

## **2. Logistics complement**

### **2.1 Handling and Order Processing**

Unit loads for transportation of luggage at the airport, in this case the unit load has protective function.

Unit loads are combinations of individual items which are moved by handling systems, usually employing a pallet of normed dimensions.

Handling systems include: trans-pallet handlers, counterweight handler, retractable mast handler, bilateral handlers, trilateral handlers, AGV and stacker handlers. Storage systems include: pile stocking, cell racks (either static or movable), cantilever racks and gravity racks.

Order processing is a sequential process involving: processing withdrawal list, picking (selective removal of items from loading units), sorting (assembling items based on destination), package formation (weighting, labeling and packing), order consolidation (gathering packages into loading units for transportation, control and bill of lading).

Picking can be both manual or automated. Manual picking can be both man to goods, i.e. operator using a cart or conveyor belt, or goods to man, i.e. the operator benefiting from the presence of a mini-load ASRS, vertical or horizontal carousel or from an Automatic Vertical Storage System (AVSS). Automatic picking is done either with dispensers or depalleting robots.

Sorting can be done manually through carts or conveyor belts, or automatically through sorters.

### **2.2 Transportation**

Cargo, i.e. merchandise being transported, can be moved through a variety of transportation means and is organized in different shipment categories. Unit loads are usually assembled into higher standardized units such as: ISO containers, swap bodies or semi-trailers. Especially for very long distances, product transportation will likely benefit from using different transportation means: multimodal transport, intermodal transport (no handling) and combined transport (minimal road transport).

Operators involved in transportation include: all train, road vehicles, boats, airplanes companies, couriers, freight forwarders and multi-modal transport operators.

Merchandise being transported internationally is usually subject to the Incoterms standards issued by the International Chamber of Commerce.

### **2.3 Configuration and management**

Similarly to production systems, logistic systems need to properly configured and managed. Actually a number of methodologies have been directly borrowed from operations management such as using Economic Order Quantity models for managing inventory in the nodes of the network. Distribution resource planning (DRP) is similar to MRP, except that it doesn't concern activities inside the nodes of the network but planning distribution when moving goods through the links of the network.

Traditionally in logistics configuration may be at the level of the warehouse (node) or at level of the distribution system (network).

Regarding a single warehouse, besides the issue of designing and building the warehouse, configuration means solving a number of interrelated technical-economic problems: dimensioning rack cells, choosing a palletizing method (manual or through robots), rack dimensioning and design, number of racks, number and typology of retrieval systems (e.g. stacker cranes). Some important constraints have to satisfied: fork and load beams resistance to bending and proper placement of sprinklers. Although picking is more of a tactical planning decision than a configuration problem, it is important to take it into account when deciding the racks layout inside the warehouse and buying tools such as handlers and motorized carts since once those decisions are taken they will work as constraints when managing the warehouse, same reasoning for sorting when designing the conveyor system and/or installing automatic dispensers.

Configuration at the level of the distribution system concerns primarily the problem of location of the nodes in a geographic space and distribution of capacity among the nodes. The first may be referred to as facility location (with the special case of site selection) while the latter to as capacity allocation. The problem of outsourcing typically arises at this level: the nodes of a supply chain are very rarely owned by a single enterprise. Distribution networks can be characterized by numbers of levels, namely the number of intermediary nodes between supplier and consumer:

- Direct store delivery, i.e. zero levels
- One level network: central warehouse

-Two level network: central and peripheral warehouses

This distinction is more useful for modeling purposes, but it relates also to a tactical decision regarding safety stocks: considering a two level network, if safety inventory is kept only in peripheral warehouses then it is called a dependent system (from suppliers), if safety inventory is distributed among central and peripheral warehouses it is called an independent system (from suppliers). Transportation from producer to the second level is called primary transportation, from the second level to consumer is called secondary transportation.

