

LOGISTICS AND SUPPLY CHAINS

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LEARNING OBJECTIVES

After reading this chapter you should be able to:

- understand the broad role of logistics
- see how logistics support the operations of an organisation
- describe the role and structure of supply chains
- discuss the overall aims of logistics
- understand how logistics contribute to organisational performance
- appreciate the balance between customer service and costs
- list the activities within logistics and understand the relationships between them
- recognise the importance of logistics to every organisation.



Role of logistics

Every organisation has to move materials. Manufacturers have factories that collect raw materials from suppliers and deliver finished goods to customers; retail shops have deliveries from wholesalers; a television news service collects reports from around the world and delivers them to viewers. Most of us live in towns and cities and eat food brought in from the country. When you order books from a website, a courier delivers them to your door, and when you buy a mobile phone it has probably travelled around the world to reach you. Every time you buy, rent, lease, hire or borrow anything at all, someone has to collect it and deliver it to your door. **Logistics** is the function responsible for this movement.

Logistics

the function responsible for all aspects of the movement and storage of materials on their journey from original suppliers through to final customers

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On a national scale, logistics needs a huge amount of effort. China has become ‘the factory of the world’ and exports US\$100 billion of goods a month, while the internal trade of goods within the European Union (EU) is worth more than US\$2 trillion a year – and all of this has to be moved between strings of suppliers and customers. A rule of thumb says that logistics accounts for 10–20% of gross domestic product (GDP), so the USA’s GDP of US\$13 trillion¹ might include US\$2 trillion for logistics. The 30 members of the Organisation for Economic Co-operation and Development (OECD) have a combined GDP of US\$40 trillion² and might spend US\$6 trillion on logistics.

Despite this effort, we hardly notice logistics as it goes about its business – but sometimes you might notice the lorries driving down a motorway, visit a shopping mall, drive through a trading estate, see a container ship unloading, fly from an airport, or have a parcel delivered by a courier service. These are the visible signs of a huge industry that employs millions of people and costs billions of dollars a year. In this book, we describe this complex function, seeing exactly what it involves and how it can be managed.

Logistics support operations

Every organisation delivers **products** to its customers. Traditionally, these products are described as either goods or services. Then manufacturers like Sony, Ford and Guinness make tangible goods, while the BBC, Qantas and Vodafone provide intangible services. But this view is misleading, and it is more realistic to describe every product as a complex package that contains a mixture of both goods and service. For example, Toyota manufactures cars, but they also give services through warranties, after-sales guarantees, repairs and finance packages. McDonald’s provides a combination of goods (burgers, cutlery, packaging, etc.)

Product

the combination of goods and services that an organisation supplies to its customers

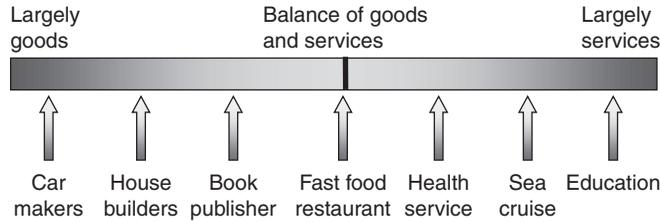


Figure 1.1 Spectrum of products

and services (when they prepare food, sell it and clean the restaurant). Then we can describe a **product package** as lying on the spectrum (shown in Figure 1.1). At one end of this spectrum are products that are predominantly goods, such as cars, domestic appliances, clothes and furniture; at the other end are products that are predominantly services, such as insurance, banking, education and telephone services. In the middle are products with a more even balance, such as restaurant meals, hospitals and some websites.

At the heart of an organisation are the **operations** that create and deliver the products. These operations take a variety of inputs and convert them into desired outputs, as shown in Figure 1.2. The inputs include raw materials, components, people, equipment, information, money and other resources. Operations are the manufacturing, serving, transporting, selling, training, and so on. The main outputs are goods and services. For instance, The Golden Lion restaurant takes inputs of food, chefs, kitchen, waiters and dining area; its operations include food preparation, cooking and serving; the main outputs are meals, service, customer satisfaction, and so on.

Logistics manages the flow of inputs from suppliers, the movement of materials through different operations within the organisation, and the flow of materials out to customers (as shown in Figure 1.3).

Moving materials into the organisation from suppliers is called **inbound or inward logistics**; moving materials out to customers is **outbound or outward**

Product package
view of a product as a complex mixture of goods and services, including logistics

Operations
all the activities that create an organisation's products

Inbound or inward logistics
move materials into an organisation from suppliers

Outbound or outward logistics
move materials from an organisation out to customers

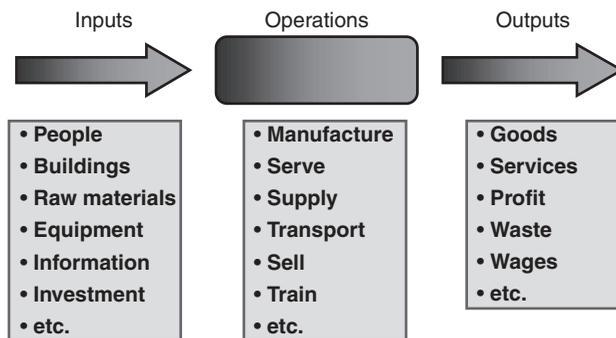


Figure 1.2 Operations transform inputs to desired outputs

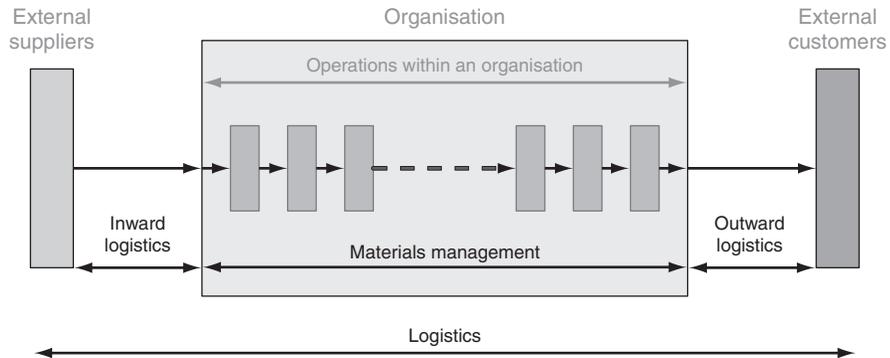


Figure 1.3 The flow of materials controlled by logistics

logistics; moving materials within the organisation (often described as collecting from internal suppliers and delivering to internal customers) is **materials management**.

Materials management
controls the movement of materials within an organisation

Materials

We have outlined the role of logistics in moving materials – but what exactly do we mean by **materials**? Sometimes this is obvious, for example, when a power station brings coal from a mine, a farmer takes potatoes to a market, or a computer manufacturer delivers PCs to a warehouse. With tangible goods it is easy to see the role of logistics, and even organisations providing the most intangible services move some goods around (perhaps paperwork or consumables).

Materials
anything that is moved into, through, or out of an organisation

Often the flow of materials is less clear, for example, when a television company delivers entertainment to its viewers, a telephone company provides a communications service, an internet service provider (ISP) gives access to the Web, or a research company creates knowledge. A broad view of materials also includes these intangibles. Then logistics is responsible for moving both tangible goods and intangible services – and this might include materials, components, finished products, people, information, paperwork, messages, knowledge, consumables, energy, money, and anything else needed by operations. A television company uses logistics to transmit programmes to customers, in the same way that an oil company uses logistics to deliver petrol. The clear message is that every organisation moves materials, and for this it needs logistics.

To summarise:

- A **product** is the mixture of goods and services that an organisation passes to its customers.
- **Materials** are all the things needed to make a product, and these can be both tangible (such as raw materials) and intangible (such as information).
- **Logistics** is responsible for moving and storing all the materials.



It can be difficult to imagine the effort put into logistics, but next time you go into a supermarket, think how difficult it would be to get everything delivered to the shelves. Then imagine a company like Tesco that has to keep all the shelves filled in its 4000 stores around the world.

