Study about the Types of Information Technology Service for Supply Chain Management

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Abstract-The globalization of company is the excellent object to happen to supply chain management (SCM) in the last 30 years. This study tries to describe the impact of information technology (IT) in supply chain management (SCM). The criteria include the applications of Information Technology (IT) to get the high firm performance comprising marketing performance, financial performance, and customer satisfaction. The information and communication technologies create as one of the biggest consent of the current supply chain management (SCM). This study focuses on one of the vital use of information technologies in SCM background, that is to say Materials Requirement Planning (MRP), manufacturing resource planning (MRP-II), Enterprise resources planning (ERP), SCM-software, Electronic data Interchange, Bar Coding and Scanner, Radio Frequency-Identification technology (RFID) Supply Chain Execution software, Wide Area network (WAN) Technologies, Metropolitan Area network (MAN) Technologies, Local Area network (LAN) Technologies Internet and intranet service etc. These types and ways of information technologies related to supply chain management is examine.

Key Words: **Supply chain management (SCM), Enterprise resource planning (ERP), Material Requirement Planning (MRP), manufacturing resources planning (MRP-2), Electronic Data Interchange (EDI)**

I. INTRODUCTIONS

THE beginnings of supply chain management are not exactly known, but there is common reference to its introduction through consultants in the early 1980s. In the decades since, it has received considerable concentration, at first starting within the business community. From the early 1990s, academic investigate started following supply chains and tried to establish a few theoretical structure (Cooper, Lambert, and Pagh 1997).

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Supply Chain Management is the management of the flow of commodities and services. It includes the movement and storage of raw materials (RM), work-in-process (WIP)

inventory, semi finish and finished product from location of orison to place of use. In the supply chain management (SCM) flow of material supplier to customer and flow of money customer or consumer to supplier. A supply chain management consists of supplier, manufacturer, distributor, retailer, customer etc. Entity of SCM is systematic way of representation shown in the fig.1. SCM Main goals of the supply chain management (SCM) are listing in the given below:

1. The Right manufactured goods
2. To The Right-consumer
3. At The Right-Place
4. At The Right-time
5. In The Right-Condition
6. In The Right-Quantity
7. At Right-Cost

Figure.1 Supply chain Management

A-Main Entity of supply chain management
- Supplier (Raw material, Components, Energy, service)
- Producers / Manufacturers (Product, Power, Professional Service, Government Service, Education service)
- Customers (Retailer, Wholesaler, Distributor and Consumer)

B-Types of Flow in Supply Chain Management
In the supply chain, there are four types of flow from the supplier to the end customer in the chain. These types of flow shown in the figure.2
1. *Information flow:* it is the consist of Invoice, receipt, order, product records, sales, forecasting decisions, Stock deployment, Manufacturing decisions, Physical procurement decisions, new product intro decisions, capacity, promotion plan, delivery schedule.
2. *Material flow:* The flow of material (products and services) from the starting place of materials onward (or upstream) to the final consumer in the external

chain. It should be noted that there is also a toward the back (or downstream) flow of materials. It is consists of raw material, semi-finished goods, finished goods.

3. *Money or funds flow:* The financial flow consists of credit terms, payment schedule, and consignment and title ownership arrangements.

4. *Reverse product flow:* Reverse product flow consists of Return for repair, replacement, reprocess & disposals.
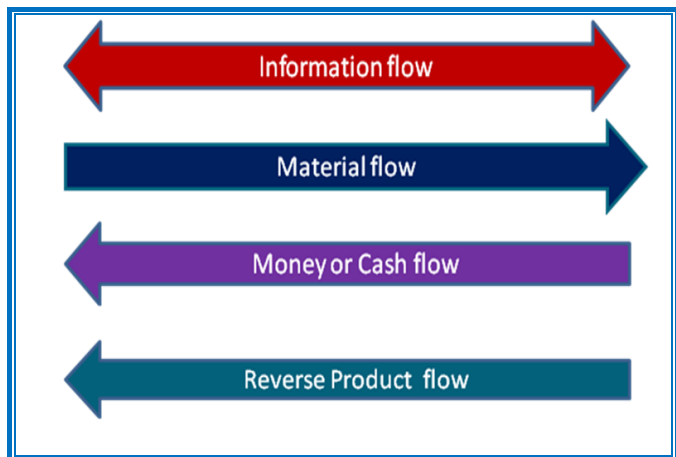

Figure: 2 Type of flow in SCM

C-Supply Chain Performance Measures

SCM performance measure is used to determine the efficiency and effectiveness of an existing system. These supply chain performance measures classified in two categories.

