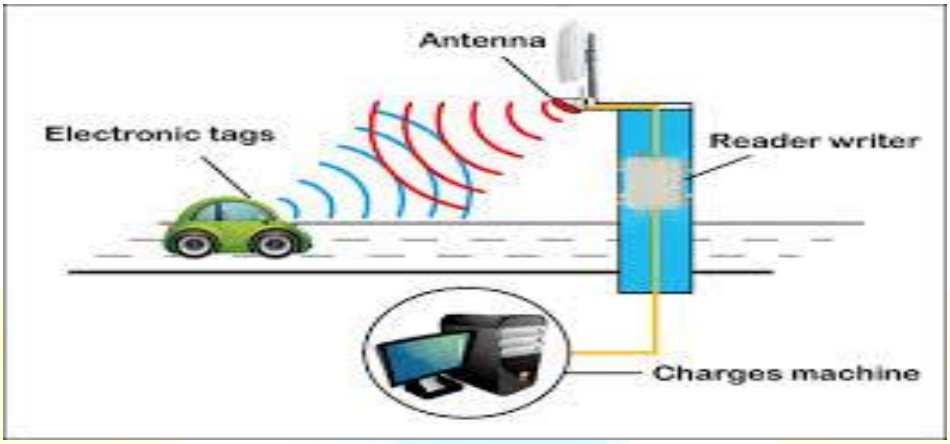
G) Radio Frequency Identification (RFID)

The bar code was intended to improve efficiencies in the retail space, but the bar code cannot uniquely identify the specific object such as when items are produced, the lot of the items was made and when will the items expire. RFID was able to take care of these issues.

Both RFID and Bar codes are indeed, quite similar, both being auto-ID technologies, which are intended to provide item identification. The primary difference is the reading data from the items. In bar coding, the reading device scans a printed label with optical laser or imaging technology and in RFID the reading device scans a tag by using radio frequency signals

The need to minimise operating costs and employed assets has resulted in the adoption of radio frequency technology to track inventories within a supply chain down to the item level, thus reducing channel volume and enhancing forecasting and planning capabilities (D'Avanzo et al., 2004). RFID is a type of automatic identification system. The purpose of an RFID system is to enable data to be transmitted by a portable device, called a tag, which is read by an RFID reader and processed according to the needs of a particular application. The data transmitted by the tag may provide identification or location information, or specifics about the product tagged, such as price, colour, date of purchase, etc. (EPIC, 2002).

Figure 8: Depicts the Working of RFID

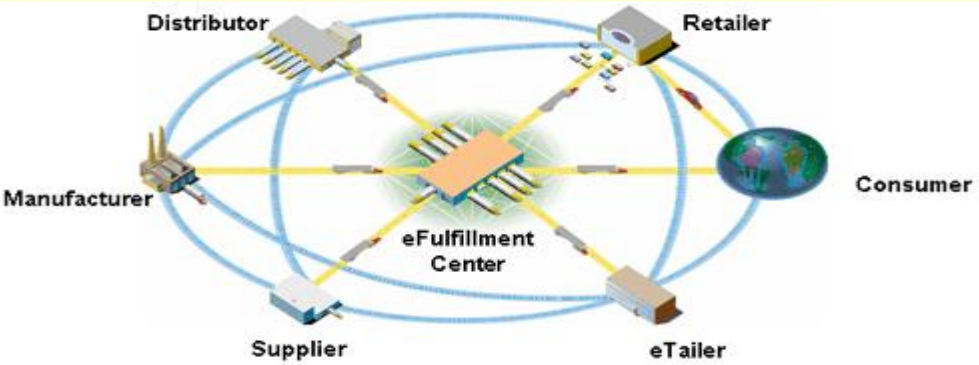


Source: www.wenshing.com.tw

H) Software Agents

Artificial Intelligence emerged into the paradigm of software agents with the application area of multi-agent systems. A software agent is a software system, which has attributes of intelligence, autonomy, perception or acting on behalf of a user. Agents can behave autonomously or proactively. The intelligence of an agent refers to its ability of performing tasks or actions using relevant information gathered as part of different problem-solving techniques such as influencing, reasoning and application specific knowledge. Java has been the most common tool for building such intelligent agents which are increasingly becoming mobile. Most of the agent platforms available today like Agent Builder, Aglets, Voyager, JADE, ZEUS and FIPA are implemented using this language.

