

Introduction to logistics and supply chain management

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Outline

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Supply chain

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Production and distribution systems

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What is logistics?

Definition (Goetschalckx (2011)). Logistics is concerned with the organization, movement, and storage of material and people.

Definition (Ghani et al. (2022)). Logistics is the discipline that studies, in an organization, the management and implementation of the operations concerning the flow of tangible goods (materials, food and medical supplies, refuse, equipment, weapons, etc.) from their sources (suppliers, mines, crop fields, etc.) to their points of utilization or consumption or disposal (retailers, landfills, crop fields, etc.) to meet the objectives of the organization.

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What is logistics management?

Definition (Council of Supply Chain Management Professionals (CSCMP)). 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.

What is logistics management?

Logistics Management activities typically include

- ▶ inbound and outbound transportation management
- ▶ fleet management
- ▶ warehousing
- ▶ materials handling
- ▶ order fulfillment
- ▶ logistics network design
- ▶ inventory management
- ▶ supply/demand planning
- ▶ management of third-party logistics services providers
- ▶ somewhat also includes sourcing and procurement, production planning and scheduling, packaging, assembly, and customer service

Remark. The emphasis is not on simply minimizing transportation or inventory cost but on taking a systems approach to logistics management.

Flows in supply chains

Logistics focuses of three types of flows:

1. **Material flow**: raw materials, work-in-progress (WIP), sub-assemblies, and finished goods, services, people, etc.
2. **Monetary flow**: invoices, payments, credits, etc.
3. **Information flow**: status of inventory, orders, deliveries, marketing promotions, plant capacities, etc.

Lead to investing in Enterprise Resource Planning (ERP) software packages

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What is supply chain?

Definition (Christopher (1998)). A supply chain is a network of organizations that are involved through upstream and downstream linkages in the different processes and activities that produce value in the form of products and services in the hands of the ultimate customer.

Definition (Goetschalckx (2011)). A supply chain is an integrated network of resources and processes that is responsible for the acquisition of raw materials, the transformation of these materials into intermediate and finished products, and the distribution of the finished products to the final customers. It includes among others vendors, manufacturing and distribution facilities, forwarders, distributors, and wholesalers, third-party logistics providers, and all other entities involved with the sourcing, transformation, and transportation of products until they reach the customer.

Remark. (Goetschalckx (2011)) Simply put, Supply chain activities = Production + Logistics

What is supply chain?

Definition (Ravindran et al. (2024)). A supply chain consists of the following:

1. A series of stages (e.g., suppliers, manufacturers, distributors, retailers, and customers) that are physically distinct and geographically separated at which inventory is either stored or converted in form and/or in value.
2. A coordinated set of activities concerned with the procurement of raw materials, production of intermediate and finished products, and the distribution of these products to customers within and external to the chain.

Definition (Simchi-Levi et al. (2014)). A network of suppliers, manufacturing centers, warehouses, distribution centers, and retailer outlets, as well as raw materials, work-in-process inventory, and finished products that flow between the facilities.

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Example: Manufacturing systems



Figure: Souce:

<https://corporatefinanceinstitute.com/resources/management/supply-chain/>

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Definition (Production system (Ravindran et al. (2024))). take physical inputs (e.g., materials and labor) and conceptual inputs (e.g., projected consumer demand, short-term and long-term business plans) to achieve an output of physical products that ultimately are sold to satisfy customers.

Definition (Distribution systems (Ravindran et al. (2024))). take as their input the products generated by the production system and, along with labor and other plans related to business goals and customer demand, coordinate the movement, storage, and transport of those products to ultimately satisfy that demand, hopefully on-time and in the right quantity.

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Example: Manufacturing systems

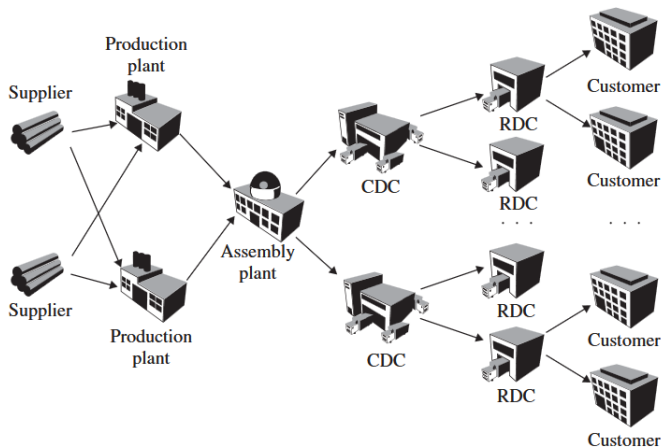


Figure: Souce: Ghiani et al. (2024)

Example: Manufacturing systems

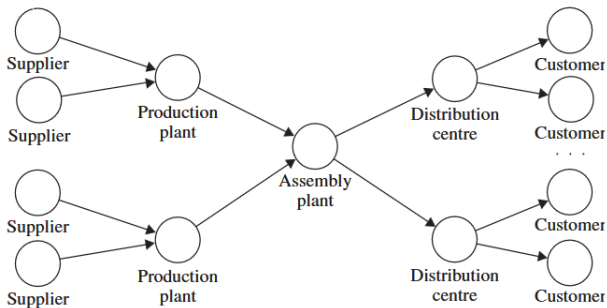


Figure: Representation as a directed graph (Source: Ghiani et al. (2024))

