

UNIT-1

INTRODUCTION TO E-SCM

In the ongoing era of knowledge economy, almost every discipline of study has the influence of information technology in one form or other. The impact of information technology on supply chain domain is such that it plays a significant role as a key performance driver or key enabler of business performance. The term electronic supply chain management (e-SCM) has to be understood from the context of information technology applications for the purpose of supplychain integration. This unit will introduce you to the concept of e-SCM.

1.1 DEFINITIONS OF ELECTRONIC SUPPLY CHAIN MANAGEMENT (E-SCM)

Cooper & Lambert ¹ defined supply chain management taking into account the eight supply chain processes: customer relationship management, customer service management, demand management, fulfillment, procurement, manufacturing flow management, product development and commercialization, and reverse logistics. They defined SCM as *“the integration of key business processes from end user through original suppliers that provides products, services, and information that add value for customers and other stakeholders”*. Based on the above definition, Cristina Giménez & Helena R. Lourenço² defined e-SCM as *“the impact that the Internet has on the integration of key business processes from end user through original suppliers that provides products, services, and information that add value for customers and other stakeholders”*.

1.1 ELECTRONIC SUPPLY CHAIN FRAMEWORK

Cooper & Lambert view of supply chain involves product, information, cash flows and eight integrated end –end key business processes from end customers to original suppliers, including internally integrated focal enterprise.

Internal functions of focal enterprise:

The integration of internal functions of the focal enterprise is a prerequisite for end-end key business process integration with trade partners in the supply chain. The internal functions include marketing and sales, logistics, purchasing, production, R&D and finance.

End-End key business processes:

Eight end-end key business processes that require integration are follows:

1. Customer relationship management
2. Customer service management
3. Demand management
4. Order fulfillment

1 Cooper, M. C., D. M. Lambert, et al. (1997). "Supply Chain Management: More than a new name for Logistics." The International Journal of Logistics Management 8(1):1-13.

2 Giménez & Helena R. Lourenço (2006). "e-Supply Chain Management: review, implications and directions for future research." IJOPM

5. Manufacturing management
6. Procurement (supplier relationship management)
7. Product development and commercialization
8. Returns management

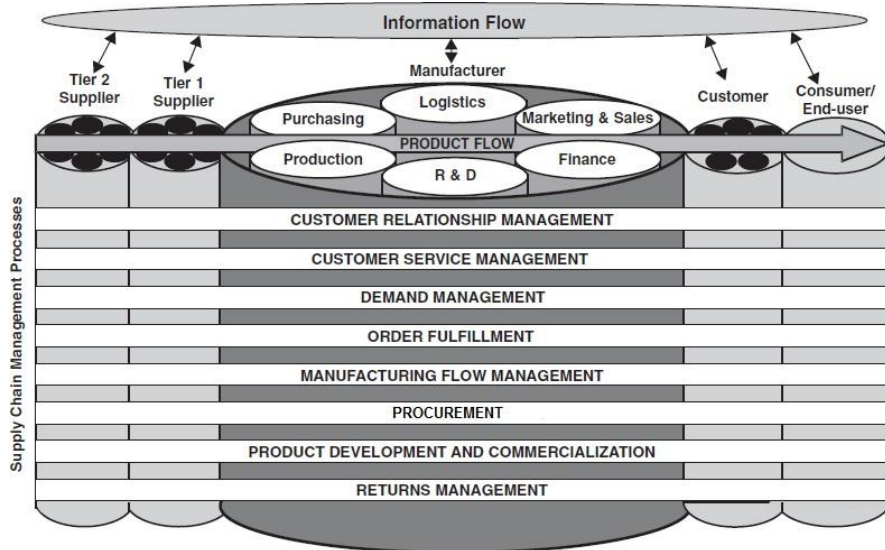


Figure 1.1: Supply chain management

Source: (Cooper, Lambert et al. 1997)

Since Giménez & Helena R. Lourenço’s definition of e-SCM is based on Cooper & Lambert’s definition, all the eight key business processes were considered. In addition to these processes, it also considers three key SCM enablers: supply chain relationships, planning and optimization tools and information flows and two key areas on that were impacted by Internet: industry structure and competitive challenges, and impact on performance. Thus the e-SCM framework looks as follows:

