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Logistics and supply chain management

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ABSTRACT

In this paper an introduction to the principles and methods used in logistics and supply chain management is presented. It begins by a discussion on fundamentals and explains the relevant terms. Next policy and practice associated with logistics and freight services are regarded with a focus on the EU policy for the sector which greatly influences the development of logistics chains and services. Mathematical formulation of typical transport and logistics-related problems is also presented followed by a discussion on the concept of sustainability.

1. Principles of logistics

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1.1. Background

The term “logistics” originates from the ancient Greek word “λόγος” (logos—ratio, word, calculation, reason, speech, oration), and as such the word logistics has been in use for a much longer time than the current business logistics concept. The word logistics itself originates from the military discipline. There were divisions in the military who were responsible for the supply of necessary arms, ammunition and rations as and when they were needed, for example when they had to move from their own base to a forward position. In that situation the logistics division would provide all the necessary support to move the arms, ammunitions, tents, foods etc. In the ancient Greek, Roman and Byzantine empires, there were military officers with the title ‘Logistikas’ who were responsible for financial, supply and distribution matters. Not surprisingly the Oxford English dictionary defines logistics as; “The branch of military science having to do with procuring, maintaining and transporting material, personnel and facilities.” Another dictionary defines logistics as “The time related positioning of resources.” Logistics is also commonly seen as a branch of engineering which creates “people systems” rather than “machine systems”, but the modern logistics concept and practice is about providing cost and time effective services for non-military, mainly commercial activities. This service includes the transport of goods from one point to another, warehousing them in a suitable place, inventory, packaging, and other administrative activities such as order processing.

1.2. Understanding logistics

Generally logistics is about adding “place utility” to a product meaning that, for example, a product needs to be moved from one point say Newcastle upon Tyne, UK to another point say Budapest, Hungary (Fig. 1). The product could be raw material to be processed (thus will also need material management) in a factory, or the product could be finished from the factory and to be distributed to the market for consumption.

In terms of “place utility” in logistics, this is due to the fact that a buyer and a seller of the product have agreed to sell and buy the product at certain conditions that include delivery price and time. As per the agreed conditions, a transport and/or logistics service provider will be hired (by the buyer or seller depending on the sales terms) to move cargo from the seller’s premises to the buyer’s premises. When it is in transit or under logistics service, the “product” will be termed as “cargo” or “goods”. As per the agreement, the cargo may need to be stored in somewhere along the transit; this service is termed as ‘warehousing’ and depending on the necessity and type of cargo, the warehouse location, size, type etc. will be determined. The buyer may buy the product in a big lot

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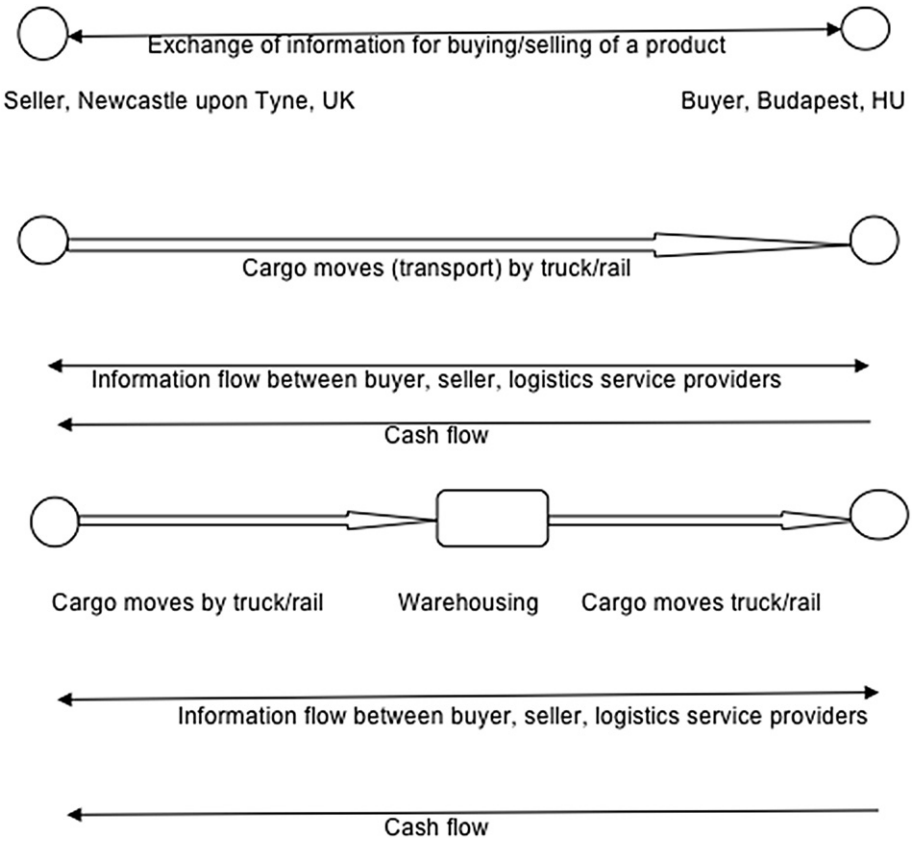