LOGISTICS IN PRACTICE – TESCO

Tesco is one of the world's leading retailers, with more than 4000 stores and sales of £50 billion a year. They have a long-term strategy of continuing growth, based on their aspiration to: 'Strive every day to do the best we can for our customers.' For this they concentrate on four areas – growth in the core UK business, strong international expansion, to be as strong in non-foods as in foods, and to follow customers into new retailing services.

To support its operations it has a huge, efficient logistics network that spans the world. This continually evolves to meet changing customer demands, 'Following the customer – as customers' shopping habits change, we change and respond by providing new products and services.' You can see this effect in their UK stores. In the 1970s most of Tesco's sales were in fairly small supermarkets in town centres. Over the next 20 years they closed many of these smaller stores to focus on larger, out-of-town developments. More recently, they added smaller Express and Metro formats, so by 2008 they had 2.5 million square metres of sales area with four main formats to meet varying needs:

- 150 Extras with more than 6000 square metres and selling a complete range of household products
- 450 Superstores with 2000–5000 square metres and focusing on food
- 200 Metro stores with 700–1500 square metres selling a smaller range of food and ready meals
- 550 Express stores with up to 300 square metres giving a local service of 7000 lines.

The food range continues to expand, adding own brand, 'Finest', 'organic', 'fair trade', 'Healthy Living', 'Free From', and so on. Alongside food, the company now sells household goods – and continues its diversification into finance, insurance, telephone and Internet services, petrol stations, pharmacies, healthcare, and so on. Operations within the stores have also changed, with the growth of 24-hour opening, self-service checkouts, shelf-ready packaging, Clubcard and on-line shopping. Tesco has moved heavily into e-commerce, which has transformed many aspects of their logistics, including a web-based home delivery service with sales of more than a billion pounds a year.

Question

- What do you think that Tesco's logistics tries to achieve? What are likely to be the main problems?

(Source: Company annual reports and website www.tesco.com)



Supply chains

So far we have described the movement of materials through a single organisation. But no organisation works in isolation, and each one acts as a customer when it buys materials from its own suppliers, and then it acts as a supplier when it delivers materials to its own customers. For instance, a wholesaler acts as a customer when buying goods from manufacturers, and then as a supplier when selling goods to retailers. A manufacturer buys raw materials from suppliers, assembles these into finished products, and sells them to wholesalers. As a result, most products move through a series of organisations as they travel between original suppliers and final customers. Milk moves through a farm, tanker collection, dairy, bottling plant, distributor and supermarket before we buy it. A toothbrush starts its journey with a company extracting crude oil, and then it passes through pipelines, refineries, chemical works, plastics companies, manufacturers, importers, wholesalers and retailers before finishing in your bathroom. A sheet of paper moves through a string of organisations before it reaches your desk (illustrated in Figure 1.4).

People use different names for these chains of activities and organisations. When they emphasise the operations, they refer to the process; when they emphasise marketing, they call it a logistics channel; when they look at the value added, they call it a value chain;³ when they see how customer demands

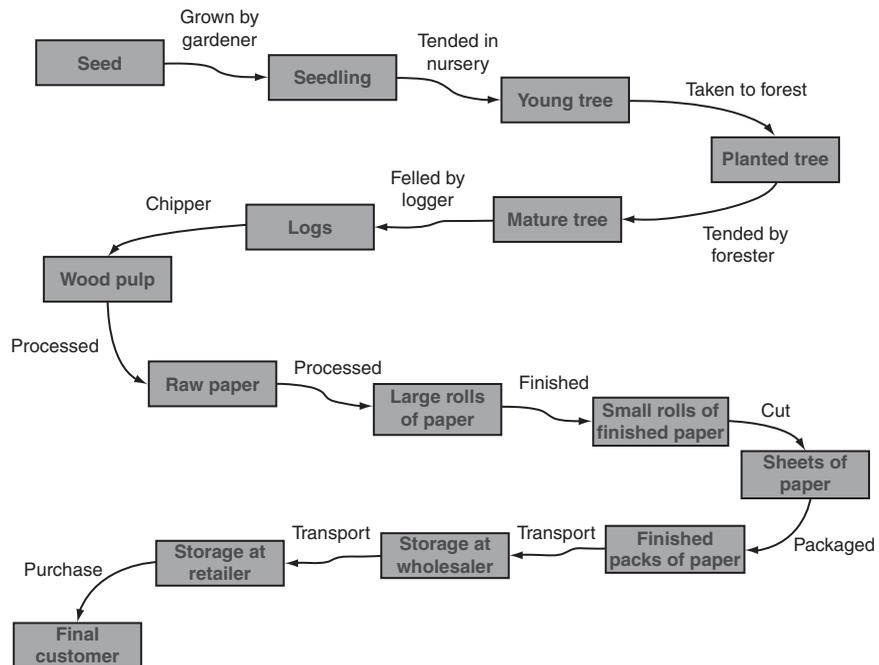


Figure 1.4 Outline of the supply chain for paper



are satisfied, they call it a demand chain. Here we are emphasising the movement of materials and use the most common term of supply chain.

- A **supply chain** consists of the series of activities and organisations that materials move through on their journey from initial suppliers to final customers.

Supply chain consists of the series of activities and organisations that materials move through on their journey from initial suppliers to final customers

Basic structure

Every product has its own unique supply chain, and this can be both long and complicated. A supply chain in Cadbury starts with cocoa beans growing on farms and ends when hungry customers buy bars of chocolate. A supply chain for Levi jeans starts with someone growing a field of cotton and ends when you buy them in a shop. The supply chain describes the total journey of materials as they move ‘from dirt to dirt’.⁴ Along this journey, materials may move through farmers, miners, processors, raw materials suppliers, agents, component makers, manufacturers, assemblers, finishers, packers, logistics centres, warehouses, third-party operators, transport companies, wholesalers, retailers, and a whole range of other operations.

The simplest view of a supply chain has a single product moving through a series of organisations, each of which somehow adds value to the product. Taking one organisation’s point of view, activities in front of it (moving materials inwards) are called **upstream**; those after the organisation (moving materials outwards) are called **downstream**.

The upstream activities are divided into tiers of suppliers (shown in Figure 1.5). A supplier that sends materials directly to the operations is a first-tier supplier; one that send materials to a first-tier supplier is a second-tier supplier; one that sends materials to second-tier supplier is a third-tier supplier, and so on back to the original sources. Customers are also divided into tiers. One that gets

Upstream in front of an organisation and moving materials inwards from original suppliers

Downstream after an organisation and moving materials outwards to final customers

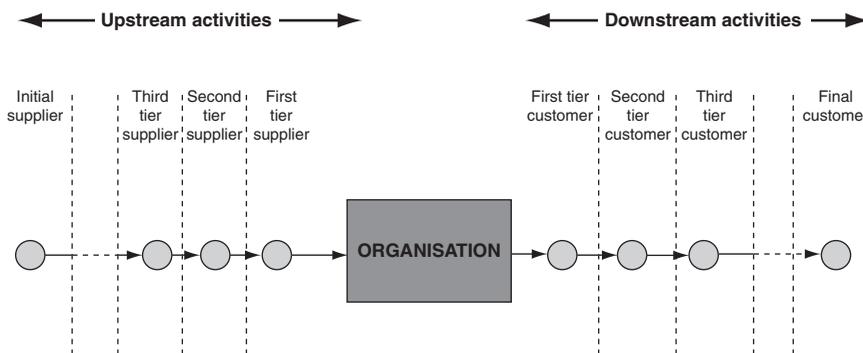


Figure 1.5 Activities in a simple supply chain



a product directly from the operations is a first-tier customer; one that gets a product from a first-tier customer is a second-tier customer; one that gets a product from a second-tier customer is a third-tier customer, and so on to the final customers.

