

EVOLUTION OF SUPPLY CHAIN MANAGEMENT

Aditya Bahety , Anika Agarwal , Akshay Shrivastava , Aanya Gadde, Charvi Patel

Abstract : This paper discusses the evolution of transportation and logistics into supply chain management. It provides a timeline of evolution for the same. It also discusses the importance of supply chain management (hereafter referred to as SCM) as well as some future trends in this field. The paper consists purely of secondary research.

INTRODUCTION

Origin, meaning and usage of 'logistics' and 'SCM'

It is quite clear that transportation and logistics are subsets of SCM. SCM includes concepts of both these fields and also adds a few concepts of its own (which are traditionally not considered a part of logistics or transportation).

The term 'SCM' was first used by consultants in the early 1980s (Oliver et al, 1982). The usage of the term 'logistics' in the title of papers in the 'Journal of Business Logistics' was at its peak in the mid-1990s. Since then the usage of this term has declined and research on SCM has become much more popular. It is also noteworthy that the organisation which conducts basic research into these fields changed its name from the Council of Logistics Management to the Council of Supply Chain Management Professionals. The aforementioned organisation has defined Logistics as follows:

"Logistics Management is that part of Supply Chain Management that plans, implements, and controls the efficient, effective forward and reverse flow and storage of goods, services and related information between the point of origin and the point of consumption in order to meet customers' requirements."

(<http://www.cscmp.org/Website/AboutCSCMP/Definitions/Definitions.asp>, CSCMP 2005)

The term logistics, although coined in the English language in the early 1800s in a magazine article, gained popularity in 18th century France. One of Napoleon's staff officers, had his duties limited to troop lodging and camp preparation. He realized that careful preparation and management of supplies was essential to success in battle. This is where 'logistics' began to gain prominence. Prior to the 1950s, logistics was still looked upon in military terms. Its potential was not fully understood by managers in organizations, and their idea of this field was fragmented. Very little was done to balance and integrate logistical activities in organizations at that time. Research played a major role in bringing greater clarity and attention to this field.

In the 1960s and 70s, the study of physical distribution and logistics gained popularity. It was realized that logistics costs were very high and could be brought down, and as a result, physical distribution and logistics received even greater managerial attention.

The term SCM has been defined by CSCMP as follows:

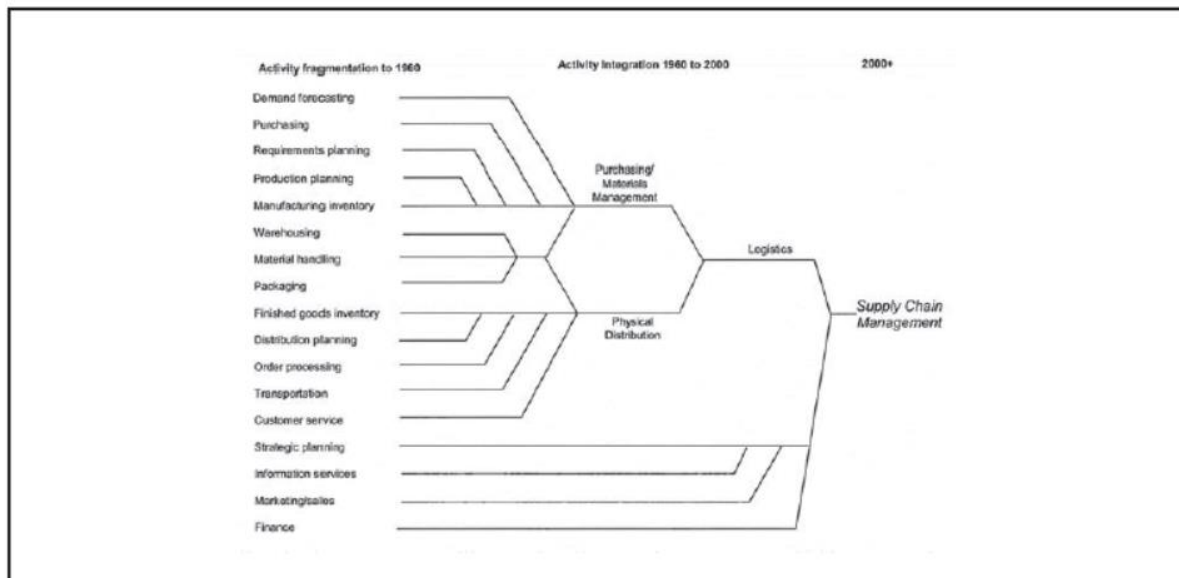
"Supply Chain Management encompasses the planning and management of all activities involved in sourcing and procurement, conversion, and all logistics management activities. Importantly, it also includes coordination and collaboration with channel partners, which can be suppliers, intermediaries, third-party service providers, and customers. In essence, Supply Chain Management integrates supply and demand management within and across companies."