Example: e-Commerce



Figure: Souce:

<https://corporatefinanceinstitute.com/resources/management/supply-chain/Examples>

Example: Waste collection systems

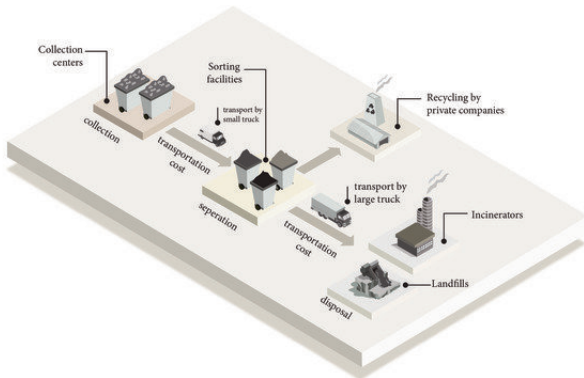


Figure: Souce: https://www.researchgate.net/figure/Waste-management-supply-chain_fig2_333072072

Example: Postal services

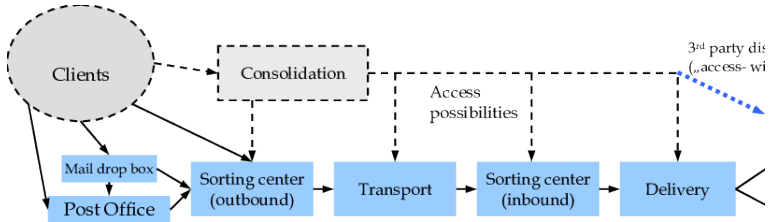


Figure: Source:

https://www.researchgate.net/figure/The-postal-value-chain_fig4_242935732

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What is supply chain management (SCM)?

Definition (CSCMP). Supply Chain Management encompasses the planning and management of all activities involved in **sourcing and procurement, conversion, and all Logistics Management activities.**

Definition (Stadtler and Kilger (2008)). The **task of integrating organizational units along a supply chain** and **coordinating materials, information, and financial flows** in order to fulfill the demands of the ultimate customer with the aim of improving competitiveness of a supply chain as a whole.

Definition (Simchi-Levi et al. (2003)). SCM is a set of approaches utilized to efficiently integrate suppliers, manufacturers, warehouses and stores, so that merchandise is produced and distributed at the right quantities to the right locations, and at the right time in order to minimize system-wide costs while satisfying service level requirements.

What is supply chain engineering?

Definition (Ravindran et al. (2024)). Supply chain engineering encompasses the following key activities for the effective management of a supply chain:

1. Design of the supply chain network, namely the location of plants, DCs, warehouses, etc.
2. Procurement of raw materials and parts from suppliers to the manufacturing plants
3. Management of the production and inventory of finished goods to meet customer demands
4. Management of the transportation and logistics network to deliver the final products to the warehouses and retailers
5. Management of the integrity of the supply chain network by mitigating supply chain disruptions at all levels

Remark. The emphasis is on the design of the supply chain network and the use of mathematical models and methods to determine the optimal strategies for managing the supply chain.

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Levels of logistics planning

1. Strategic
2. Tactical
3. Operational

Strategic planning

- ▶ Decisions deal primarily with the design of the supply chain network and the selection of partners.
- ▶ Decisions span several years and are characterized by their permanence and importance to economic survival of the company.
- ▶ Examples:
 - **Network design**: where to locate and at what capacity?
 - ▶ Number and location of plants and warehouses
 - ▶ Selection of distribution channels
 - ▶ Plant and warehouse capacity levels
 - **Production and sourcing**: make or buy?
 - ▶ Produce internally or outsource
 - ▶ Choice of suppliers, sub-contractors, and other partners
 - ▶ Switch from company-owned to third-party logistics
 - **Information technology**: how to coordinate the chain?
 - ▶ Develop software internally or purchase commercially available packages - e.g., SAP, Oracle.
 - identification and ranking of product-customer pairs
- ▶ Strategic planning has lack of quantitative and validated data for the full time horizon of the decision and has to deal with uncertainty of operating environments.

Tactical planning

- ▶ Decisions span quarterly to couple of years
- ▶ Decisions are made in a less uncertain environment relative to strategic decisions
- ▶ Examples:
 - **Purchasing decisions:** how much to buy and when?
 - **Production planning decisions:** how much to produce and when?
 - **Inventory management decisions:** how much and when to hold physical goods in order to balance the costs of resupply with the risks of shortages?
 - **Transportation decisions:** which modes to choose and how frequently to ship on them?
 - amount of product to be picked and shipped to a customer
 - **Distribution decisions:** how to coordinate distribution center (DC) replenishment with production schedules?
 - **Procurement decisions:** how to prepare contract to purchasing raw material from a supplier?

Operational planning

- ▶ Decision span made on one day to one week
- ▶ Operational uncertainty that existed when the strategic and tactical decisions were made is not present at this stage
- ▶ Typically have a permanence of one day to one week.
- ▶ Examples:
 - weekly/daily production schedule
 - amount of product to be picked and shipped to a customer
 - amount of product purchased from a supplier.
 - setting delivery schedules for shipments from suppliers
 - routing and loading of trucks

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- ▶ Apple
- ▶ Amazon
- ▶ PM Gatishakti

Thank you!