This view of a supply chain seems reasonable, but you soon meet problems with the definition of boundaries. For instance, the supply chain for bread starts with wheat growing in a field. But the grain farmer might buy seed from a merchant, who in turn buys electricity to power their facilities – and you could extend the chain backwards almost endlessly. In the same way, there may not be a clear end to the chain, as logistics is increasingly seen as extending beyond the final customer to include the eventual disposal of products. For instance, the European Waste Electrical and Electronic Equipment (WEEE) Directive⁵ became law in 2003 and sets collection, recycling and recovery targets for all types of electrical goods. In particular, it says that suppliers should have some responsibility for eventual disposal of their products so that, ‘Users of electrical and electronic equipment from private households should have the possibility of returning WEEE at least free of charge.’ The broad calls to ‘reduce, reuse and recycle’⁶ mean that logistics is increasingly concerned with the collection and return of materials as well as with its original delivery.

The boundaries around a supply chain are rather fuzzy and we have to draw an arbitrary line to define our primary interest, and say that anything outside this is of secondary interest. But there is another complication as our linear model of a simple series of organisations is not really accurate. Virtually every organisation gets materials from many different suppliers and sells products to many different customers. So each sees supply chains converging on its operations as raw materials move in through the tiers of suppliers, and then diverging as products move out through tiers of customers. For instance, a manufacturer might see sub-assembly works as first-tier suppliers, component makers as second-tier suppliers, material suppliers as third-tier suppliers; and it might see wholesalers as first-tier customers, retailers as second-tier customers, and end-users as third-tier customers (as illustrated in Figure 1.6).

Most supply chains follow this general pattern, but each product has its own unique chain and they come in a huge variety of different shapes and sizes. An everyday object like a shirt or blouse has a long journey from the farm growing cotton through to the final customer – and it also has different chains merging as buttons, polyester, dyes, packaging and other materials join the main process. When you buy a computer, many upstream strands merge as Intel provide the processor, Matshita the DVD drive, Agfa the scanner, Hewlett-Packard the printer, Microsoft the operating system, and so on.

After the operations, parallel marketing channels mean that supply chains also diverge into separate downstream strands, with the same product following different routes to different types of customer. For instance, car component makers

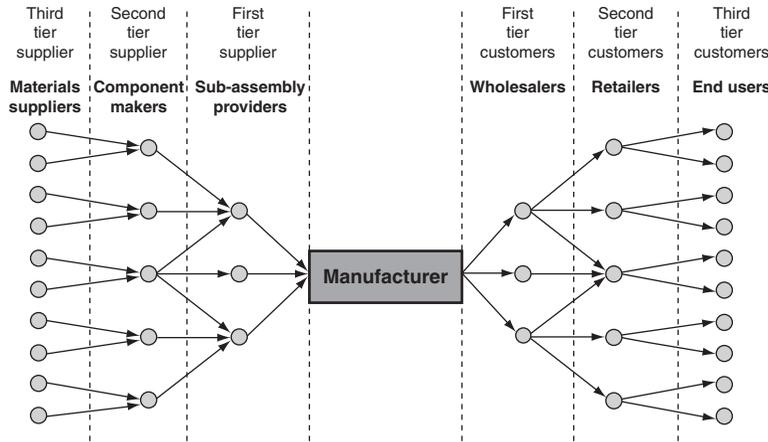


Figure 1.6 Typical supply chain around a manufacturer

sell to car assembly plants, wholesalers, garages, retail shops, car owners, and anyone else interested in buying their products.

LOGISTICS IN PRACTICE – LISTERINE’S SUPPLY CHAIN

Listerine was first formulated in 1879 as a surgical antiseptic, and has been used by dentists for oral care since 1895. In 1914 it became the first over-the-counter antiseptic mouthwash. The original formula has a notoriously strong flavour, but it was almost 80 years before new variations were introduced. Then in 1992 Cool Mint Listerine was introduced, followed by FreshBurst in 2003 – and now there are eight different versions, marketed under the slogan ‘Kills germs that cause bad breath’.

The ownership of Listerine has changed several times. Most recently it was owned by Pfizer’s consumer healthcare division until this was taken over by Johnson and Johnson in December 2006.

We can summarise the main elements in Listerine’s supply chain as follows (illustrated in Figure 1.7):

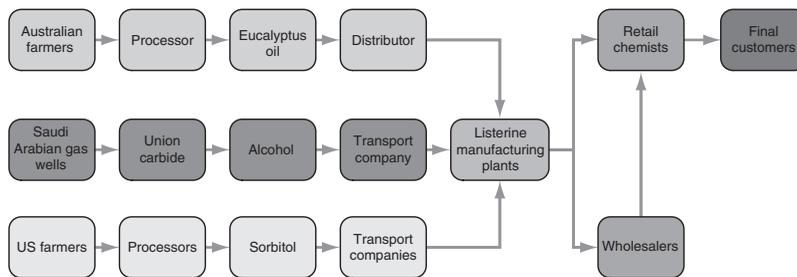


Figure 1.7 Outline of the supply chain for Listerine



LOGISTICS IN PRACTICE – LISTERINE'S SUPPLY CHAIN (CONTINUED)

- Australian farmers grow eucalyptus, harvest the leaves and send them to a processing company to extract oil.
- The eucalyptus oil is then sold to distributors and on to one of Johnson and Johnson's manufacturing plants (perhaps a Warner Lambert factory in Texas).
- Natural gas is drilled in Saudi Arabia.
- Union Carbide buys liquid gas and processes it into alcohol, which is shipped to the manufacturing plant.
- Farmers in the US mid-West harvest corn.
- This is processed to make Sorbitol which both sweetens and adds bulk to the mouthwash.
- Sorbitol is sent to manufacturing plant.
- The manufacturing plant collects ingredients and does all the operations needed to produce Listerine.
- The mouthwash is packed and sent to wholesalers, or directly to retail chemists.

Questions

- How typical do you think Listerine's supply chain is?
- Would it be useful to add more details to the description of the chain? What might these include?

(Sources: Website at www.listerine.com, 2008; Kalakota, R. and Robinson, M. (1999) *e-Business, roadmap for success*, Addison Wesley, Reading, MA)

Networks and webs

Our picture of supply chains is getting more complicated, with various mergers and divisions along their length. The reality is even more complex, as each chain can have more complex movements, such as loops where materials are returned. Most importantly, each organisation works with many – often thousands – of different products, each of which has its own supply chain. For instance, the French company Carrefour is Europe's largest retailer and comes at the end of tens of thousands of supply chains; Mittal's steel is used by countless other companies, Dell's computers are used for huge amounts of information transfer. This leads to Peck's⁷ view of a rather nebulous 'flow of materials, goods and information (including money), that pass within and between organisations, linked by a range of tangible and intangible facilitators, including relationships, processes, activities, and integrated information systems'.

Because of the complexity, some people argue that the term 'supply chain' gives too simple a view and they prefer to talk about a **supply network** or **supply web**. In reality, these terms still describe the same structure and functions,



and differences are largely a matter of definition. In this book we stick to the usual name of supply chain, and recognise that it refers to a complex pattern of movements and relationships.

Of course, you might ask why supply chains become so complicated and wonder if there is some way of simplifying them, rather like farm shops selling vegetables directly to consumers. But the truth is that short supply chains are not necessarily the most efficient. For instance, suppose the whole population of a town decides to buy vegetables directly from a farm shop. Then everyone in the town has to travel separately to the farm and back. It clearly makes sense to have a transport company collect the vegetables from the farm and deliver them to a central location in the town – like a supermarket. If the transport company delivers to one town, it can easily deliver to other nearby towns, perhaps stopping at a depot to organise local deliveries. This depot might store vegetables when the supply is plentiful and keep them for times of shortage. When the vegetables are being stored, the depot can add value by cleaning and preparing them. Continuing with this kind of argument, you can infer long supply chains develop. Bringing even basic products to your door is a complicated process, and it really is better to involve more steps and organisations.