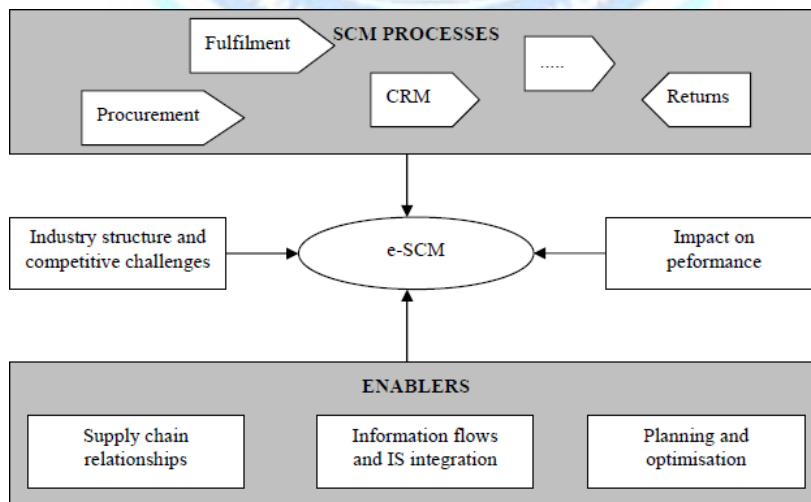


Figure 1.2: A framework for e-SCM

Source: (Giménez & Helena R. Lourenço, 2006)

The resultant framework has eight key business processes, three enablers and two impact outcomes. The eight key business processes are customer relationship management, customer service management, demand management, e-fulfillment, manufacturing flow management, e-procurement, product development and commercialization, reverse logistics and returns. The three enablers include supply chain relationships, information flows and systems integration, and planning and optimization. The two impact areas are industry structure and competitive challenges, and impact on performance.

Overview of eight key business processes in e-SCM

1. **The customer relationship management (CRM) process:** The CRM process provides the framework for how the relationship with the customer is developed and maintained. This process includes customer identification, customer segmentation and customizing products and services to their needs. The process also includes all activities related to working with customers in order to improve business processes, eliminate variability in demand and non-value added activities, and development of metrics. The impact of Internet on this process is as follows:
 - a. Provides single version of truth about customer information is made possible for all functions in an internally integrated focal enterprise.
 - b. Improves reach to customers through new communication channels (websites, portals)
 - c. Improves customer transaction and behavior data capture and analysis for better forecasts and inventory deployment.
2. **The customer service management process:** This process provides the focal enterprise face and serves as single source of information to the customer. Real time information is provided to the customer through focal enterprise interfaces, such as operations and logistics. This process includes both strategic and tactical aspects of communication to customer:
 - a. Strategic: The development of the response procedures and the establishment of the infrastructure needed to respond
 - b. Tactical: The recognition of the events that require a response, the implementation of the responses and the control of the process (customer care)

The impact of Internet on this process is on both strategic and tactical areas by enabling information sharing related to customer interactions/events in real time.

3. **The demand management process:** This process balances the customers' requirements with focal enterprise supply capabilities including forecasting demand and synchronizing it with distribution, production and procurement. The impact of Internet on this process is as follows:
 - a. Information sharing about actual sales enables companies to improve their forecasts across the supply chain.
 - b. Inside the focal enterprise, improved forecasts will get translated to improved production planning and reduced inventory levels.
 - c. On demand side of supply chain, information sharing enables the customer to eliminate the replenishment orders, thereby reducing order processing costs and inventory levels.
 - d. On supply side of supply chain, information sharing enables the suppliers to improve forecasts, leading to improved production planning and reduces inventory levels.
 - e. Information sharing and knowledge sharing for planning can enable collaborative