1. *Qualitative performance measure*
   - Customer Satisfaction may be Product Availability, Operational performance, Customer services
   - Supplier Performance is the Suppliers deliver raw materials to production facilities on time and in good condition.
   - Flexibility may be Market, Supply, organizational, logistics and operational system flexibility

2. Quantitative performance measure
   - Cost Minimization
   - Inventory Investment Minimization
   - Sales Maximization
   - Profit Maximization
   - Return on Investment Maximization
   - Customer order fill rate Maximization
   - Product Lateness Minimization
   - Customer Response Time Minimization
   - Lead Time Minimization

II. LITERATURE REVIEW

Telecommunications and computer technology permit all the aspect in the supply chain to communicate with each other. The apply of information technology (IT) permits suppliers, manufacturers, distributors, retailers, and customers to reduce lead-time, paper work, and additional

needless activities. It is also mentioned that managers will experience considerable reward with its use such as the flow of information in a coordinated manner, access to information and data inter-change, better customer and supplier relationships, and inventory management (IM) at not only the national level but also international level (Handfield and Nichols, 1999). In addition, the advantages will take in supply contracts via internet, distribution of strategies, outsourcing and procurement (Simchi-Levi et al., 2003). All corporations or businesses are looking for cost and lead-time reductions with the purpose of improving the level of service but also to enhance inter organizational relationships (Humphreys et al. 2001). A study carried out by Tim (2007) states that with communication tools, such as the websites, industrial organizations can build importance in their supply chain relationships. According to Turner (1993), any more solution for supply chain management (SCM) achievement is the use of planning tools. He also mentions that without the use of information systems, companies cannot handle costs, offer superior customer service and lead in logistics performance. Turner (1993) indicates that firms cannot effectively manage cost, offer high customer service, and become leaders in supply chain management without the incorporation of top-of-the-line information technologies (IT) . Li (2001) identified 14 such information technology tools, among them electronic data interchange (EDI), enterprise resource planning (ERP), internet, and extranets. Li grouped these tools into three groups in terms of their primary purpose: communication tools, resource-planning tools, and supply chain management tools. Evidence that is more present has established that companies get large reimbursement from Information Technology (IT) application. Exposed significant productivity grows from run of information (Barua and Lee 1997). Other studied have argued influentially that sufficient proof has been gathered on the constructive special effects of Information technology that the productivity paradox can be labeled a myth of the past (Mukhopadhyay et al., 1997). There seems to be a truth that information system investment does pay off now, determining how it does remains secrecy. Earlier study noted that IT value research had ignored the synergistic effects of Information T with other organizational factors such as business strategies, mass customization, and supply chain management. Information software does not operate in a vacuum; it works very closely with other firm assets (Andersen et al., 2001). However, (Brooks and Davenport, 2004; Lou et al., 2004) argued with the purpose of technologies are characterized by high levels of uncertainty due to its vital characteristics of: autonomy (Jennings and Wooldridge, 1995), social ability (Moyaux and Chaib-draa, 2006), reactivity (Parunak, 1999), and pre-activeness (Moyaux and Chaib-draa, 2006). It was assumed that the diffusion of IT into the activities of the supply chain amplified its value-creating potential. Information technology (IT) has potential to manage the flow and to influence several of the dimensions of the supply chain such as cost, quality, delivery, flexibility, and ultimately the profits of the firm (Brandy berry at el., 1999). Sanders et al. (2002) presented the nonstop relationship between technology use in SCM was report that organization utilize

Information technology (IT) more than the standard in their business, get extra operational benefits; such as reduced cost, incorrect information flow and cycle time. However, the effectual between information technology (IT) use and supplier network performance is moderated by industry clock-speed (Guimaraes et al., 2002). Narasimhan and Kim (2001) support certain form of IT system are more applicable for SCM that help firms get better process and production control, price management, customer management, customer service, warehouse management (WM) and inventory management (IM).