Although configuring a distribution network from zero is possible, logisticians more usually have to deal with restructuring existing networks due to presence of an array of factors: changing demand, product or process innovation, opportunities for outsourcing, change of government policy toward trade barriers, innovation in transportation means (both vehicles or thoroughfares), introduction of regulations (notably those regarding pollution) and availability of ICT supporting systems (e.g. ERP or e-commerce).

Once a logistic system is configured, management, meaning tactical decisions, takes place, once again, at the level of the warehouse and of the distribution network. Decisions have to be made under a set of constraints: internal, such as using the available infrastructure, or external, such as complying with given product shelf lives and expiration dates.

At level of the warehouse, the logistician must decide how to distribute merchandise over the racks. Three basic situations are traditionally considered: shared storage, dedicated storage (rack space reserved for specific merchandise) and class based storage (class meaning merchandise organized in different areas according to their access index).

Picking efficiency varies greatly depending on the situation. For man to goods situation, a distinction is carried out between high level picking (vertical component significant) and low level picking (vertical component insignificant). A number of tactical decisions regarding picking must be made:

Routing path: standard alternatives include transversal routing, return routing, midpoint routing and largest gap return routing

Replenishment method: standard alternatives include equal space supply for each product class and equal time supply for each product class.

At the level of the distribution network, tactical decisions involve mainly inventory control and delivery path optimization. Note that the logistician may be required to manage the reverse flow along with the forward flow.

## **2.4 Production logistics**

The term production logistics describes logistic processes within an industry. Production logistics aims to ensure that each machine and workstation receives the right product in the right quantity and quality at the right time. The concern is not the transportation itself, but to streamline and control the flow through value-adding processes and to eliminate non-value-adding processes. Production logistics can operate in existing as well as new plants. Manufacturing in an existing plant is a constantly changing process. Machines are exchanged and new ones added, which gives the opportunity to improve the production logistics system accordingly.[16] Production logistics provides the means to achieve customer response and capital efficiency.

Production logistics becomes more important with decreasing batch sizes. In many industries (e.g., mobile phones), the short-term goal is a batch size of one, allowing even a single customer's demand to be fulfilled efficiently. Track and tracing, which is an essential part of production logistics due to product safety and reliability issues, is also gaining importance, especially in the automotive and medical industries.

## **2.5 Logistics management**

Logistics management is that part of the supply chain 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 customer requirements. A professional working in the field of logistics management is called a logistician.

Materials management

Channel management

Distribution (or physical distribution)

Supply-chain management

The Chartered Institute of Logistics and Transport (CILT), established in the United Kingdom in 1919, received a Royal Charter in 1926. The Chartered Institute is one of the professional bodies or institutions for the logistics and transport sectors that offers professional qualifications or degrees in logistics management. CILT programs can be studied at centers around UK, some of which also offer distance learning options. The institute also have overseas branches namely The Chartered Institute of Logistics & Transport Australia (CILTA) in Australia and Chartered Institute of Logistics and Transport in Hong Kong (CILTHK) in Hong Kong.

## **2.6 Warehouse management systems and warehouse control systems**

Although there is some overlap in functionality, warehouse management systems (WMS) can differ significantly from warehouse control systems (WCS). Simply put, a WMS plans a weekly activity forecast based on such factors as statistics and trends, whereas a WCS acts like a floor supervisor, working in real time to get the job done by the most effective means. For instance, a WMS can tell the system that it is going to need five of stock-keeping unit (SKU) A and five of SKU B hours in advance, but by the time it acts, other considerations may have come into play or there could be a logjam on a conveyor. A WCS can prevent that problem by working in real time and adapting to the situation by making a last-minute decision based on current activity and operational status. Working synergistically, WMS and WCS can resolve these issues and maximize efficiency for companies that rely on the effective operation of their warehouse or distribution center.

## **2.7 Logistics automation**

ASRS used by the U.S. military, also used by business in conjunction with manual picking.