As mentioned earlier, the difference between SCM and logistics is that SCM includes things which is generally outside the ambit of logistics, such as the management of returns, product development and distribution, and relationships pertaining to marketing. In essence, SCM manages product flows across several functions and organizations, while logistics is mainly to do with product flows within the organization.

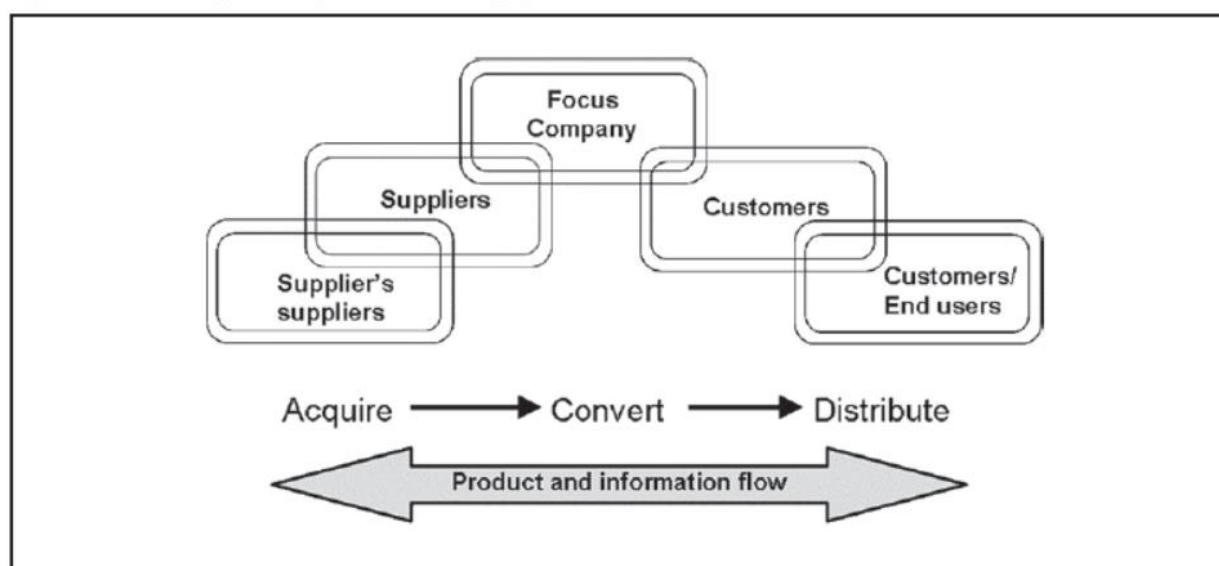
Where and how does OR come into all this?

With the advent of problem solving techniques through the field of operations research, transportation problems have become much easier to deal with. The logistics of companies have become much more competitive. OR has made decision making easier and more efficient by simplifying the complexities in problems and in understanding how different parts of a system interact with each other.

In the 60s and 70s, when logistics was still a young field and consisted mainly of physical distribution, the emergence of computation and of programming languages such as FORTRAN made OR a much more powerful tool, and was used more widely in logistics. Today, with the prevalence of much more powerful computers, the internet, and newer concepts such as the Internet of Things, OR has become all the more effective in the fields of logistics and SCM.



