PART ONE
Concepts of logistics and distribution

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Introduction to logistics and distribution 01

Introduction

The key components of logistics – transport, inventory, warehousing – have been fundamental elements of industrial and economic life for countless years. However, these components and their sub-functions were treated as individual elements and rarely as part of a bigger and broader concept whereby they are connected together to provide the means to an end. That end is the satisfactory supply of goods or products to a customer at an acceptable time and an acceptable cost. Thus, in those early years, logistics was not recognized as a major business function in its own right. The main reason for this is the nature of logistics itself. It is a function made up of many sub-functions and many subsystems, each of which has been, and may still be, treated as a distinct management operation. Both the academic and the business world accept that there is a need to adopt a more holistic view of these different operations in order to take into account how they interrelate and interact with one another and to ensure that the overall operation, whatever it may be, is optimized.

The appreciation of the scope and importance of logistics and the supply chain has led to a more scientific approach being adopted towards the subject. This approach has been aimed at the overall concept of the logistics function as a whole but, importantly, also includes the interrelationship of the individual subsystems. Much of this approach has addressed the need for, and means of, planning logistics and the supply chain, but has necessarily included the consideration of the major operational issues as well.

Continuous advances in technology and the development of new ideas and concepts, however, mean that there is a constant change in thinking with regard to the most effective approaches that should be adopted for logistics and the supply chain. Some of these key ideas and issues are described in Chapter 5. This first chapter of the book provides an introduction to the very basic aspects of distribution, logistics and the supply chain. Initially there is a review of the scope and definition of

distribution, logistics and the supply chain. Next is a discussion of the key elements that are fundamental to the logistic function. A brief description of the historical growth of distribution and logistics is followed by an assessment of its importance throughout the world. Finally, a typical distribution and logistics structure is described and discussed.

Scope and definition

Parallel to the growth in the importance of distribution, logistics and the supply chain has been the growth in the number of associated names and different definitions that are used. Among the many different names can be found:

- physical distribution
- logistics
- business logistics
- materials management
- procurement and supply
- product flow
- marketing logistics
- supply chain management
- demand chain management

and there are several more.

There is, realistically, no 'true' name or 'true' definition that can be pedantically applied to these different terms because the elements that are covered can be so variable. Every industry has its own characteristics, and for each company in that industry there can be major variations in strategy, size, range of product, market coverage, etc. Logistics is, therefore, a diverse and dynamic function that has to be flexible and has to change according to the various constraints and demands imposed upon it and with respect to the environment in which it works.

Thus, these many different terms are used, often interchangeably, in literature and in the business world. One of the key relationships can be described as follows:

Logistics = Materials Management + Distribution

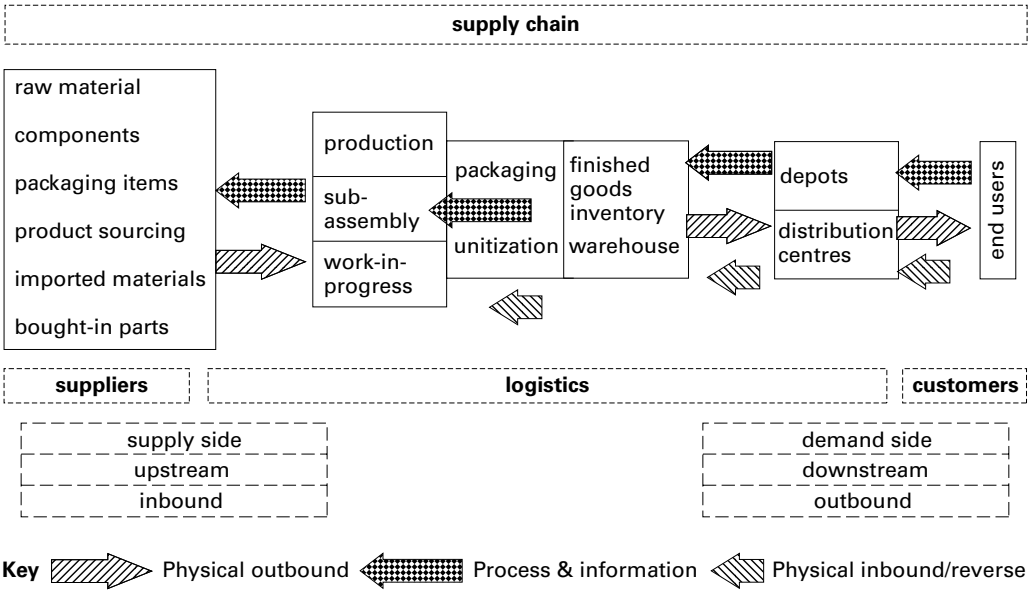
where 'materials management' represents the activities concerning materials going into and through the production process and 'distribution' represents the process of making a product available to the consumer or business that needs it.