Fig. 1. Logistics: a graphical example.

for once in a month or every week in a smaller lot and this decision influences the level of inventory the buying company has to maintain. It can be noted that inventory costs capital and interest. To determine the optimal size of the inventory level, there are concepts such as Just-in-time (JIT) which is a 'pull' technique meaning that the buyer will receive the product only when it is needed. This concept aims to have an effective inventory level of "zero". In contrast the traditional approach is the 'push' technique where, the buyer will buy the product a lot and will maintain a certain level of inventory. Such an inventory approach is discussed further in a later chapter. For the transport and warehousing services, the product will be suitably packed depending on the type of product it is. From the beginning to end there will be some administrative activities such bill of lading (B/L) issued by the transport service provider. The B/L contains details of the shipment of the product and gives title of the shipment to a specified party (here the buyer). B/L is a very important document used in international trade to provide guarantees that the seller (exporter) receives payment and the buyer (importer) receives the product.

From the above discussion we understand that:

$$\begin{aligned}\text{Logistics} &= \text{supply of raw materials}\\ &+ \text{materials management in a factory}\\ &+ \text{distribution to customers;}\end{aligned}$$

1.3. Varying terminologies and definitions

Langley, Coyle, Gibson, and Novack (2008, p. 34) notes that "logistics management is the most widely used term and encompasses logistics not only in the private business sector but also in the public/government and non-profit sectors." There is confusion about the definition of logistics due to the fact that a number of terminologies are used to describe logistics management including the following:

- Logistic Management;
- Business Logistics Management;
- Integrated Logistics management;
- Materials Management;
- Physical Distribution Management;
- Industrial Logistics Management;
- Procurement and Supply;
- Product Flow Management; and
- Marketing Logistics Management.

Logistics involves an integrated approach with the integration of information, transportation, inventory, warehousing, material handling, and packaging, and recently added security. There are varying definitions due to the varying scope and understanding of logistics.

Mangan, Lalwani, and Butcher (2008, p. 9) states that "Logistics involves getting, in the right way, the right product, in the right quantity and right quality, in the right place at the right time, for the right customer at the right cost". Rushton, Oxley, and Croucher (2009, p. 6) explains that "Logistics concerns the efficient transfer of goods from the source of supply through the place of manufacture to the point of consumption in a cost-effective way whilst providing an acceptable service to the customers The Charter of the Institute of Logistics and Transport (CILT) (2012) maintains that logistics should aim "to deliver exactly what the customer wants - at the right time, in the right place and at the right price". CILT (2012) defines logistics as "the process of designing, managing and improving such supply chains, which might include purchasing, manufacturing, storage and, of course, transport."