(logistics as a subset of SCM)



(Multiple functions of SCM)

A concise timeline of evolution of logistics and SCM is as follows:

1810 – “Logistics” word used for the first time

A famous publication, ‘The Scots Magazine and Edinburgh Literary for January 1810’ included an article saying that Dr. Wilhelm Muller was going to write a book on the elements of science of war which comprised of the “logistics” of soldier movements, this was the first time the word was used in the English language.

Around 100 years after this incident, ‘The Independent’ newspaper had an article describing “Supply Chain”, which was in relation to the war activities.

1913 – The invention of the ‘Assembly line’

The famous car manufacturer Ford installed their first moving assembly line which enabled them to produce the vehicles at a faster rate, thereby ensuring economies of scale.

1940 – Pallets and lift mechanization

In the period of 1940s to 1950s, the main aim of the logistics field was to find out methods to increase the efficiency of keeping stock in the warehouse, the use of racking and finally the best possible design for a warehouse. The concept of using pallets gained a lot of publicity during this time.

1950-The birth of ‘Transport Management’

The use of intermodal containers along with ships, trains and trucks to send items wherever they needed to be saw the birth of ‘Transport Management’ and made the way for the globalization of supply Chain Management.

1952-Barcode was patented.

1960-The discovery was made that computer systems had the capability to transfer the documents from one computer to another.

1961- IBM develops the earliest version of Material Requirement Planning (MRP)

1971-The concept of Reverse logistics started in which the consumer played the role of a seller, who distributed his waste materials where there is a demand.

1985-Fed Ex invented a new computerized tracking system to track the packages in real time.

1988-The term “Lean Manufacturing” was established.

2003-Walmart announces mandatory RFID tag norms

2010-Emergence of smart factory

In a smart factory, there is extensive use of sensors, Internet of things, big data, machine learning and artificial intelligence which combine to help the manufacturers increase the performance and supply chains are able to track parts and do maintenance when it needs to be done.

CONCEPTS OF SUPPLY CHAIN MANAGEMENT

Supply chain management involves a series of activities which should be completed in a well organized and well timed manner. Otherwise the product will be available when needed by a consumer.

Some important concepts to be considered to have an efficient supply chain management are:

Production

- Fundamental concern is how to find a balance between efficiency and responsiveness.
- Factories are built to either be product focused or functional focused.
- Warehousing is done through stock keeping unit, job lot storage, or cross-docking

Inventory

- Inventory includes everything from raw materials to finished goods.
- Cycle inventory, safety inventory and seasonal inventory are the three options when it comes to holding and creation of inventory

Location

- Location refers to the geographical position of the facilities.
- Efficiency vs responsiveness is the decision whether to decentralize the facility and bring it close to the customers or to centralize the facility and obtain economy of scale
- Cost and performance are heavily affected by the location of supply chain

Transportation

- Transportation is the movement of material and/or finished goods
- It is done through road, railway, ships etc.

Information

- All decisions involved in supply chain management are based on the timely availability of information about the above four drivers
- Information is used for coordinating daily activities and to plan and anticipate future demands.

The most important concept in supply chain management is risk pooling.

Risk pooling is a statistical concept which suggests that if demand is aggregated then the demand variability is reduced, which means spread of demand in different geographical locations will be likely that more demand from one customer will offset less demand from another. This reduces safety stock and average inventory.

Why is Supply Chain Management Important?

a) IMPROVE CUSTOMER SERVICES

Companies need to boost customer services by ensuring the following:

1. the right product combination and quantity is delivered : if you buy 3 books from Flipkart and only one of them actually arrive, one wrong book is delivered and one is missing, customer trust on Flipkart will reduce, which would lead to bad reviews and the customer won't return to the platform again.
2. Availability of product at right location: Customer satisfaction is reduced if car's tyre punctures and non availability of parts in auto repair shop delays in repairs.
3. Right After Sale Support : Quick service or replacement of products, because customer satisfaction will diminish when a product stops operating and repairs aren't made for long.
4. Accurate Delivery Time – By fulfilling customers expectations by delivering products on time .For eg customer satisfaction will diminish if Dominos delivers the pizza 2 hours late.

b) REDUCE OPERATING COSTS

The management can reduce the operating costs by the following methods:

1. Decreases Purchasing Cost - Retailers use methods like FIFO and LIFO so that high inventory holding cost in stores can be avoided .Taking example of electronic stores who have to deliver Whirlpool Refrigerators fast so that high inventory costs can be avoided.