An extension to this idea helps to illustrate that the supply chain covers an even broader scope of the business area. This includes the supply of raw materials and components as well as the delivery of products to the final customer. Thus:

Supply Chain = Suppliers + Logistics + Customers

It should also be noted that logistics and the supply chain are concerned not only with physical flows and storage from raw material through to the final distribution of the finished product, but also with information flows and storage. Indeed, major emphasis is now placed on the importance of information as well as physical flows and storage. This is reflected in the content throughout this book. An additional and very relevant factor is that of reverse logistics – the flow of used products and returnable packaging back through the system. Figure 1.1 illustrates these different elements and flows, as well as indicating how some of the associated logistics terminology can be applied.

Figure 1.1 A flow representation of logistics for a fast-moving consumer goods (FMCG) manufacturer. This shows the key components, the major flows and some of the different logistics terminology



Having indicated above that there is no 'true' definition of logistics that can be universally applied, it would be remiss not to consider some of the alternatives! The question of what is the most appropriate definition of logistics and its associated namesakes is always an interesting one. There is a multitude of definitions to be found in textbooks and on the internet. Several early definitions referred to the

ability of logistics to help create time and place utility for products in the marketplace. A selection of more recent definitions is:

> Logistics is the management of the flow of goods between point of origin and point of destination to meet customer and corporate requirements.
>
> Collins Dictionary

> Logistics management is that part of supply chain management that plans, implements and controls the efficient, effective forward and reverse flow and storage of goods, services and related information between the point of origin and the point of consumption in order to meet customers' requirements.
>
> Council of Supply Chain Management Professionals (USA), 2025

Logistics is the process of planning, implementing, and controlling procedures for the efficient and effective transportation and storage of goods including services, and related information from the point of origin to the point of consumption for the purpose of conforming to customer requirements. This definition includes inbound, outbound, internal, and external movements.

In this context, CSCMP defines supply chain management as follows:

> Supply chain management encompasses the planning and management of all activities involved in sourcing and procurement, conversion, and all logistics management activities. Importantly, it also includes coordination and collaboration with channel partners, which can be suppliers, intermediaries, third party service providers, and customers. In essence, supply chain management integrates supply and demand management within and across companies.
>
> council of supply chain management professionals (usa), 2021

For many definitions it is possible to detect the different biases – military, economic, academic… An appropriate modern definition that applies to most industries and that we might use for this book is that:

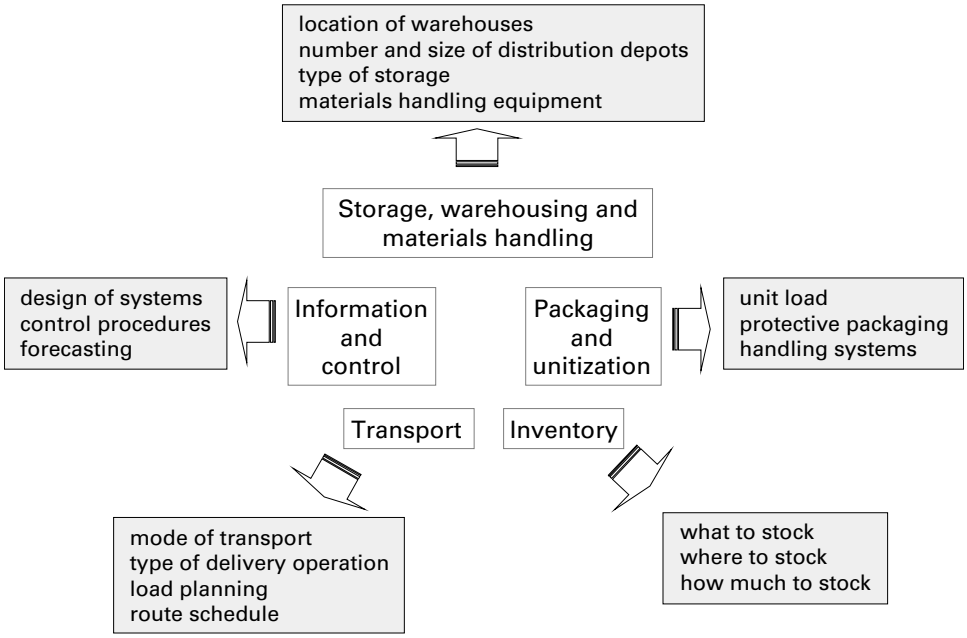
> logistics concerns the efficient transfer of goods from the source of supply through the place of manufacture to the point of consumption in a cost-effective way while providing an appropriate service to the customer.