Essentially, a new element should be added to a supply chain whenever it gives a net benefit – which means that it either adds value by doing work that customers are prepared to pay for, or else it reduces costs. The following worked example suggests the type of calculation needed for this.

WORKED EXAMPLE

Sterling Chemicals deliver products directly from their main plant to customers. Business is growing and they can use a specialised warehouse as an intermediary. With the following estimated costs (in euros) for each batch of chemicals, would this be a sensible move?

<i>Plant logistics costs</i>	<i>Current system</i>	<i>With warehouse</i>
Storage and handling	1,000	100
Packaging	350	0
Stock holding	100	50
Transport to warehouse	0	350
Transport to customer	1,600	200
Fixed costs	6,000	4,000
Administration	150	100
<i>Warehouse costs</i>	<i>Current system</i>	<i>With warehouse</i>
Storage and handling	0	300
Packaging	0	250
Stock holding	0	150
Fixed costs	0	4,500
Administration	0	150


WORKED EXAMPLE (CONTINUED)
Answer

Adding the logistics costs shows that the total for the current system is €9200 a batch, which is clearly cheaper than using a warehouse costing €10,150 a batch. So the Sterling should not immediately use a warehouse. However, the figures also show the breakdown between fixed and variable costs.

Current system: Fixed costs €6000 variable cost €3200
 With warehouse: Fixed costs €8500 variable cost €1650

The variable cost is lower with a warehouse, suggesting that this is more attractive for higher volumes. As Sterling's business is growing, the company could move in this direction at some point in the future.

An interesting point is that adding extra elements to a supply chain does not necessarily make it more complicated, and can actually simplify movements. For instance, imagine four factories sending products directly to eight customers, as shown in Figure 1.8. Here logistics managers have to organise 32 different delivery routes, but if the factories use a central wholesaler, the number of routes is cut to 12.

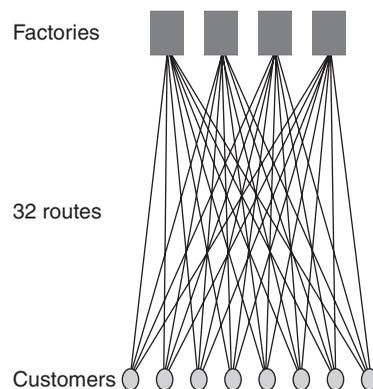
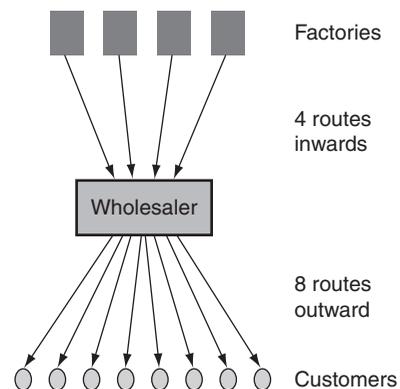
(a) Without a wholesaler

(b) With a wholesaler


Figure 1.8 Adding a wholesaler simplifies material flows

Aims of logistics

We have said that logistics is responsible for the flow of materials through a supply chain, so it is also described as **supply chain management**. Some people argue



that logistics is somewhat narrower and concentrates on the movements within a single organisation, while supply chain management takes a broader view of the whole chain. But again this is largely an argument over semantics rather than a real difference. Here we stick to the convention that the two terms refer to exactly the same function. This view is supported by the Chartered Institute of Logistics and Transport who give the following definitions:⁸

- ‘**Logistics** is the time-related positioning of resources, or the strategic management of the total supply-chain.’
- ‘The **supply-chain** is a sequence of events intended to satisfy a customer.’

These definitions are deliberately broad and can include virtually everything that an organisation does. Imagine a car assembly plant, where each car passes along a series of operations. In principle, each time a car moves one step along the production line it can be described in terms of logistics moving materials, but it is usually considered in terms of production or operations management. This points to a basic interaction between logistics (moving materials to the point where they are needed) and operations management (working on the products). There can be no clear boundary between these two functions, and there is no point in drawing artificial boundaries around the activities to be included in each.

In this context, you might also hear people talk about logistics management, business logistics, distribution, physical distribution, supply management, materials management, merchandising, and a series of other terms. These are usually alternatives for the more general ‘logistics’, but you have to be careful as they sometimes refer to specific parts of the supply chain or slightly different activities.

Essential purpose

Supply chains exist to overcome gaps between suppliers and customers. They permit operations that are best done – or can only be done – in locations that are some distance away from customers or suppliers. Supply chains are needed to bridge the gap between coffee bean growers in South America and their customers in North America, and between natural gas wells in Siberia and customers in Europe, coal mines and power stations, food in the country and people in cities, and so on.

Overcoming physical distance is only one purpose of supply chains, as they allow for any kind of mismatch between supply and demand. For instance, the demand for sugar is more or less stable throughout the year, but the supply varies with the harvesting of sugar cane and beet. When there is excess supply, stocks build up in the supply chain and these stocks are used after the harvests finish. So in general, supply chains exist to overcome any kind of gap between customers



and suppliers. Alderson discussed this idea in 1954⁹ and we can extend his ideas to suggest that they overcome:

1. *space gaps*, with suppliers physically separate from customers (for example, bauxite is mined in Australia but is used by distant manufacturers)
2. *time gaps*, when there is a difference between the time a product become available and the time when customers want to buy it (for example, whisky is distilled in Scotland and then stored for at least three years while it matures)
3. *quantity gap*, between the amounts available from suppliers and the demand from customers (for example, publishers print books in large batches to reduce their operating costs, but each customer usually buys a single copy)
4. *variety gap*, when customers want a wider variety of products than is available from a single supplier (for example, each music company has contracts with particular singers, but we buy CDs from retailers who stock a broader range)
5. *information gap*, when customers do not know about the availability or source of products, and suppliers do not know about potential customers (for example, some countries have no McDonald's restaurants because the supply chains have not yet penetrated the markets).

Customer service

Logistics managers want to overcome these gaps as efficiently as possible – but what exactly do we mean by 'efficiently'? There are several answers to this, and managers may define it in terms of fast deliveries, low costs, little wastage, quick response, high productivity, low stocks, no damage, few mistakes, high staff morale, and so on. Although these are all worthy goals, they are really measures of performance rather than aims. To find the real aim of logistics, we must relate it to the wider objectives of the organisation.

An organisation usually states its overriding aims in a corporate strategy, and this typically refers to profitability, return on investment, share value, sales, customer base, and so on. The key point is that every organisation achieves its aims by supplying products to customers, and its success ultimately depends on achieving customer satisfaction. If an organisation does not satisfy its customers it will not survive for long, let alone achieve any of its aims.

This gives the context for logistics, and allows us to phrase the overriding aim of logistics in terms of providing customer service. To put it simply, managers should organise logistics in the best way to achieve customer satisfaction.

We have to be careful here, as any organisation can give outstanding customer service if it allocates enough resources. But resources cost money and higher customer service almost inevitably comes at a higher price. If you want to travel to a nearby town you might hire a chauffeur-driven limousine (giving high service and price), or catch a bus (giving lower service and price). The problem is that customers will only pay a certain amount for a product, so a more realistic aim for logistics is to find the best balance between service and cost. It might aim at



providing a specific level of customer service for the lowest cost or, alternatively, maximising the service that is given for a specific cost.

- An overriding **aim of logistics** is to help the organisation achieve customer satisfaction.
- Higher customer service needs more resources that come with higher costs,
- A realistic aim is to provide the best balance of customer service and costs.

People often summarise the aims of logistics as getting, ‘the right materials, in the right quantity, at the right place, at the right time, from the right source, with the right quality, at the right price’ (which Bowersox¹⁰ characterises as the ‘Seven Rs’). No one can argue with this but, of course, it depends on what we mean by ‘right’. This is defined by customers who, in different circumstances, can demand very different things. For instance, when you post a letter, you sometimes want it delivered quickly – in which case the ‘right’ delivery is the fastest. Sometimes you want it delivered as cheaply as possible, or with high security, at a specified time, with a receipt, to a specified person, and so on. Logistics must deal with these varying demands, with the essential point that it must give a service that customers are prepared to pay for. This is usually phrased in terms of logistics ‘adding value’ – which means that its costs are less than the perceived benefits that it brings.