Logistics automation is the application of computer software and/or automated machinery to improve the efficiency of logistics operations. Typically this refers to operations within a warehouse or distribution center, with broader tasks undertaken by supply chain management systems and enterprise resource planning systems.

Industrial machinery can typically identify products through either Bar Code or RFID technologies. Information in traditional bar codes is stored as a sequence of black and white bars varying in width, which when read by laser is translated in a binary sequence, which according to fixed rules can be converted in a decimal number. Sometimes information in a bar code can be transmitted through radio frequency, more typically radio transmission is used in RFID tags. An RFID tag is

card containing a memory chip and an antenna which transmits signals to a reader. RFID may be found on merchandise, animals, vehicles and people as well.

## **2.8 Logistics outsourcing**

Logistics outsourcing involves a relationship between a company and an LSP (logistic service provider), which, compared with basic logistics services, has more customized offerings, encompasses a broad number of service activities, is characterized by a long-term orientation, and thus has a strategic nature.

Outsourcing does not have to be complete externalization to a LSP, but can also be partial:

A single contract for supplying a specific service on occasion

Creation of a spin-off

Creation of a joint venture

### **Third-party logistics**

Third-party logistics (3PL) involves using external organizations to execute logistics activities that have traditionally been performed within an organization itself. According to this definition, third-party logistics includes any form of outsourcing of logistics activities previously performed in house. For example, if a company with its own warehousing facilities decides to employ external transportation, this would be an example of third-party logistics. Logistics is an emerging business area in many countries.

### **Fourth-party logistics**

The concept of a fourth-party logistics (4PL) provider was first defined by Andersen Consulting (now Accenture) as an integrator that assembles the resources, planning capabilities, and technology of its own organization and other organizations to design, build, and run comprehensive supply chain solutions. Whereas a third-party logistics (3PL) service provider targets a single function, a 4PL targets management of the entire process. Some have described a 4PL as a general contractor that manages other 3PLs, truckers, forwarders, custom house agents, and others, essentially taking responsibility of a complete process for the customer.

## **2.9 Emergency logistics**

Emergency logistics is a term used by the logistics, supply chain, and manufacturing industries to denote specific time-critical modes of transport used to move goods or objects rapidly in the event of an emergency. The reason for enlisting emergency logistics services could be a production delay or anticipated production delay, or an urgent need for specialized equipment to prevent events such as aircraft being grounded (also known as "aircraft on ground"—AOG), ships being delayed, or telecommunications failure. Emergency logistics services are typically sourced from a specialist provider.

### **As a profession**

A logistician is a professional logistics practitioner. Professional logisticians are often certified by professional associations. One can either work in a pure logistics company, such as a shipping line, airport, or freight forwarder, or within the logistics department of a company. However, as mentioned above, logistics is a broad field, encompassing procurement, production, distribution, and disposal activities. Hence, career perspectives are broad as well. A new trend in the industry are the 4PL, or fourth-party logistics, firms, consulting companies offering logistics services.

Some universities and academic institutions train students as logisticians, offering undergraduate and postgraduate programs. A university with a primary focus on logistics is Kühne Logistics University in Hamburg, Germany. It is non profit and supported by Kühne-Foundation of the logistics entrepreneur Klaus Michael Kühne.

The International Association of Public Health Logisticians (IAPHL) is a professional network that promotes the professional development of supply chain managers and others working in the field of public health logistics and commodity security, with particular focus on developing countries. The association supports logisticians worldwide by providing a community of practice, where members can network, exchange ideas, and improve their professional skills.

### **Logistics museums**

There are many museums in the world which cover various aspects of practical logistics. These include museums of transportation, customs, packing, and industry-based logistics. However, only the following museums are fully dedicated to logistics:

General logistics:

Museum of Logistics (Tokyo, Japan)

Logistics Museum (Saint Petersburg, Russia)

Military logistics:

Royal Logistic Corps Museum (Surrey, England, United Kingdom)

The Canadian Forces Logistics Museum (Montreal, Canada)