- programs like CPFR (collaborative planning, forecasting and replenishment) that reduces forecast errors dramatically
- f. It enables collaborative projects for replenishment programs like quick replenishment programs (QRP), collaborative replenishment programs (CRP) and vendor managed inventory programs (VMI)
4. **The e-fulfillment process:** This process (Order fulfillment) is related with the effective management of all the activities needed to deliver the order to the customer. At strategic level, it is about design of efficient supply chain to enable a timely and accurate order fulfillment. At the operational level, it includes defining the following activities: generating, communicating, entering, processing, picking and delivering customer orders. As a whole, this process is about the integration of the manufacturing, logistics and marketing functions to ensure customer satisfaction and reduce total cost before, during and after the order fulfillment. The impact of Internet on this process is as follows:
- a. It enables efficient placement of orders by customer over Internet leveraging e-commerce technologies.
 - b. It improves order fulfillment process by sharing information about customer orders and inventory data across the supply chain over Internet.
 - c. Increases information sharing reduces variability and costs to supply chain partners.
 - d. The resultant customer order data captured during the process can be used for further analysis leading to forecasting & inventory optimization, distribution planning and efficient vehicle routing.
5. **The manufacturing flow management process:** This process involves making the products and developing the manufacturing flexibility needed to serve the target markets. The process includes all activities necessary for managing the product flow through the manufacturing facilities, and obtaining, implementing and managing flexibility. The impact of Internet on this process is as follows:
- a. Improves product flow through manufacturing facilities by providing visibility of demand and supply data to all companies within the manufacturing supply chain.
 - b. Provides the ability to anticipate demand fluctuations and respond accordingly (resulting in reduced inventory and lead times).
 - c. Improves reduction in production cycles due to increased speed of communication with suppliers.
 - d. Provides the ability to develop advanced planning and optimization system for multiple manufacturing facilities.
 - e. Supports implementation of systems to change supply chain from and order driven – lot sizing approach to capacity-availability-booking approach. In other words from “push” to “pull” model.
6. **The e-procurement process:** The procurement process is fundamental to supply chain management and is related to focal enterprise suppliers. At strategic level, the focal enterprise defines corporate, manufacturing and sourcing strategies and identifies the products and services that should be acquired from outside. At operational level, it develops and controls procurement activities such as reviewing suppliers, identifying opportunities, and developing and implementing product or service agreements. The e-procurement process supports both the sourcing and procurement activities via Internet technologies and enables negotiation between buyers and suppliers. There are two types of e-procurement: marketplaces that bring multiple

buyers and sellers together in a virtual market and B2B (business to business), a one to one relationship. The impact of Internet in on this process is as follows:

- a. It enables large amount of information sharing and transfer between buyers and sellers.
 - b. It enables market places, e-auctions and B2B e-procurement
7. **The product development and commercialization process:** This process relates to a set of activities that focal enterprise undertakes to successfully develop and launch products. It includes defining new products, establishing the cross-functional product development team, designing and building prototypes, determining the distribution channel for the new product, and measuring the process performance. This involves integrating customers and suppliers into product development to launch the right product and reduce the time to market. The impact of Internet on this process is as follows:
- a. It enables collaboration among designers, manufacturers, suppliers and customers without the limitations of geographic allocation and time zone.
8. **The reverse logistics and returns process:** This process includes all the components in a supply chain and involves decisions on return avoidance practices, gate keeping, disposal guidelines, development of a returns network and flow options. The impact of Internet on this process is as follows:
- a. It provides better information and knowledge to all members of supply chain involved in this process. Information shared includes reasons for return (defective, in warranty, old, etc.), conditions of the product, point of return, instructions to customers, etc.
 - b. Returns in e-commerce related transactions are more than traditional commerce. It enables design of efficient closed loop supply chains to improve reverse logistics and returns process.

Discussion on three enablers of e-SCM

1. **Supply chain relationships:** Supply chain management can be defined as management of supplier and customer relationships to deliver better value at best cost to the supply chain as a whole. Focal enterprises relationships can be grouped in two generic segments: Strategic relationships and Arm's length relationships. For strategic relationships (partnerships or alliances) the Internet enables enterprises to share information and knowledge for better coordination and collaboration. For arm's length relationships the Internet enables enterprises to take advantage of dynamic pricing structures that are web-enabled.
2. **Information flows and systems integration:** The information flows are enabled by EDI (electronic data interchange) technology supporting business-to-business electronic trading for more than 20 years. Due to complexity in early EDI packages, incompatible standards and relatively high costs have traditionally excluded many small and mid-size enterprises. The Internet technology has changed this scenario by making information flows easier and relatively cheaper. The ERP (enterprise resource planning) systems enabled information sharing across all parts of the organization in real-time. However, the extension of the benefits of ERP to supply chain partners has been enabled through e-business models that rely on Internet and development of system integration standards. This sharing of information affects all supply chain processes and some of its effects are:
 - a. Reduced inventory due to better forecasts
 - b. Effective inventory allocation in different retail outlets

- c. Usage of advanced planning and optimization tools with more information
- d. Implementation of collaborative planning and design
- e. Effective medium to collect, locate and disseminate traceability data
- f. Development of knowledge tools to gain insights into supply chain performance
- g. Virtual integration of supply chain partners for better coordination

3. Planning and optimization: Enterprises can use these techniques to anticipate problems and issues and, therefore, better respond to the needs of the customer. These web applications include decision technologies such as data management, statistical analysis, forecasting, data mining, optimization models, exact and heuristic solution methods, simulation, economic models, game theory, etc. Many ASPs (application service providers) provide these tools over Internet at affordable prices. The Internet enables in accessing the decision support systems that can access and process large volumes of data over Internet.