Managers often describe the added value of logistics as a **utility**. When products are available at the place they are needed, logistics is said to have added **place utility**; when products are delivered at the time they are needed, logistics has added **time utility**; when products are delivered to the right people, logistics has increased **ownership utility**. Then we might phrase the aim of logistics in terms of maximising added value or achieving the highest possible utility. To achieve this, managers have to make two types of decision. The first type concerns design, when managers take a strategic view and devise the best structure for their supply chains. We look at different aspects of supply chain design in Chapters 3–9. The second type of decision concerns the flow of materials through this chain. We look at ways of getting an efficient flow of materials in Chapters 10–15. Summarising these two types of decision, Harrington¹¹ says that, ‘logistics is both the glue that holds the materials/product pipeline together and the grease that speeds product flow along it’.

Utility

a measure of added value

Place utility

value added by having products available at the place they are needed

Time utility

value added by having products available at the time they are needed

Ownership utility

value added by having products delivered to the right people

LOGISTICS IN PRACTICE – WAL-MART

In 1962 Sam Walton opened a discount store in Rogers, Arkansas. He started with the idea that, ‘The secret of successful retailing is to give your customers what they want’ and this includes ‘a wide assortment of good quality merchandise; the lowest possible prices; guaranteed satisfaction with what you buy; friendly knowledgeable service; convenient hours; free parking;



LOGISTICS IN PRACTICE – WAL-MART (CONTINUED)

a pleasant shopping experience'. Sam called his store Wal-Mart, and was so successful that his chain grew quickly. In 1983 he opened a Sam's Club warehouse for members, and in 1988 the first 'Supercenter' selling groceries. During the 1980s Wal-Mart became the leading retailer in the USA, and started its international expansion. Early moves into Mexico, Puerto Rico and Canada were followed by South America, Asia and Europe – with most of the later expansion from buying local companies (such as ASDA in the UK and Interspar in Germany).

Wal-Mart is a classic example of how to manage rapid growth without changing the company's underlying values – in this case 'the basic value was, and is, customer service'. This is emphasised from the front door of each store, where someone greets each customer and tells them about special offers and promotions. Wal-Mart is now the world's largest retailer and in 2007 had 6700 stores, serving 176 million customers a week, employing 1.9 million staff – or 'associates' – and a turnover of US\$345 billion.

A large Wal-Mart store stocks 120,000 different items, each of which has its own supply chain. Not surprisingly, the company needs a huge logistics effort, with 61,000 suppliers delivering \$4 billion dollars' worth of goods a week. In the mainland USA products move through a hundred distribution centres, and on to 1000 Wal-Mart stores, 2300 Supercentres, 600 Sam's Clubs and 120 Neighbourhood Markets.

Efficient logistics plays a large part in Wal-Mart's success, and it uses the 'industry's most efficient and sophisticated distribution system'. This includes high levels of automation, sophisticated communications, utilisation of resources, and guaranteed availability of products. The logistics costs are so high that small improvements can have a considerable effect on profit. For instance, improving fuel consumption in their fleet of 7000 trucks by one mile a gallon would save more than US\$50 million a year. In 2006 installing auxiliary power units in trucks that made overnight stops (meaning that the main engine could be turned off for longer) saved 10 million gallons of diesel fuel a year, US\$25 million and 100,000 tonnes of carbon dioxide emissions.

Question

- Are logistics always as complicated as they are in Wal-Mart?

(Sources: Wal-Mart reports and websites at www.walmart.com, www.walmartstores.com and www.walmartfacts.com)

Activities of logistics

Logistics is a broad function which consists of a series of related activities. You can imagine these by following some materials on their way through an organisation, when you would typically see the following:

- **Procurement or purchasing.** The flow of materials into an organisation is usually initiated by a purchase order sent to a supplier. To prepare this a



purchasing, or procurement, department finds suitable suppliers, negotiates terms and conditions, organises delivery, arranges insurance and payment, and does everything needed to get materials into the organisation. In the past, this was a clerical job that processed the transactions of orders, but this is now largely automated and procurement focuses on its role as the main link with upstream activities. We describe procurement in Chapter 10.

- **Inward transport or traffic** moves materials from suppliers to an organisation's receiving area. For this, managers have to choose the type of transport (road, rail, air, etc.), find the best transport operator, design a route, make sure that all safety and legal requirements are met, ensure deliveries on time, keep costs low, and so on. We describe transport in Chapter 13.
- **Receiving** makes sure that materials delivered match an order, acknowledges receipt, unloads delivery vehicles, inspects materials for damage, and sorts them.
- **Warehousing or stores** moves materials from the receiving area into storage and makes sure that they are available when needed. Warehousing also looks after stored materials, giving the right conditions, treatment and packaging to keep them in good condition. This is particularly important with, say, frozen food, drugs, alcohol in bond, chemicals, animals, and dangerous goods. We describe warehousing in Chapter 12.
- **Stock control** sets the policies for inventory. It considers the materials to store, overall investment, customer service, stock levels, order sizes, order timing, and so on. We describe stock management in more detail in Chapter 11.
- **Material handling** is the general term for moving materials within an organisation. Every time that materials are moved around operations, it uses materials handling, whose aim is to give efficient movements, with short journeys, using appropriate equipment, with little damage, and using special packaging and handling where needed. We describe materials handling in Chapter 12.
- **Order picking** finds and removes materials from stores. Typically, materials needed for a customer order are located, identified, checked, removed from racks, consolidated into a single load and moved to a departure area for loading onto delivery vehicles.
- **Packaging** wraps materials to make sure that they are properly protected during movements so that damage is kept to a minimum.
- **Outward transport** takes materials from the departure area and delivers them to customers (with concerns that are similar to inward transport).
- **Physical distribution** is a general term for the activities that deliver finished goods to customers, including outward transport. It is often aligned with marketing and forms an important link with downstream activities.

Physical distribution
a general term for the
activities that deliver
finished goods to
customers



Reverse logistics
returns materials back to
an organisation after they
have been delivered to
customers

Forward logistics
makes deliveries out to
customers

- **Recycling, returns and waste disposal.** Even when products have been delivered to customers, the work of logistics may not be finished. Sometimes there are problems with delivered materials and they have to be collected and brought back (perhaps because they were faulty, or too many were delivered, or they were the wrong type). Sometimes associated materials such as pallets, delivery boxes, cable reels and containers are returned to suppliers for reuse. Sometimes materials are brought back for recycling, such as metals, glass, paper, plastics and oils. Other materials cannot be recycled but are returned for safe disposal, such as dangerous chemicals. Activities that return materials back to an organisation are called *reverse logistics* (compared with *forward logistics* that made the original deliveries).
- **Location.** Logistics activities are usually spread over many locations. For instance, stocks of finished goods can be held at the end of production, moved to nearby warehouses, sent to regional depots, put into stores near to customers, passed on to third parties, or a range of alternatives. Managers have to find the best locations for each activity, and consider related questions about the size and number of facilities. These decisions define the underlying structure of the supply chain, and we discuss them in Chapter 7.
- **Communication.** Alongside the physical flow of materials is the associated flow of information. This links all parts of the supply chain, passing information about products, customer demand, materials, movements, schedules, stock levels, availability, problems, costs, service levels, and so on. Coordinating the flow of information is always difficult, and logistics managers often describe themselves as processing information rather than moving goods. This view led Christopher to say that, 'Supply chain competitiveness is based upon the value-added exchange of information.'¹² The Council of Supply Chain Management Professionals highlights the combination of materials and information flow in their definition:

Logistics management (is the function) 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.¹³

LaLonde et al.¹⁴ run regular surveys that show the activities most commonly included in logistics, and in 2007 these were transport (93% of replies), warehousing (86%), inventory management (75%), procurement (67%), forecasting (65%) and customer service (63%). In different circumstances, many other activities can be included in logistics, such as production scheduling, overseas liaison, third-party operations, information processing, and so on. The important point is not to compile a list of activities and draw boundaries around them, but to recognise that logistics includes many activities that must all work together to give efficient flows of materials. When we bring these activities together, we get the following general features of supply chains:

- Logistics managers make all decisions about the design of supply chains and the subsequent flow of materials.
- Materials flow through a series of activities and organisations.
- The forward flows start at initial suppliers and end with final customers, with reverse logistic moving materials backwards.
- Each organisation in the supply chain is a customer when buying materials, and is a supplier when selling its products.
- There are different kinds of relationships between suppliers and customers .
- There are always costs of logistics and these must be controlled and related to the levels of service given.
- Each element in the supply chain somehow adds value to the products.
- Alongside the flow of materials are associated flows of money and information.
- Stocks are formed whenever materials stop moving.
- There are inherent risks in supply chains, and things do not always go according to plan.

