

1. Logistics

Logistics is the management of the flow of goods between the point of origin and the point of consumption in order to meet some requirements, for example, of customers or corporations. The resources managed in logistics can include physical items, such as food, materials, animals, equipment and liquids, as well as abstract items, such as time, information, particles, and energy. The logistics of physical items usually involves the integration of information flow, material handling, production, packaging, inventory, transportation, warehousing, and often security. The complexity of logistics can be modeled, analyzed, visualized, and optimized by dedicated simulation software. The minimization of the use of resources is a common motivation in logistics for import and export.

1.1 Origins and definition

The prevalent view is that term logistics comes from the late 19th century: from French *logistique* (*loger* means to lodge). Others attribute a Greek origin to the word: *λόγος*, meaning reason or speech; *λογιστικός*, meaning accountant or responsible for counting.

The Oxford English Dictionary defines logistics as "the branch of military science relating to procuring, maintaining and transporting material, personnel and facilities." However, the New Oxford American Dictionary defines logistics as "the detailed coordination of a complex operation involving many people, facilities, or supplies", and the Oxford Dictionary on-line defines it as "the detailed organization and implementation of a complex operation" Another dictionary definition is "the time-related positioning of resources". As such, logistics is commonly seen as a branch of engineering that creates "people systems" rather than "machine systems".

According to the Council of Logistics Management, logistics includes the integrated planning, control, realization, and monitoring of all internal and network-wide material, part, and product flow, including the necessary information flow, industrial and trading companies along the complete value-added chain (and product life cycle) for the purpose of conforming to customer requirements.

Logistics is the process of planning, implementing, and controlling the effective and efficient flow of goods and services from the point of origin to the point of consumption.

Academics and practitioners traditionally refer to the terms operations or production management when referring to physical transformations taking place in a single business location (factory, restaurant or even bank clerking) and reserve the term logistics for activities related to distribution, that is, moving products on the territory. Managing a distribution center is seen, therefore, as pertaining to the realm of logistics since, while in theory the products made by a factory are ready for consumption they still need to be moved along the distribution network according to some logic, and the distribution center aggregates and process orders coming from different areas of the territory. That being said, from a modeling perspective, there are similarities between operations management and logistics, and companies sometimes use hybrid professionals, with for ex. "Director of Operations" or "Logistics Officer" working on similar problems. Furthermore, the term supply chain management originally refers to, among other issues, having a global vision of both production and logistics from point of origin to point of production. All this terms may suffer from semantic change as a side effect of advertising.

1.2 Logistics viewpoints

Inbound logistics is one of the primary processes of logistics, concentrating on purchasing and arranging the inbound movement of materials, parts, and/or finished inventory from suppliers to manufacturing or assembly plants, warehouses, or retail stores. Outbound logistics is the process related to the storage and movement of the final product and the related information flows from the end of the production line to the end user.

1.3 Logistics fields

Given the services performed by logisticians, the main fields of logistics can be broken down as follows:

Procurement logistics

Production logistics

Distribution logistics

After-sales logistics

Disposal logistics

Reverse logistics

Green logistics

Global logistics

Domestics logistics

Concierge Service

RAM logistics

Procurement logistics consists of activities such as market research, requirements planning, make-or-buy decisions, supplier management, ordering, and order controlling. The targets in procurement logistics might be contradictory: maximizing efficiency by concentrating on core competences, outsourcing while maintaining the autonomy of the company, or minimizing procurement costs while maximizing security within the supply process.

Production logistics connects procurement to distribution logistics. Its main function is to use available production capacities to produce the products needed in distribution logistics. Production logistics activities are related to organizational concepts, layout planning, production planning, and control.

Distribution logistics has, as main tasks, the delivery of the finished products to the customer. It consists of order processing, warehousing, and transportation. Distribution logistics is necessary because the time, place, and quantity of production differs with the time, place, and quantity of consumption.

Disposal logistics has as its main function to reduce logistics cost(s) and enhance service(s) related to the disposal of waste produced during the operation of a business.

Reverse logistics denotes all those operations related to the reuse of products and materials. The reverse logistics process includes the management and the sale of surpluses, as well as products being returned to vendors from buyers. Reverse logistics stands for all operations related to the reuse of products and materials. It is "the process of planning, implementing, and controlling the efficient, cost effective flow of raw materials, in-process inventory, finished goods and related information from the point of consumption to the point of origin for the purpose of recapturing value or proper disposal. More precisely, reverse logistics is the process of moving

goods from their typical final destination for the purpose of capturing value, or proper disposal. The opposite of reverse logistics is forward logistics."

Green Logistics describes all attempts to measure and minimize the ecological impact of logistics activities. This includes all activities of the forward and reverse flows. This can be achieved through intermodal freight transport, path optimization, vehicle saturation and city logistics.