Understanding the impact on industry structure, competitive challenges and performance

Enterprises across industries are experiencing and responding to competitive challenges that emerge because of changes in industry structure. Music and Personal computers are two good examples that responded to changes in industry structures by adopting e-business models. The Internet has direct impact of performance of supply chain as a whole and in parts through application of various collaboration tools. The performance improvements enabled by Internet can be observed in the following dimensions:

- a. Efficiency of individual supply chain partners
- b. Effectiveness of e-commerce and time-delivery performance
- c. Effectiveness of cross functional integration and customer satisfaction /responsiveness

Not limiting to one or two industries, the impact of Internet is clearly visible in today's enterprises across industries. May it be in the areas of process improvements, collaborations, transaction processing or decision support, and Internet play a definitive role in improving performance.

1.2 KEY SUCCESS FACTORS FOR E-SCM

The success of e-SCM depends on many factors. According to APICS, The Association for Operations Management, enterprises evolve through various stages: Multiple dysfunctional, Semi functional, integrated enterprise and extended enterprise. They evolve from functional silo approach to integrated process oriented approach. The "integrated and extended enterprises" stages are enabled by information technology and Internet. Following are the characteristics of integrated and extended enterprises:

Characteristics of integrated enterprise

1. New focus on process orientation, moving away from functional silo approach
2. Internal process integration through enterprise resource planning systems implementation
3. Intranets, etc., across functions for improved cross functional collaboration
4. Cross functional design teams
5. Enhanced warehousing, logistics, forecasting, etc. through better coordination

Characteristics of extended enterprise

1. Process integration across supply chain partners
2. Eventual electronic information connections among multiple partners
3. ERP-to-ERP links among supply chain partners for better information sharing
4. Leverage E-commerce model

The key success factors for e-SCM from the focal enterprise perspective are as follows:

1. **Integrated enterprise:** A pre-requisite for implementing e-SCM strategy is to achieve integrated enterprise stage. Enterprises that are moving into extended enterprise stage have just started to develop e-supply chains.
2. **Collaboration readiness:** Process orientation is a pre-requisite for successful collaboration. Whether it is collaboration between internal functions or with supply chain partners, well defined processes aid in communicating and realizing collaboration benefits.
3. **Effective leadership:** Like continuous improvement strategy, e-SCM projects require effective leadership sharing vision and providing support not only to internal people but also for supply chain partners. The initiatives of extending ERP benefits to supply chain partners begin with decisions from organization leaders. It also provides necessary guidance on developing conflict resolution procedures to facilitate seamless integration.
4. **Information integration strategy:** It involves integration of process and systems interfaces with supply chain partners. While the process integration requires involvement of cross functional teams from supply chain partners, the systems integration requires involvement from multiple technology partners. Many times there would be trade-offs among supply chain partner initiatives like collaboration vs. information security and inventory vs. information visibility. There would also be hostile positions among technology partners that require adoption of standards like web services or SOA for systems integration.
5. **Appropriate e-business strategy:** e-SCM includes application of e-business model implementation either in the form of business-to-business, business-to-customer or e-market places. The models are aligned with e-SCM strategy and corporate strategy. It requires critical decisions like who in the supply chain should invest in information technology infrastructure, how information security is assured, how information is shared and analyzed.
6. **Knowledge management strategy:** e-business strategy supported by information integration results in large volumes of data collected from various transactions across the supply chain. When organized and analyzed using mathematical or simulation models, the data provides valuable insights into customer behavior, demand forecasts and process bottlenecks. The knowledge derived from data analysis can be shared with supply chain partners for process improvements.
7. **Well defined performance measures:** You can't manage what you don't measure is an old management saying. Well defined measures that can be applied across supply chain partners support better performance monitoring. Best-in-class benchmarking, process benchmarking or competitive benchmarking can be used for performance excellence.

8. **Effective change management strategy:** This will be biggest challenge that any enterprise implementing e-SCM strategy would face. As resistance to change is natural, the change management strategies shall be defined along with e-SCM strategy formulation. The change management strategy should seamless integration of process, people, partners, systems projects. Effective change management strategy is always well complemented with effective leadership.

1.3 BENEFITS OF E-SCM

Enterprises in adopting e-SCM strategy will realize both tangible and intangible benefits as following:

Tangible benefits (measurable in units/cost savings/revenues)	Intangible benefits (derived measures/ opportunity costs)
Increased forecasting accuracy Reduced inventory Increased order fill rates Increased perfect order fulfillment Better delivery through reduced cycle times Reduced supply chain response time Increased production flexibility Reduced supply chain costs Reduced cash to cash cycle time Increased asset turn over Faster speed to market of new products Increased profitability	Increased customer satisfaction Improved customer service More efficient use of human resources Increased sharing of information and technology Stronger emphasis on supply chain whole Stronger focus on core competences Enhanced public image Greater trust and interdependence Competitive advantage over other supply chains Improved new opportunities Transformed culture Improved market share Improved shareholder value

The above benefits are a result of three key characteristics of e-SCM: integration, information and collaboration with a multi-level supply chain management framework (organization, processes, people, technology and measures).