III. IMPACT OF INFORMATION TECHNOLOGY IN SCM

- Data transfer within second every stage of the supplier
- Providing information availability and visibility;
- Enabling a single point of contact for data;
- Allowing decisions based on total supply chain information; and
- Enabling collaboration with partners
- Improved Supply Chain Network
- Minimized delays time for supply
- Local and global communication between every stage of the supplier
- Reduction of information transfer issue
- Improve the goods distribution Service
- Process automation through reduced errors & real information transfer
- Improve payment process during the transaction
- Maintain inventory status in the stores
- Coordination and information sharing
- Order tracking and delivery coordination
- Have a greater control over stock level

IV. TYPES OF IT SERVICES IN SCM

Different types of information technology services for supply chain management briefly described in the given below:

A-Material Requirement Planning (MRP)

Material requirement planning (MRP) is a computer based software help to assist manager to ensure enough products are available for delivery to customer and material is available for production and to minimize stock in warehouse it also helps in scheduling and placing order for dependent items. Main vital benefits of material requirement planning for supply chain management are listed in the given below:

- Minimize inventory level.
- Increase inventory turnover.
- Track material requirements.
- Identifies shortage in inventory items.
- Helps to track raw material, work-in-process and finish goods.
- Helps to plan the procurement schedule.
- Determines the mainly economical lot sizes for order.

- Computes quantities required for safety stock.
- Calculate bill of material and assemblies required.
- On time product delivery

B-Manufacturing Resource Planning (MRP2)

The technology of MRP expended in 1980 to create new approach called manufacturing resource planning or MRP2. In manufacturing resource planning (MRP2), the valid production schedule proved itself so successful that organization knows that resources could be better controlled and planned with valid schedules. Main most important advantages of manufacturing resource planning (MRP-II) for supply chain management are listed in the given below:

- Better control of Inventories
- Productive relationship with Better quality
- Improve design control
- Improve cash flow through fast delivery
- Accurate inventory records
- Reduced working capital for inventories

C-Enterprise resource planning (ERP)

ERP is a term used to refer to a system that links individual applications into a single application that integrates the data and business processes of the entire business. ERP System are integrated with the all business functions such as marketing, sales, manufacturing, warehousing, planning, finance, accounting, distribution, Human Resources management (HRM), customer relationship management (CRM) and Engineering etc. ERP make it easier for inventory tracking, revenue tracking, sales forecasting, order tacking and related activities. Various types of ERP system benefits in supply chain management brief described in the given below:

- Standardized the business process in the organization ERP systems provide advanced e-commerce integration, which can handle web-based order tracking and processing.
- Improve business intelligence functionalities.
- Upgrading technology infrastructure
- Achieve better efficiency of operations
- Provide immediate access to enterprise information
- Improve data Precisions
- Reduced error and data duplicate
- Enhanced efficiency of the management
- ERP Replaces the systems that separate your data
- Centralized the related data
- Improved security of data because login by only authorized person

D-Electronic Data Interchange (EDI)

EDI is a standard format for exchanging business data between organizations by electronic means. It is used to transfer electronic documents or business data from one computer system to another as an electronic equivalent for paper-based orders, confirmation and invoices between trading partners. Various important reasons for using electronic data interchange for supply chain management, which are listed in the below:

- Increased accuracy and Productivity
- Reduction of clerical labor and paper work
- Lead time and Inventory Reduction
- Facilitation of just in time systems
- Electronic transfer of funds
- Improve control of operations
- Improve billing facilities