2. **Decreases Production Cost** - Material shortages can be avoided that can lead to shutdown of production by manufacturers using supply chain by reliable deliver of assembly parts at plants. For example, an unexpected parts shipment delay that causes an auto assembly plant shutdown can cost millions of rupees per day in lost wages.

3.Reduces Total Supply Chain Cost- Supply chain managers are required by manufacturers and retailers to design networks that satisfies customer service expectations at least cost. When a supply chain is efficient it can help a firm to be more competitive in the market. Taking the example of DELL's revolutionary computer supply chain approach making each computer customised on orders and then delivering it directly to customers. this helped DELL reducing its cost by avoiding costs like inventory cost.

c) IMPROVE FINANCIAL POSITION

1. **Increases Profit Leverage** -Supply chain managers are important for businesses because they help in cost cut down . For instance, Indian consumers eat 2.7 billion packages of Maggi annually, so decreasing Maggi supply chain costs just one cent per maggi box would result in \$13 million rupees saved industry-wide as 13 billion boxes of maggi flowed through the improved and efficient supply chain over a three to five year period.

2. **Decreases Fixed Assets**- Cost incurred in transportation, warehouses and machines can be avoided by the efficient use of supply chain management. For example, cost of building extra warehouses can be avoided by redesigning networks that serves the customers.

3. **Increases Cash Flow** – It is appreciated by the firm the contribution made by the supply chain management in reduced time of product flows to customers . For example, if a product is made and delivered in 15 days rather than 55days, it can invoice the customer 40 days sooner.

SOCIETAL ROLES OF SCM

ENSURE HUMAN SURVIVAL

1. **Helps Sustains Human Life** -Humans rely on supply chains to deliver daily necessities such as food,water,items of daily use. Any breakdown of these delivery pipelines would quickly threaten human life.
2. **Improves Human Healthcare** -During a medical emergency, quick delivery of medicines and healthcare supplies can be the difference between life and death.
3. **Protects Humans from Climate Extremes** -A power blackout can lead to threat to human life and energy supply chain delivers energy for household and commercial purposes can prevent such threats.

IMPROVES QUALITY OF LIFE

1. **Helps in economic growth**- With the development of supply chain infrastructure, goods can be made available at low cost and quickly by the businesses as interstate connectivity and railroads networks have improved resulting in improvement of economy.
2. **Change in Standard of Living**: Because of development in economy shoppers can bear to purchase more merchandise with their pay accordingly enhancing the Standard of living. For instance, it is ascertained that supply chain costs make up 20% of a good's cost in the U.S. be that as it may, 40% of a good's cost in China. In the event that vehicle harm is included, these costs make up 60% of a good's cost in China. The high Chinese supply chain cost is a noteworthy obstruction in enhancing the way of life for Chinese nationals. In like manner, China has begun taking monstrous efforts to build up its infrastructure.
3. **Occupation Creation** – Supply chain experts plan and work the greater part of the supply chains in a general public and oversee transportation, warehousing, stock administration, bundling and coordinations data. Thus, there are numerous employments in the supply chain field. For instance, in the U.S., logistic exercises speak upto 9.9% of all dollars spent on goods and services in 2006. This converts into 10,000,000 U.S. logistics employments.
1. **Chance to Decrease Pollution** – Supply chain exercises require bundling and item transportation. As a side-effect of these exercises, some undesirable natural toxins, for example, cardboard waste and carbon dioxide fuel outflows are produced. For instance, paper and paperboard represented 34% of U.S. landfill squander in 2005. Just half of the 84 million tons of paper and paperboard squander were reused. Additionally, carbon dioxide emanations from transportation represented 33% of aggregate U.S. CO2 emissions in 2005. As originators of the system, store network experts are in a key position to grow more supportable procedures and strategies.
2. **Opportunity to Decrease Energy Utilization** – Supply chain exercises include both human and item transportation. As a side-effect of these exercises, rare energy is drained. For instance, presently transportation represents 30% of world energy utilized and 95% of worldwide oil utilization. As designers of the system, supply chain experts have the part of creating energy effective supply chains that use less resources.