Below is a case of a hi-tech products manufacturer who enabled electronic supply chain and set the standards for its trade partners to increase market share rapidly:

Hi-tech manufacturer’s electronic supply chain

A hi-tech systems manufacturer that was admired to have grown at fastest rate found itself in a strange situation. The manufacturer realized that growth depended on their ability to scale manufacturing, distribution and other supply chain processes along with people quickly. As a strategy they decided to implement an e-SCM strategy. They outsourced most of the manufacturing and logistics activities, and used networking technology to link suppliers and distributors tightly to their in-house processes. The outsourcing strategy paid off by allowing them to concentrate on core competencies: new product development, looking after customer needs and brand management.

The manufacturer’s electronic supply chain seamlessly links customers, prospects, partners, suppliers and employees in a multi-party, multi-location electronic network. This e-network not only acts as the glue holding together all the internal operations of the supply chain, but also enables all the parties involved to present a unified face to the outside world, with the result that all the working

parts look and act as if they are one company. At the heart of e-supply chain system are two portals:

1. The customer portal
2. The manufacturing portal

The customer portal

The customer portal is a gateway to comprehensive resources for customers, resellers, suppliers and partners. It presents the information stored in ERP databases, legacy systems and client/server systems. The customer portal has four key components:

1. Market-place: a dynamic on-line products catalogue used by thousands of authorized representatives of direct customers and partners. It contains a suite of applications for order processing that enables customers to configure, price, route and submit orders.
2. Status Agent: gives the sales force, direct customers and partners immediate access to critical information on the status of orders.
3. Customer Service: for non-technical information.
4. Technical Assistance and Software Library: For troubleshooting, downloads and technical support.

After the implementation it was noted that Over 90 per cent of the company's orders are received via customer portal making the portal most valuable website.

The manufacturing portal

The company's manufacturing system includes 34 plants globally, of which only two are owned by it. The result of this manufacturing outsourcing is a huge contribution to profits. Their suppliers not only make all of the components and perform 90 per cent of the sub-assembly work, but they also undertake 55 per cent of the final assembly. The company's suppliers not only make all of the components and perform 90 per cent of the sub-assembly work, but they also undertake 55 per cent of the final assembly. Thus, the suppliers ship directly to customers without any value addition from the hi-tech manufacturer. The end result, company does not manufacture at all. They call it "virtual manufacturing", where the subcontractors follow manufacturing processes and systems as defined by the hi-tech manufacturer.

The contract manufacturers, assemblers, distributors and logistics partners connect with the hi-tech manufacturer through a supply chain extranet manufacturing portal. It enables the hi-tech manufacturer and its partners to access real-time manufacturing information including data on demand forecasts, inventory and purchase orders. Through the manufacturing portal it exercised centralized control for planning and decentralized control for execution.

The hi-tech manufacturer's e-supply chain initiatives resulted in:

- A single enterprise system: embracing contract manufacturers, distributors, logistics partners, development engineers, service engineers, sales representatives and customers into a single information system. This enabled business partners to manage much of the hi-tech manufacturer's supply chain.

- Information sharing in real time: the entire supply chain operates from the same demand signal. This means that any change in one node of the network is immediately transmitted throughout the network.
- Direct fulfillment: whereby most of the company's contract manufacturing partners' ship directly to customers. The suppliers directly fulfill 55 per cent of the company's customer orders.
- Automatic testing: to ensure product quality by creating test cells on supplier production lines. The cells are able to automatically configure test procedures when an order arrives.
- Rapid new product introduction: reducing the number of iterations required during prototype development. Automation and better connectivity has also reduced time-to-market by three months.

1.4 SELF-ASSESSMENT QUESTIONS

1. Define the term "electronic supply chain management". An enterprise supply chain uses Internet for email communication with its customers and suppliers. Can we say that the enterprise is managing an electronic supply chain? Provide rationale.
2. Illustrate logical electronic supply chain framework and elucidate on the key business processes.
3. Describe the three enablers of e-supply chain management?
4. What are the key success factors of creating and managing e-supply chains?
5. List the benefits of e-supply chain management.