LOGISTICS IN PRACTICE – AUGULLA LIMITED

Augulla Limited makes a range of basic clothes in its Mumbai factory. Typical products are plain white T-shirts, underwear and shorts. The process is fairly straightforward, but Pradhir Augulla, the company's chairman, is disappointed by long delays in the supply chain. When he investigated these, he found that it takes an average of 365 days to move one product from an initial purchase of fibres on the open commodity market to purchase by final customers.

- Start of the supply chain with fibre available on the open commodity market:
 - Store fibre in commodity warehouses (140 days)
 - Buy fibre and move to spinners (11 days)
 - At spinners:
 - store raw fibre (21 days)
 - spin to form yarn (13 days)
 - store yarn as finished goods (11 days)
 - Buy yarn and move to knitters (8 days)
 - At knitters
 - store yarn (6 days)
 - knit to form fabric (9 days)
 - store work in progress as grey stock (12 days)
 - dye standard colour and finish fabric (7 days)
 - store fabrics as finished goods (8 days)


LOGISTICS IN PRACTICE – AUGULLA LIMITED (CONTINUED)

- Buy fabric and move to Augulla Limited (7 days)
- At Augulla Limited
 - store fabric (12 days)
 - cut to form components (5 days)
 - store buffer of components (6 days)
 - sew components to form garments (14 days)
 - store garments as finished goods (18 days)
- Deliver to regional distribution centre and store (21 days)
- Deliver to local wholesaler and store (17 days)
- Deliver to retail shop and store (19 days)
- End of supply chain when customer buys garment from shop.

The main operations of spinning, knitting, dyeing, cutting and sewing take 48 days, and it seems that the various aspects of logistics take another 317 days. Pradhir Augulla is convinced that the supply chain can be more efficient, and has considered buying other companies to give more vertical integration and improve flows.

Question

- Much of the time in this supply chain seems to be used for storage and transport. Do you think this is common?

(Source: Pradhir Augulla and company records)

Importance of logistics

Logistics is an essential function in every organisation. It is easiest to imagine in a manufacturer, with forklift trucks unloading pallets from lorries and moving them around warehouses – but the same principles apply in any other organisation. When a rock band goes on tour they carry huge amounts of equipment. Procurement buys everything that is needed on the tour, transport pack it and move it to the next destination, receiving make sure that everything arrives safely, warehousing keeps things safe until they are needed, materials handling moves things between trucks and the stage, location decides where to perform. The same types of decision are made with even the most intangible service, and an insurance company decides what kind of branch network to have, where to locate offices, who to buy telephone and other services from, how to deliver information to customers, and so on. Christopher¹⁵ supports this view, saying that, ‘Logistics has always been a central and essential feature of all economic activity.’ Shapiro and Heskett¹⁶ agree, saying that, ‘There are few aspects of human activity

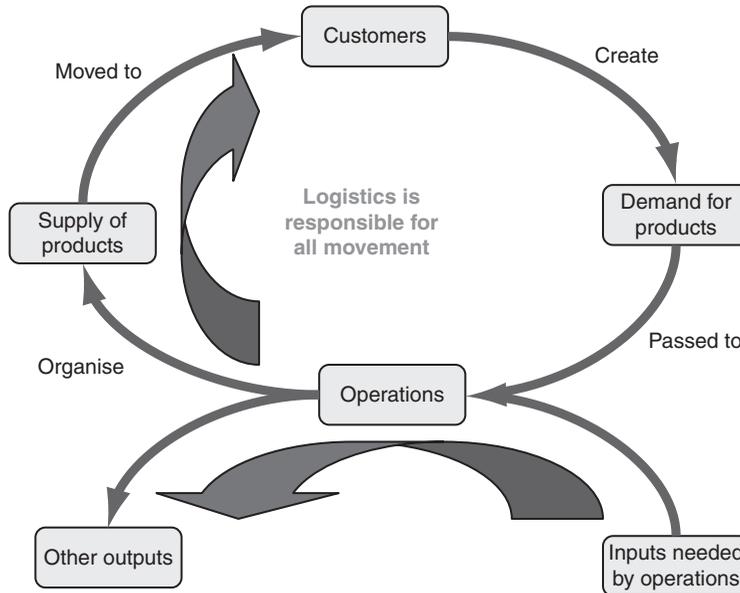


Figure 1.9 Essential role of logistics in meeting demand

that do not ultimately depend on the flow of goods from point of origin to point of consumption.’ Bowersox et al.¹⁷ say that, ‘It is difficult to visualise accomplishing any marketing, manufacturing or . . . commerce without logistics.’ To put it simply, without logistics, no materials move, no operations can be done, nothing is made, no products are delivered, and no customers are served.

Figure 1.9 suggests the role of logistics is an essential part of every trade. Customers generate demand for products, which operations create using necessary resources – and logistics move everything around this loop.

Not only is logistics essential, but it is also expensive. Unfortunately, it is difficult to say exactly how expensive, because normal accounting conventions do not separate logistics costs from other operating expenditure, and there is always disagreement about the activities to include. As a result, very few organisations can put precise figures on their logistics costs, and many have almost no idea of the amounts involved. One obvious point, though, is that expenditure on logistics varies widely between different industries. Building materials, such as sand and gravel, have very high logistics costs compared with, say, jewellery, pharmaceuticals and cosmetics.

We have already mentioned the rule of thumb that logistics accounts for 10–20% of GDP, but you have to interpret such figures carefully. Malone¹⁸ suggests that the actual cost of US logistics reached US\$1.2 trillion by 2005, accounting for 10% of GDP – but this estimate focuses on transport, which only accounts for 60% of total logistics costs.¹⁹ The UK government says that 11% of the GDP comes from wholesale and retail trades and another 4% from transport and storage,²⁰ suggesting that overall logistics costs are much higher.



These national figures translate into high costs for each company, and although they differ in detail, everyone agrees that logistics is very expensive. Whether it is getting more expensive is open to debate. Some people say that fuel, land, safety, environmental protection and employee costs are rising and making logistics more expensive. They argue that this is a long-term trend that will inevitably continue. An opposing view says that improvements to logistics are more than compensating for price rises. This says that new and more efficient methods – such as lower stocks, more efficient vehicles, fewer empty journeys, e-business, lower overheads, and so on – mean that logistics costs are falling as a proportion of product value. The Council of Supply Chain Professionals²¹ reports a mixed picture suggesting that the cost of logistics in the USA more than doubled over the 20 years to 2006, but then fell from 16% to 9% of GDP. This is probably a common pattern, as Childerley suggests that in 1980 logistics accounted for 32.5% of the UK's GDP,²² but is now considerably lower. A broader survey in Europe²³ suggests that logistics costs fell from an average of 14.3% of sales revenue in 1987 to 7.5% in 2003, but then began rising again.