PROTECT CULTURAL FREEDOM AND DEVELOPMENT

fending Human Freedom – Citizens of a country largely depend on military logistics since they strategically locate aircraft, ships, tanks, missiles and other weapons in positions that provide maximum security to soldiers and other citizens.

PROTECT DELIVERY OF NECESSITIES

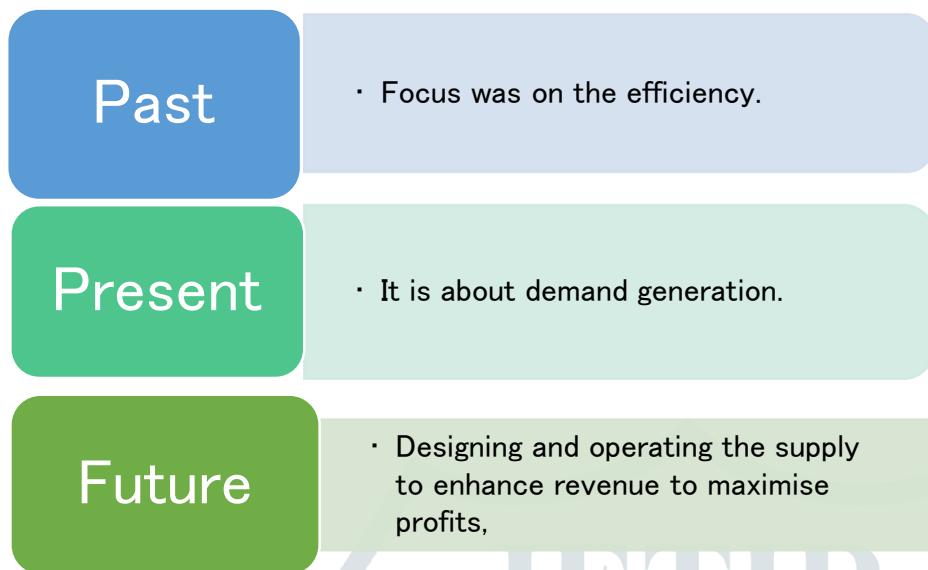
Some of the methods that help in preventing terrorists from accessing important systems are sophisticated packaging techniques, RFID inventory tracking and state of the art surveillance cameras.

FUTURE OF SUPPLY CHAIN MANAGEMENT AND LOGISTICS

Talking about the future of supply chain management in logistics, the growing interest of supply chain management in logistics is due to globalisation, outsourcing and free trade.

Better management of the associated supply chain process will be required when there is a shift in the movement and consumption of goods.

However many significant changes have been noted in the field of supply chain management in logistics.



The above view replaces the important objective of the company to minimize supply chain costs, which will boost supply chain management in the eyes of the top management. In order to enhance the revenue effects, a new objective came into existence which is called ROSCA. ROSCA is return on supply chain assets.

$ROSCA = \text{Revenue} - \text{Costs} / \text{Assets}$

Revenue= Supply chain's contribution to the sales of the firm.

Costs= Expenses incurred in supply chain processes.

Assets= Investment made in facilities and equipment to support the supply chain processes.

We will take an example of a company which we explain us about the challenges faced by the company, new methods adopted in SCM and their impacts and results on the company:

STARBUCKS

Starbucks has been one of the most successful worldwide brands but still it has gone through periods of supply chain problems.

PROBLEMS:

- Less than 50% of the outlet deliveries were arriving on time
- Poor outsourcing decisions had led to more expenses.
- The supply chain was not able to grow by design which gave rise to further complications.