Figure 9: Depicts the Working of Software Agents



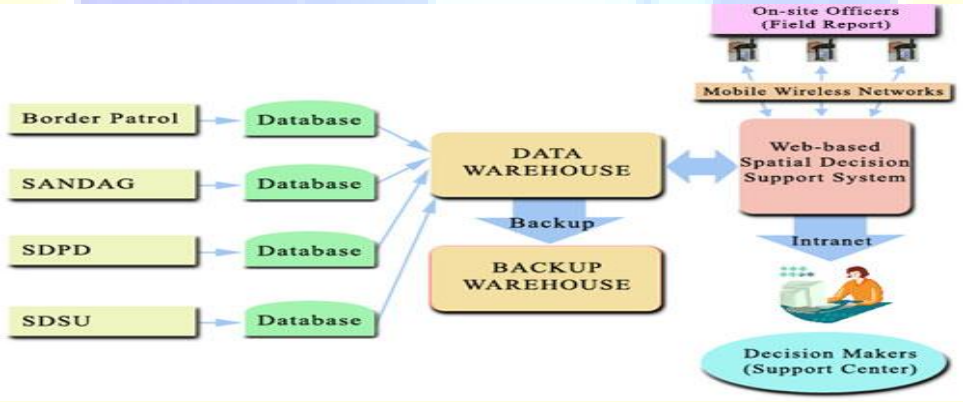
Source: made4net.com

I) Decision Support Systems

Decision Support Systems (DSS) are a specific class of computerized information systems that supports business and organizational decision-making activities. A properly designed DSS is an interactive software-based system intended to help decision makers compile useful information from raw data, documents, personal knowledge, and/or business models to identify and solve problems and make decisions. In SCM, there is always a likelihood of having disagreements among parties for a certain decision making process. This phenomenon gets worse, when the business environment becomes more competitive and turbulent. Accordingly Decision Support Systems (DSS) have been integrating in various areas like logistics, inventory management, facility design, sales analysis etc.

Baan, a leading ERP vendor unveiled an application, Baan Enterprise Decision Manager for aiding corporate decision making. Major retailers like Walmart, Sara Lee, Roebuck have increasingly started using Collaborative Forecasting and Replenishment (CFAR) which uses DSS for jointly developing forecasts. GAF Materials Corp, the largest manufacturer of asphalt-based roofing materials in the US, uses a freight-management DSS (Lee et al, 1999).

Figure 10: Depicts the Working of DSS



Source: kelvin1122125.wordpress.com

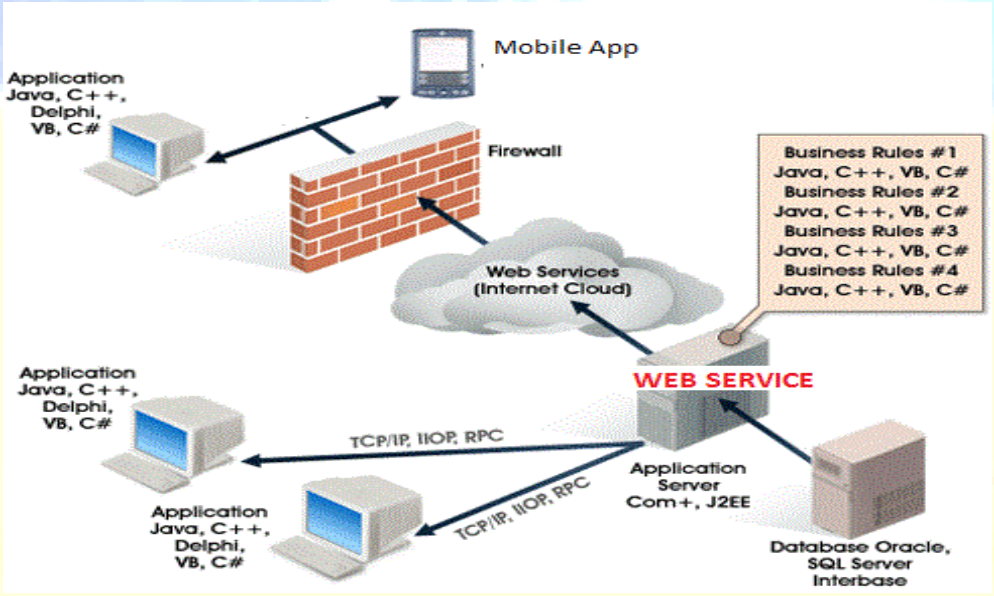
J) Web Services

Web services are application interfaces accessible via Internet standards that use XML and that employ at least one of the following standards: Simple Object Access Protocol (SOAP), Web Services Description Language (WSDL) or Universal Description, Discovery and Integration (UDDI). These standards, and the next generation standards that are being built on

them, are defining the way that forward-thinking enterprises manage lightweight integration tasks. In the view of Sun Microsystems (2004), web services interoperability for supply chain management is being used to support business-to-customer models. The computing giant provided an example where retailers offer electronic goods to consumers. To fulfil orders, the retailer has to manage stock levels in warehouses (Coronado et al 2004).