LOGISTICS IN PRACTICE – KONIGSHAVEN SCHLESSER

Konigshaven Schlessar is a food wholesaler, delivering to supermarkets in southern Denmark and Northern Germany. Its accounting system does not separate logistics costs, so the managers of one warehouse did some calculations to identify areas that need special attention. They used some estimates, opinions and simplifications, but feel that they have a reasonable starting point for further analyses. The following figures show the costs incurred for each €100,000 of net sales.

a. Cost of sales	€58,000
– cost of purchasing products that are sold on to customers, including administration of the purchasing office	
b. Transport inwards	€3,000
– cost of bringing goods from suppliers and delivering them to the warehouse	
c. Other costs of delivery to warehouse	€4,000
– a general category that covers all other costs associated with supplier relations	
d. Warehousing and handling	€6,000
– cost of receiving materials, checking, sorting, moving to the warehouse and storing	
e. Stock financing	€1,000
– cost of financing stock, including debt charges	
f. Sales force	€12,000
– including salaries and all other costs of the sales office	



g. Special promotions	€3,000
– including presentations, visits and samples	
h. Delivery to customers	€5,000
– cost of taking goods out of the warehouse and delivering to customers	
i. Debt financing	€2,500
– cost of financing plant and equipment	
j. Information processing	€2,000
– including all aspects of order processing	
k. Returns and recycling	€500
– cost of recovering pallets and any other materials returned to the warehouse	

These figures are open to interpretation, but an initial estimate is that transport (b + c + h) accounts for 12% of sales and warehousing (d + e) a further 7%. Several other costs might be included in logistics, including some purchasing, sales, information processing and recycling.

Question

- If logistics is so important, why is it difficult to find the costs?

(Source: Company annual reports and internal memos)

Effects on financial performance

As an expensive function, logistics has a clear impact on an organisation's financial performance. In the example of Konigshaven Schlessar you can see that any savings in logistics costs give an immediate increase in profit. In this light, the Institute of Supply Management estimate that every 1% saved in materials delivery cost gives the same benefit as a 5% increase in sales.²⁴

You can see the financial importance of logistics from a company's return on assets (ROA), which is defined as the pre-tax profit divided by the value of assets employed.

$$\text{Return on assets} = \frac{\text{profits earned}}{\text{assets employed}}$$

This gives a measure of how well an organisation's resources are used, and higher values usually suggest better performance.

Assets are described as either current (cash, accounts receivable, stocks, etc.) or fixed (property, plant, equipment, etc.). Both of these depend on logistics. For instance, improving the flow of materials reduces the amount of stock held, and this lowers the value of current assets. Similarly, improving the utilisation of facilities and equipment reduces the amount needed, thereby reducing fixed assets.

We can expand the basic equation to look at the effects of logistics on ROA summarised in Figure 1.10:

$$\text{ROA} = \frac{\text{units sold} \times \text{selling price} \times \text{profit margin}}{\text{current assets} + \text{fixed assets}}$$

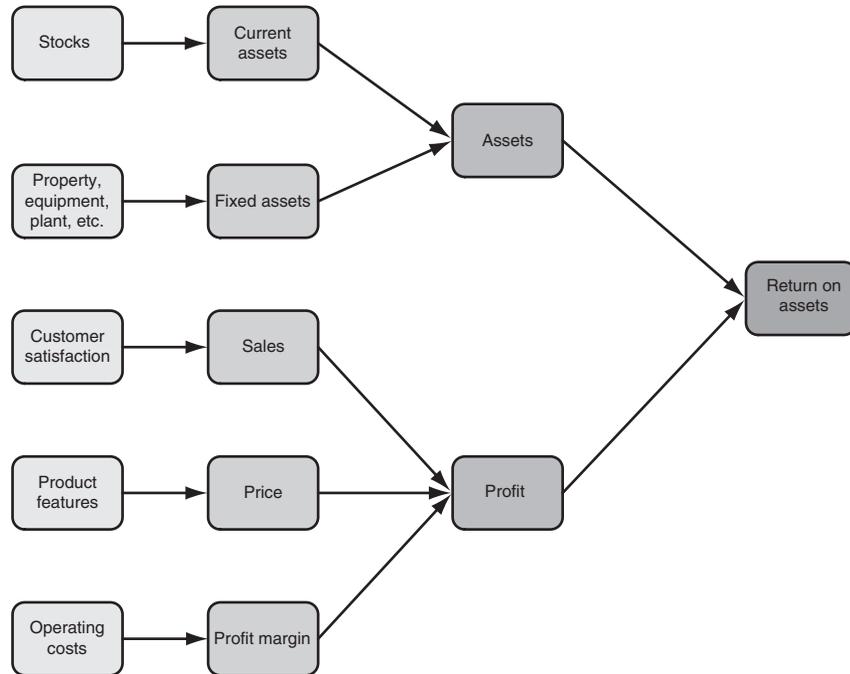


Figure 1.10 Influence of logistics on ROA

1. *Current assets.* More efficient logistics reduces the current assets, primarily through lower stock levels. Then lower investment in stock can free up cash for more productive purposes and reduce the need for borrowing.
2. *Fixed assets.* Its warehouses, transport fleets, materials handling equipment and other facilities, mean that logistics is a heavy user of fixed assets. Using these more efficiently can bring considerable savings.
3. *Sales.* By supplying a more attractive product, or delivering them efficiently to improve customer service, logistics can increase sales and give higher market share.
4. *Profit margin.* More efficient logistics reduce operating costs and directly increase profit margins.
5. *Price.* Logistics can improve the perceived value of products – perhaps making them more readily available, enabling faster delivery, or shortening lead times. This increased value can allow premium prices.

Good logistics can reduce assets and increase profits, both of which lead to a higher ROA (as illustrated in the following worked example). Using similar reasoning we can show the effects on other financial measures, such as share price, liquidity, investment, borrowing, and so on.

WORKED EXAMPLE

Mitchell Company has sales of £10 million a year. Its stocks amount to 25% of sales, with annual holding costs of 20% of the value held. Operating costs (excluding the cost of stocks) are £7.5 million a year and other assets are valued at £20 million. What is the current return on assets? How does this change if stock levels are reduced to 20% of sales?

Answer

- Taking costs over a year, the current position is:

Cost of stock	=	amount of stock × holding cost	=	£0.5 million a year
		= 10 million × 0.25 × 0.2		
Total costs	=	operating cost + cost of stock		
		= 7.5 million + 0.5 million	=	£8 million a year
Profit	=	sales – total costs		
		= 10 million – 8 million	=	£2 million a year
Total assets	=	other assets + stock		
		= 20 million + 10 million × 0.25	=	£22.5 million
Return on assets	=	profit / total assets		
		= 2 million / 22.5 million	=	0.089 or 8.9%

- With stock reduced to 20% of sales:

Cost of stocks	=	10 million × 0.2 × 0.2	=	£0.4 million year
Total costs	=	7.5 million + 0.4 million	=	£7.9 million a year
Profit	=	10 million – 7.9 million	=	£2.1 million a year
Total assets	=	20 million + 10 million × 0.20	=	£22 million
Return on assets	=	2.1 million / 22 million	=	0.095 or 9.5%

Reducing stocks gives lower operating costs, higher profit and a significant increase in ROA.

Other aspects of performance

Managers are largely judged by their financial performance, so they tend to focus on costs. But logistics also has an impact on other measures of performance. We have already mentioned this in terms of customer service, where the level of support given by logistics directly affects satisfaction with products. Then companies like FedEx and Amazon.com prosper by having efficient logistics that can promise deliveries within a specified, short time. In the same way, logistics affects measures like the waiting time for delivery, amount of damage, availability of products, and so on. It also affects less easily measured values, such as ethical standards and relations with suppliers and customers.