THE PATH TO COST REDUCTION:

In order to improve performance the company had 3 main objectives:

1. Supply chain should be reorganised.
2. Reduce cost to serve.
3. For future capability groundwork should be setup.

In order to fulfil all these objectives, the company divided all its supply chain functions into 4 key groups: "plan", "make" and "deliver".

RESULTS:

When the transformation process was completed, in 2009 and 2010 the company had made savings more than \$500 million out of which large proportion came out of supply chain

CONCLUSIONS:-

- 1) Revenue generation strategy and cost reduction both are important: Designing the supply chain processes that result in a level of logistics customer base is the basis for supply chain strategy. The cost of the processes will be managed to maximize return on supply chain assets.
- 2) Coordination and collaboration, along with trust, are the most important elements: When the supply channel is composed of multiple separate members, realizing the opportunities afforded by acting in concert requires a collaborative effort.
- 3) Information sharing will keep on continuing with advancement in technology and is called coordination,
- 4) Better definition and refinement are required in the methods of benefits: After identifying the benefits of supply chain co operations, actions need to be taken to share the benefits and keep the coalition operating in a manner to continue producing these benefits.
- 5) Logistics curricula should be expanded to include the subjects of relationship and trust building: Boundary spanning management is based on relationship collaboration, compromise and coordination which needs to be included in the course of logistics education.
- 6) Operations, purchasing, and logistics will merge, probably under the supply chain head: The wide scope of supply chain management will have an impact on the firm within an organisation. SCM requires management across many functions within the firm.
- 7) Boundary-spanning metrics is required to identify supply chain benefits and track their location: Such system will help to identify magnitude and extent of benefits sharing.

References:

Ballou, Ronald H. (2006). "Revenue Estimation for Logistics Customer Service Offerings,"

The International Journal of Logistics Management. v. 17, n. 1, p. 21-37.

Ballou, Ronald H.; Stephen Gilbert, and Ashok Mukerjee (2000), "New Managerial Challenges from Supply Chain Opportunities" Industrial Marketing Management, v. 29. n. 1, p. 7-18.

Converse, Paul D. (1954), "The Other Half of Marketing," Twenty-sixth Boston Conference on Distribution (Boston: Boston Trade Board), p. 22.

Drucker, Peter F. (1962), "The Economy's Dark Continent," Fortune, (April), p. 103, 265, 268, and 270.

Fawcett, Stanley E. and Gregory M. Magnan (2002), "The Rhetoric and Reality of Supply Chain Integration," International Journal of Physical Distribution & Logistics Management, v. 32, n. 5, p. 339-361.

Heskett, J. L.; N. A. Glaskowsky, Jr., and R. M. Ivie (1973), Business Logistics, 2. ed. (New York: The Ronald Press), p.14-21.

Heskett, J. L.; Robert M. Ivie, and Nicholas A. Glaskowsky, Jr. (1964), Business Logistics: Management of Physical Supply and Distribution (New York: The Ronald Press).

Kobayashi, I. (1973), "Management of Physical Distribution Cost," Proceedings of International Physical Distribution Conference, Tokyo, p. 9.

LaLonde, Bernard J. and Leslie M. Dawson (1969), "Pioneers in Distribution," Transportation and Distribution Management (June), p. 58-60.

LaLonde, Bernard J. and Paul H. Zinzer, (1976) Customer Service: Meaning and Measurement (Chicago: National Council of Physical Distribution Management).

Lambert, Douglas M.; Martha C. Cooper, and Janus D. Pagh (1998), "Supply Chain Management: Implementation and Research Opportunities," The International Journal of Logistics Management, v. 9, n. 2, p. 1-19.

Lewis, Howard T.; James W. Culliton, and Jack D. Steele (1956), The Role of Air Freight in Physical Distribution (Boston: Division of Research, Graduate School of Business Administration, Harvard University).

Rogers, D., & Leuschner, R. (2004). Supply Chain Management: Retrospective and Prospective. Journal of Marketing Theory and Practice, 12(4), 60-65. Retrieved from <http://ezproxy.svkm.ac.in:2100/stable/40470179>

Trends in transportation and logistics - M.Grazia Speranza Università degli Studi di Brescia