RAM Logistics (see also Logistic engineering) combines both business logistics and military logistics since it is concerned with highly complicated technological systems for which Reliability, Availability and Maintainability are essential, ex: telecommunication systems and military supercomputers.

1.4 Military logistics

Punjab Regiment uses mules for carrying cargo during WWII. Animals have been used for logistic purposes by different people throughout history, the Roman army in particular preferred mules over donkeys for their carrying capacity.

In military science, maintaining one's supply lines while disrupting those of the enemy is a crucial—some would say the most crucial—element of military strategy, since an armed force without resources and transportation is defenseless. The defeat of the British in the American War of Independence and the defeat of the Axis in the African theater of World War II are attributed by some scholars to logistical failures. The historical leaders Hannibal Barca, Alexander the Great, and the Duke of Wellington are considered to have been logistical geniuses.

Military have a significant need for logistics solutions and so have developed advanced implementations. Integrated Logistics Support (ILS) is a discipline used in military industries to ensure an easily supportable system with a robust customer service (logistic) concept at the lowest cost and in line with (often high) reliability, availability, maintainability, and other requirements, as defined for the project.

In military logistics, logistics officers manage how and when to move resources to the places they are needed.

Supply chain management in military logistics often deals with a number of variables in predicting cost, deterioration, consumption, and future demand. The United States Armed Forces' categorical supply classification was developed in such a way that categories of supply with similar consumption variables are grouped together for planning purposes. For instance, peacetime consumption of ammunition

and fuel will be considerably lower than wartime consumption of these items, whereas other classes of supply such as subsistence and clothing have a relatively consistent consumption rate regardless of war or peace.

Some classes of supply have a linear demand relationship: as more troops are added, more supply items are needed; or as more equipment is used, more fuel and ammunition are consumed. Other classes of supply must consider a third variable besides usage and quantity: time. As equipment ages, more and more repair parts are needed over time, even when usage and quantity stays consistent. By recording and analyzing these trends over time and applying them to future scenarios, the US Armed Forces can accurately supply troops with the items necessary at the precise moment they are needed.[9] History has shown that good logistical planning creates a lean and efficient fighting force. The lack thereof can lead to a clunky, slow, and ill-equipped force with too much or too little supply.

1.5 Business logistics

One definition of business logistics speaks of "having the right item in the right quantity at the right time at the right place for the right price in the right condition to the right customer". Business logistics incorporates all industry sectors and aims to manage the fruition of project life cycles, supply chains, and resultant efficiencies.

The term business logistics has evolved since the 1960s due to the increasing complexity of supplying businesses with materials and shipping out products in an increasingly globalized supply chain, leading to a call for professionals called "supply chain logisticians".

In business, logistics may have either an internal focus (inbound logistics) or an external focus (outbound logistics), covering the flow and storage of materials from point of origin to point of consumption (see supply-chain management). The main functions of a qualified logistician include inventory management, purchasing, transportation, warehousing, consultation, and the organizing and planning of these activities. Logisticians combine a professional knowledge of each of these functions to coordinate resources in an organization.

There are two fundamentally different forms of logistics: one optimizes a steady flow of material through a network of transport links and storage nodes, while the other coordinates a sequence of resources to carry out some project.

1.6 Nodes of a distribution network

The nodes of a distribution network include:

Factories where products are manufactured or assembled

A depot or deposit is a standard type of warehouse thought for storing merchandise (high level of inventory).

Distribution centers are thought for order processing and order fulfillment (lower level of inventory) and also for receiving returning items from clients.

Transit points are built for cross docking activities, which consist in reassembling cargo units based on deliveries scheduled (only moving merchandise).

Traditional retail stores of the Mom and Pop variety, modern supermarkets, hypermarkets, discount stores or also voluntary chains, consumer cooperative, groups of consumer with collective buying power. Note that subsidiaries will be mostly owned by another company and franchisers, although using other company brands, actually own the point of sale.

There maybe some intermediaries operating for representative matters between nodes such as sales agents or brokers.

1.7 Logistic families and metrics

A logistic family is a set of products which share a common characteristic: weight and volumetric characteristics, physical storing needs (temperature, radiation,...), handling needs, order frequency, package size, etc. The following metrics maybe used by the company to organize its products in different families:

Physical metrics used to evaluate inventory systems include stocking capacity, selectivity, superficial utilization, volumetric utilization, transport capacity, transport capacity utilization.

Monetary metrics used include space holding costs (building, shelving and services) and handling costs (people, handling machinery, energy and maintenance).

Other metrics may present themselves in both physical or monetary form, such as the standard Inventory turnover.