We could start listing the measures of organisational performance and show how logistics contributes to each of them, but the message should already be clear. Logistics affects virtually every aspect of an organisation's performance,



from the aspirational values it espouses through to the lead time for delivering its products. This is based on its awkward combination of being essential, expensive and spanning most of the organisation's operations. As Bowersox et al.¹⁷ say, 'No other area of business operations involves the complexity or spans the geography of logistics.' Novich²⁵ points out that, 'Poor logistics are the cause of roughly 50% of all customer complaints.' So the lesson is obvious – a well-run supply chain can give a huge competitive advantage and help achieve success; a badly run one leads to dissatisfied customers and commercial failure. With this in mind, we can summarise the importance of logistics by saying that it:

- is essential, as all organisations, even those offering intangible services, rely on the movement of materials
- has strategic importance with decisions affecting long-term performance and even survival
- is expensive, with costs often forming a large part of turnover
- has effects on most operations within an organisation
- directly affects profits, lead time, reliability and other measures of organisational performance
- forms links with upstream suppliers, developing mutually beneficial, long-term trading relationships
- forms links with downstream customers, contributing to customer satisfaction and added value
- determines the best locations and sizes of facilities
- gives public exposure and familiarity with visible locations, advertising on trucks, corporate citizenship, and so on.
- is inherently risky, with widespread safety, health, economic and environmental concerns
- prohibits or discourages some operations, such as moving excessive loads or dangerous goods
- can encourage growth of other organisations such as suppliers and intermediaries offering specialised services.

The following chapters describe current thinking about this central function.

Chapter review

- Every organisation supplies products that satisfy customer demand. Creating and delivering these products needs an efficient flow of materials.
- Logistics is the function responsible for all aspects of the movement and storage of materials. It moves materials into organisations from suppliers,



through operations, and out to customers. This is an essential function in every organisation, even those providing intangible services.

- No organisation works in isolation, and each forms a link in broader supply chains. A supply chain consists of the series of related activities and organisations that a product moves through on its journey from initial suppliers through to final customers.
- Each product has its own supply chain, so they come in many different forms. Nonetheless, there is an underlying pattern, with each organisation seeing materials converging through tiers of suppliers, and products diverging through tiers of customers.
- A fundamental aim of logistics is to help achieve customer satisfaction. However, there is a limit to the amount that customers will pay for any service, so a realistic aim looks for the best balance between customer service and cost.
- Logistics is best viewed as a single function, but it consists of a series of related activities. These range from procurement to initiate the flow of materials into an organisation, through to physical distribution to deliver products to customers.
- Logistics is always expensive, so it is in the awkward position of being essential, expensive and spanning most of the organisation's operations.
- The way that supply chains are organised affects costs, profits, relations with suppliers and customers, customer service, and virtually every other aspect of performance. As such, it plays a significant role in the success or failure of every organisation.

CASE STUDY – ACE DAIRIES

Roger Smitheram has run Ace Dairies for 16 years, providing a home delivery service for milk, dairy products and related goods. His product is a combination of goods (the items he delivers) and services (the delivery and associated jobs he does for customers).

At the heart of operations is an information system that contains details of Roger's 500 customers, including their regular orders, special orders, where to deliver, how they pay, and so on. Each day the system calculates the likely sales of all products for the following days. Roger adds some margin of safety, allows for known events (such as local fairs or holidays) and passes his order to Unigate Dairy in Totnes, Devon.

The Unigate dairy is 150 km away and acts as a wholesaler for local dairies and milkmen in Wales and the southwest of England. On the evening after it receives Ace's order, the dairy delivers it to a holding depot in Camborne. Later it moves the order a further 10 km to a cold store in Hayle. At 05:30 the following morning Roger collects his order from the cold store and starts delivering to customers. This normally takes until 13:30 in the afternoon, but on Fridays he spends more time collecting money and often finishes after 17:00.



CASE STUDY – ACE DAIRIES (CONTINUED)

There are several specific problems facing Ace Dairies. For example, there is some variation in daily demand – particularly during holiday periods – so Roger has to carry spare stock. He cannot carry too much, as dairy products have a short life and anything not delivered quickly is thrown away. Roger aims at keeping this waste down to 2% of sales. There are also problems maintaining a service during holidays, when traffic congestion causes delays, and when Unigate has difficulties with their deliveries. However, Roger's main concern is maintaining his sales over the long term. Demand for doorstep deliveries is steadily declining as people buy more milk at supermarkets. The number of milkmen in Hayle has declined from ten in 1987 to two in 2008. Most of Roger's customers have been with him for many years, but he generates new custom by canvassing, delivering leaflets, special offers, carrying a range of other products, introducing new services, and so on.

Questions

- Describe the supply chain for milk.
- Where does Ace Dairies fit into this? What specific activities form the logistics in Ace Dairies?
- What are the main problems that Ace Dairies has with logistics?

(Source: Roger Smitheram and internal reports)

Project – useful websites

You can find a huge amount of information about logistics on Websites. Many of these give limited views, typically to advertise their own services, but others give more general information and advice. For instance, there is a surprising number of online logistics magazines such as:

- www.loginstitute.ca – Logistics Quarterly from the Logistics Institute
- www.logisticsit.com – manufacturing and logistics IT
- www.logistics-mag.com – magazine for logistics planning
- www.scdigest.com – supply chain digest
- www.sdexec.com – supply and demand chain executive
- www.supplychainstandard.com – incorporating the journal of the European Logistics Association

Search the Web and see what sites are useful for logistics. The following sites published by major organisations concerned with supply chain management give useful starting points.

- www.ciltuk.org.uk – Chartered Institute of Logistics and Transport (UK)
- www.cips.org – Chartered Institute of Purchasing and Supply
- www.cscmp.org – Council for Supply Chain Management Professionals (USA)
- www.elalog.org – European Logistics Association
- www.fta.org.uk – Freight Transport Association
- www.im.ws – Institute for Supply Management
- www.lmi.org – Logistics Management Institute
- www.lscms.org – Logistics and Supply Chain Management Society
- www.supply-chain.org – Supply Chain Council
- www.infochain.org – Canadian Association of Logistics Management

Discussion questions

- 1.1 Is it true that every organisation has to move materials to support its operations? Give examples from different types of organisation to support your views.
- 1.2 How important is logistics to the national economy? How has this changed over time?
- 1.3 Organisations are only really interested in making products that they can sell to customers. Provided they have reliable first-tier supplies and transport for products to first-tier customers, logistics is irrelevant. Do you think this is true?
- 1.4 Very few organisations deal with the final customer for a product. Most work upstream and form one step of the supply chain, often passing materials to internal customers within the same organisation. How does the type of customer affect the organisation of logistics and the measures of customer satisfaction?
- 1.5 The cost of logistics varies widely from organisation to organisation. What factors affect these costs? Are the costs fixed or can they be controlled?
- 1.6 How can you measure customer service or satisfaction, and why is it important?
- 1.7 How can a company find the best balance between service level and costs?
- 1.8 Is it really true that logistics affects all aspects of an organisation's performance?
- 1.9 'Logistics is a part of every product package.' What does this mean, and is it true?
- 1.10 In 1996 a survey by Deloitte & Touche in Canada²⁶ found that 98% of respondents described logistics as either 'critical' or 'very important' to their company. The survey also emphasised the rate of change in the area, with over 90% of organisations either currently improving their supply chain or planning improvements within the next two years. Do you think that these findings are still valid?

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Further reading

There are a number of books on logistics, and you might find the following useful.

- Bowersox D.J., Closs D.J. and Cooper M.B. (2007) *Supply chain logistics management* (2nd edition), McGraw-Hill, New York, NY.
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- Hill J.E. and Fredenhall L.D. (2001) *Basics of supply chain management*, St Lucie Press, Philadelphia, PA.
- Rushton A., Croucher P. and Baker P. (2006) *The handbook of logistics and distribution management*, Kogan Page, London.
- Simchi-Levi D., Kaminsky P. and Simchi-Levi E. (2007) *Designing and managing the supply chain*, McGraw Hill, New York.
- Waters D. (2007) *Global logistics* (5th edition), Kogan Page, London.