A typical business-to-business model is used when an item in stock falls below a certain threshold. In that case the retailer must restock the item from the relevant manufacturer's inventory. In order to fulfil a retailer's request, a manufacturer may have to execute a production run to build the finished goods. In reality, a manufacturer would have to order the component parts from its suppliers and that may be a manual process which is supported through the use of fax.

Figure 11: Depicts the Working of Web Services



Source: www.mcs.csueastbay.edu

K) Electronic Commerce

Electronic commerce refers to the wide range of tools and techniques utilized to conduct business in a paperless environment. Electronic commerce therefore includes electronic data interchange, e-mail, electronic fund transfers, electronic publishing, image processing, electronic

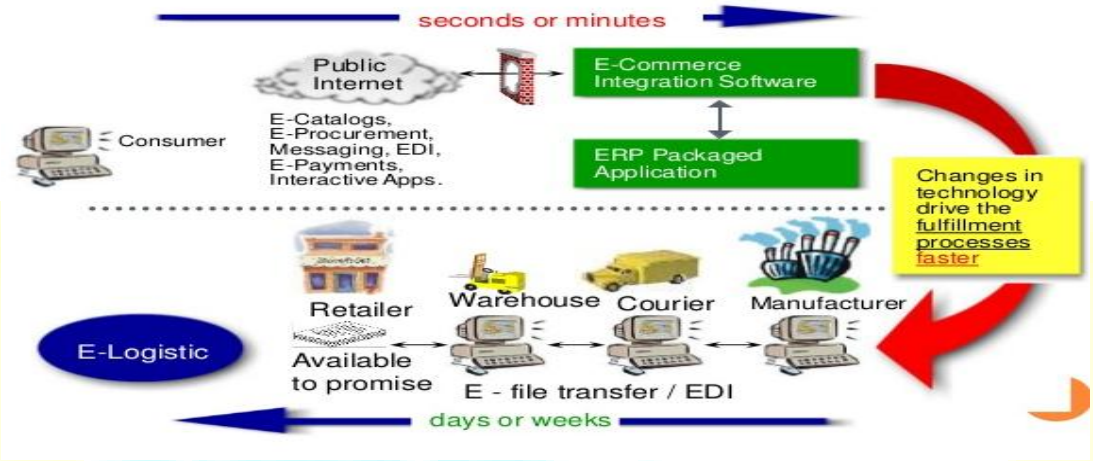
bulletin boards, shared databases and magnetic/optical data capture. Companies are able to automate the process of moving documents electronically between suppliers and customers. This system provides access to customers all over the world and thus eliminates geographical limitations. Some of the E-commerce applications with applications in B2C (Business to Consumer) and B2B (Business to Business) space, which are changing the dynamics of Supply Chain Management include:

E-tailing: using the Internet for selling goods over the internet. The archetypal e-tailing application is that of a bookseller such as Amazon. This company is renowned for the fact that it only sells books over the internet and doesn't even take telephone orders.

E-Procurement: The term procurement is used to describe the purchase of goods and services which are not directly used in the main business of a company. For example, a car manufacturer will procure stationery for its employees or procure training courses for them to attend in order to improve their skills. An e-procurement system which would automatically take the form produced by the person making the procurement, check that it satisfies all the company rules for procuring the item that is required, carry out authorisation if it is below a certain limit or send the form to someone who can carry out authorisation and then log the purchaser into the site of the supplier. He or she is then able to use this site to make the purchase, quoting an automatically generated procurement requisition number.

E-Auctions: These are sites on the web which run conventional auctions. There are two types of auction: those that are carried out in real time, where participants log in to an auction site using a browser at a specified time and bid for an article until the highest price is reached and no other bids are forthcoming. The other type of site and the most common is where an item is offered for sale and a date advertised after which no more bids are accepted. Such sites make a profit from two sources: first they usually charge a commission on the items that are sold and, second, they display adverts which are viewed by visitors to the site. The auction site will then receive some fee for displaying the advert, a further fee if a visitor clicks on an advert and it takes them to the advertiser's website and another fee if they purchase something from this site. Again, this is just an online analogue of a conventional business