On the other hand, the use of EDI supply chain partners can overcome the distortions and exaggeration in supply and demand information by improving technologies to facilitate authentic time-sharing of actual demand and supply information. Main essential advantages of Electronic Data Interchange for supply chain management briefly described in the given below:

- Information is transmitted from one company to another company efficiently and swiftly.
- Information is entered automatically through EDI software.
- Receipt verification done very easy with help of EDI software.
- Data justification is automatically completed.
- Lower administrative, resource and maintenance cost.
- More rapidly delivery due to faster information flow.
- EDI helps in building long-term relationships with trading partners and hence helps in business growth.
- EDI is removing manual data entry and paperwork. Therefore, there are minimal chances of error.
- Very good options for storing and manipulating data electronically

E- Bar Coding and Scanner

Bar Codes are the show of a number or code in a form suitable for reading by machines. Bar codes are broadly used during the supply chain to recognize and track goods at every stage in the process. Bar codes are a sequence 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 (WMS) and added to stock held in the warehouse. Bar code scanners are most visible in the checkout counter of super markets and hypermarkets. This code specifies name of product and its manufacturer. In 1983, with barcodes printed on most goods, Wal-Mart introduces checkout scanners in every its stores. They updated inventory numbers for individual bits and pieces at point of sale and enabled headquarters to easily collective sales and inventory data at its centralized Information Technology (IT) department. Various advantages of Bar coding and scanner in supply chain management brief description in the given below such as:

- Much smaller and lighter than RFID tags and therefore easier to use.
- Less expensive than RFID tags; as barcodes are directly printed onto plastic or paper materials and therefore the only cost involved is the ink; a tiny overall cost.
- Barcodes work with the same accuracy on various materials in which they are placed.

- Barcodes are a worldwide technology in that they are the norm for trade products; stores that own a barcode reader can method barcodes from anyplace in the world.
- In many cases; barcode accurateness has been said to be the same or even better than RFID tags.
- Today barcodes are found on almost every item and there is no privacy issues involved with its use.

F-Radio Frequency-Identification technology (RFID)

Radio Frequency-Identification technology (RFID) involves a tag affixed to a product, which identifies and tracks the product via radio waves. This technology has three parts: a scanning antenna, a transceiver with a decoder to interpret the data and a transponder (RFID tag) pre-set with information. The scanning antenna sends out a radio-frequency signal providing a means of communication with the RFID tag. When the RFID tag passes through the frequency field of the scanning antenna; it detects the activation signal and can transfer the information data in holds to be picked up by the scanning antenna. RFID will be a major advance in supply chain management, but enterprises will need to do considerable upfront planning and testing to successfully implement and integrate the technology. RFID will have a significant impact on every feature of supply chain management, such as moving goods through loading docks, to the complex, such as managing terabytes of data as information about goods on hand is collected in real time. RFID will initially be used to manage the identification of large lots of goods for example, at the pallet and carton levels. RFID tags, therefore, must have unique serial identifier information that associates each lot with a corresponding bill of lading sent from the originator. Most important advantages of RFID over the over the bar coding briefly described in the given below:

- No line of sight requirement
- RFID tags do not need to be positioned in a line of sight with the scanner.
- RFID tags can be read at a faster rate than barcodes.
- RFID tags can work within much greater distances; information can be read from a tag at up to 300 ft.
- RFID tags are read/write devices.
- RFID contain high levels of security; data can be encrypted, password protected.
- RFID tags carry large data capabilities such as product maintenance, shipping histories and expiry dates; which can all be programmed to the tag.
- Once these are set up; it can be run with minimal human participation.
- RFID tags are more reusable and rugged as a plastic cover protects them.