Figure 12: Depicts the Working of Electronic Commerce



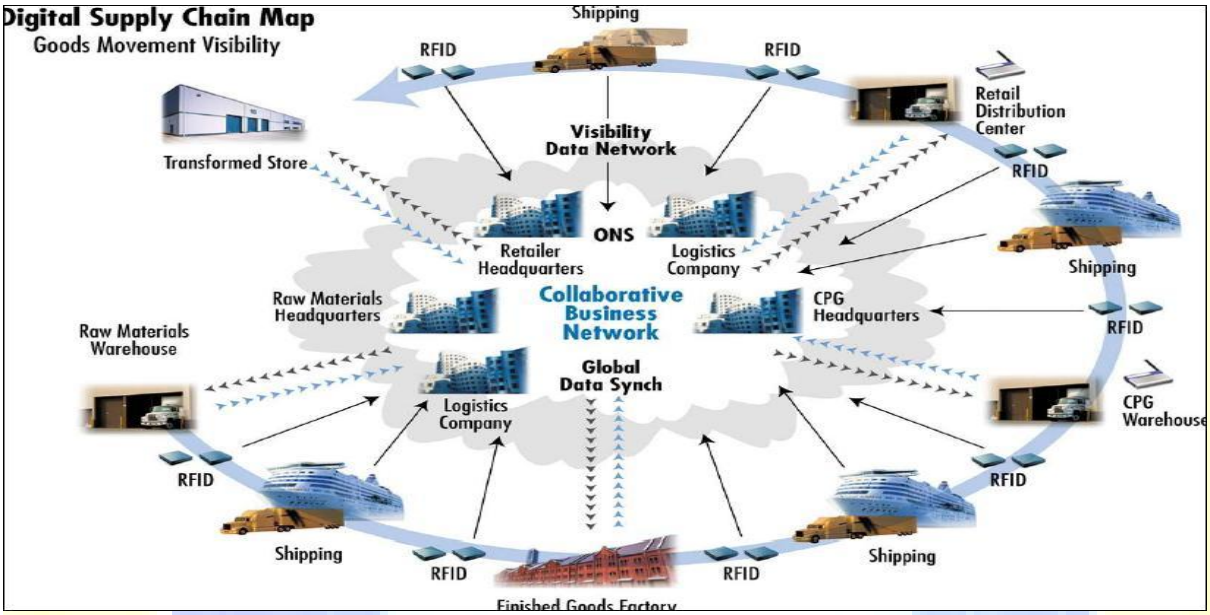
Source: www.slideshare.net

L) Electronic Supply Chains

Electronic Supply Chains (ESC) refers to those supply chains that are electronically facilitated between or among participating firms. Also called Virtual Supply Chains, these are realized in two forms, EDI-based or Internetbased.EDI generally connects firms through proprietary Value Added Networks (VAN), whereas the Internet generally connects firms through open networks which use standard protocols. The ESC links trading partners to allow them to buy, sell, move products, services and cash. Due to the low implementation costs, the introduction of the Internet has brought about opportunities that allow firms to transact with other enterprises electronically. Amazon is one such example. New types of intermediaries have been created as a result of virtual supply chains. The e-supply chain also envisages use of internet-based applications to transact and exchange information like product and inventory information with their downstream or upstream trading partners. Supply Chain initiatives like Collaborative Planning, Forecasting and Replenishment (CPFR), Vendor Managed Inventory (VMI), Efficient Customer Response (ECR) and Quick Response have been increasingly facilitated in the new e-supply chain paradigm. Information sharing among suppliers, manufacturers, distributors and retailers are greatly improved. American-On-Line and lastminute.com have achieved innovative results using ESCs (Gunasekharan et al, 2004). Over the past few years, Intel has been building e-business capabilities to conduct business with

customers and suppliers. Intel's ultimate goal is to become a "100 per cent e-corporation" by marrying internet technologies and critical business systems to increase productivity and competitiveness in the marketplace. Intel's E-Business Group is ultimately responsible for delivering this goal for the corporation.

Figure 7: Depicts the Working of Electronic Supply Chains



Source: 54324016.blogspot.com

Conclusions

Supply Chain Management is an area of enterprise activity which is visualizing the biggest impact from technology, currently to stay competitive and profitable in a multichannel world with applications having greater accuracy and timeliness like ERP, IMS,

E-commerce, DSS, Software Agents, RFID, Web Services etc the retailers must practice consumer centric transportation management systems (TMS) by integrating new channels and extend their leverage of technology in different domain wherein they can benefit from operational performance, cost efficiency and organizational capability by allowing better alignment of Supply Chain Management to wider business domain in leaps and bounds providing better end to end pipeline visibility.

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