G-Supply Chain planning software (SCP)

Uses mathematical models to forecast inventory levels based on the well-organized flow of resources into the supply chain. SCM-software is used to track and check goods and services. Organizations typically focus their selection of SCM software on applications that are able to mirror the architecture and functionality of critical supply operations presently in place. Less frequently, companies select supply chain software to assist them with modeling

or improving business processes. Most of the processes that occur in a supply chain system are called events. Events include anything from the internal movement of inventory from a supply line to the surplus, or scrapping of defective/perishable stock. Main Benefits of Supply chain software listed in the given below:

- Higher Efficiency Rate
- Reduce Cost Effects
- Raise Output
- Raised Your Business Profit Level
- Make better Cooperation
- Lowers Delay in Processes
- Enhanced Supply Chain Network

H-Supply Chain Execution software (SCE)

Supply chain execution (SCE) is the flow of tasks involved in the supply chain, such as order fulfillment, procurement, warehousing and transporting. SCE is used to automate different steps in the supply chain such as automatically sending purchase orders to vendors when inventories reach specified levels. Supply Chain Execution software applications track the physical status of commodities, the management of materials, and financial information involving every party.

I-Wide Area network (WAN) Technologies

A Wide Area Network (WAN) is a computer network covering multiple distance areas, which may spread across the entire world. WANs often connect multiple smaller networks, such as local area networks.

J-MAN ((Metropolitan Area Network)

MAN is a larger network of computers and other network devices, which are connected together usually, span a number of buildings or huge geographical region. Everyone the devices that are division of MAN are span across buildings or Small Township. MAN network has lower speed compare to line area network.

K-Local area network (LAN)

A LAN consists of a computer network at a single location typically an individual place of work building. A LAN is very useful for sharing resources, such as data storage and printers. LANs can be built with relatively inexpensive hardware, such as hubs, network adapters and Ethernet cables.

L-Internet Service

The use of the Internet in Supply chain management is fast increasing. The use of the Internet in SCM is a comparatively modern trend. The key in thing for achievement in managing a supply chain is rapid, accurate information from a broad range of operating areas of purchasing/ procurement, inventory management, order processing, production scheduling, transportation scheduling, vehicle tracking, customer service and vendor service.

M-Intranet

Extranet Service is to use Internet technology and protocol for the internal and suppliers' communications. Intranet is system in which multiple PCs are connected to each other. PCs in intranet are not available to the world outside the intranet. Usually each company or organization has their own Intranet network and members/employees of that company can access the computers in their intranet. An IP Address also identifies each computer in Intranet, which is unique among the computers in that Intranet.

V. CHALLENGE OF IT IN SCM

- Disconnected enterprise systems create data redundancy, and error
- Lack of visibility of orders, schedules and shipments can lead to costly administrative decision making processes
- Less physical control System
- Required computing hardware device
- Need on the network connectivity
- Requires a constant Internet connection
- Less security of data
- Difficulty of controlling finance
- Loss of control over purchases being made by the company
- Does not work well with low-speed connection
- There is risk that the software does not work or use properly

VI. CONCLUSION

The objectives of this paper are brief knowledge about SCM, impact of IT in SCM, types of IT service and challenges. World is decrease day by day through improvement of recent technology skill. Customers' opportunities are moreover growing and companies are level to more and unsure situation. The planned and technological modernization in supply chain will influence how organizations purchase and put on the market in the future. However, understandable image, strong planning and technological near into the Internet's facility would be compulsory to guarantee that companies make the most of the Internet's potential for enhanced SCM and finally improved competitiveness.

VII. FUTURE SCOPE OF IT IN THE SCM

- The cloud computing based material requirement planning (MRP), Manufacturing resource planning software (MRP-II), Enterprise resource planning (ERP) software , Supply Chain planning software (SCP), Supply Chain Execution (SCE) software are now taking over the traditional software system of managing supply chain data and processes because of its advantages such as provide enhanced data storage capacity, security and control, give a real-time access from anywhere, reduced hardware & server cost etc.
- Mobiles based material requirement planning (MRP), Manufacturing resource planning (MRP-II), ERP software, supply chain planning (SCP), Supply Chain Execution (SCE) software systems are now taking over traditional software system. It will have various

advantages compare to traditional Software System such as faster decision-making, Greater operational efficiencies, improved communication and collaboration, anytime access to enterprise, business and manufacturing intelligence, improved workflow and expedited approval process, improved responsiveness to customer and vision needs etc.

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