This focus on cost-effectiveness and customer service will be a point of emphasis throughout this book.

A more critical consideration of the difference between logistics and the supply chain is given at the end of Chapter 2. It is developed using some of the ideas that are discussed in that chapter.

For most organizations it is possible to draw up a familiar list of key areas representing the major components of distribution and logistics. These will include transport, warehousing, inventory, packaging and information. This list can be

Figure 1.2 The key components of distribution and logistics, showing a few of the associated detailed elements



'exploded' once again to reveal the detailed aspects within the different components. Some typical examples are given in Figure 1.2.

All of these functions and sub-functions need to be planned in a systematic way, in terms both of their own local environment and of the wider scope of the distribution system as a whole. A number of questions need to be asked and decisions made. The different ways of answering these questions and making these decisions are addressed in the chapters of this book as consideration is given to the planning and operation of the logistics and supply chain function. In addition, the total system interrelationships and the constraints of appropriate costs and service levels are discussed.

Historical perspective

The different elements of logistics and the supply chain have, of course, always been fundamental to the manufacturing, storage and movement of goods and products. For most companies they are recognized as vital functions that contribute to the business and economic environment. The role of logistics has developed such that it now plays a major part in the success of many different operations and organizations. In essence, the underlying concepts and rationale for logistics are not new.

They have evolved through several stages of development, but still use the basic ideas such as trade-off analysis, value chains and systems theory together with their associated techniques. Of course, many of these ideas, concepts and techniques have altered, almost beyond recognition, from their original format.

There have been several distinct stages in the development of distribution and logistics.

1950s and early 1960s

In the 1950s and early 1960s, distribution systems were unplanned and unformulated. Manufacturers manufactured, retailers retailed, and in some way or other the goods reached the shops. Distribution was broadly represented by the haulage industry and manufacturers' own-account fleets. There was little positive control and no real liaison between the various distribution-related functions.

1960s and early 1970s

In the 1960s and 1970s the concept of physical distribution was developed with the gradual realization that the 'dark continent' (as distribution was described in early academic literature) was indeed a valid area for managerial involvement. This consisted of the recognition that there was a series of interrelated physical activities such as transport, storage, materials handling and packaging that could be linked together and managed more effectively. In particular, there was recognition of a relationship between the various functions, which enabled a systems approach and total cost perspective to be used. Under the auspices of a physical distribution manager, a number of distribution trade-offs could be planned and managed to provide both improved service and reduced cost. Initially the benefits were recognized by manufacturers, who developed distribution operations to reflect the flow of their product to their customers.

1970s

The 1970s was an important decade in the development of the distribution concept. One major change was the recognition by some companies of the need to include distribution in the functional management structure of an organization. The decade also saw a change in the structure and control of the distribution chain. There was a decline in the power of the manufacturers and suppliers, and a marked increase in that of the major retailers. The larger retail chains developed their own distribution structures, based initially on the concept of regional or local distribution depots to supply their stores.

1980s

In the 1980s fairly rapid cost increases and the clearer definition of the true costs of distribution contributed to a significant increase in professionalism within distribution. With this professionalism came a move towards longer-term planning and attempts to identify and pursue cost-saving measures. These measures included centralized distribution, notable reductions in stockholding and the use of the computer to provide improved information and control. The growth of the third-party distribution service industry was also of major significance, with these companies spearheading developments in information and equipment technology. The concept of and need for integrated logistics systems were recognized by forward-looking companies that participated in distribution activities.

Late 1980s and early 1990s

In the late 1980s and early 1990s advances in information technology enabled organizations to broaden their perspectives in terms of the functions that could be integrated. In short, this covered the combining of materials management (the inbound side) with physical distribution (the outbound side). The term 'logistics' was used to describe this concept (see Figure 1.1). Once again, this led to additional opportunities to improve customer service and reduce the associated costs. One major emphasis made during this period was that informational aspects were as important as physical aspects in securing an effective logistics strategy.

1990s

In the 1990s the process of integration was developed even further to encompass not only the key functions within an organization's own boundaries but also those functions outside that also contribute to the provision of a product to a final customer. This became known as 'supply chain management' (see Figure 1.1). The supply chain concept gave credence to the fact that there may be several different organizations involved in getting a product to the marketplace. Thus, for example, manufacturers and retailers should act together in partnership to help create a logistics pipeline that enables an efficient and effective flow of the right products through to the final customer. These partnerships or alliances should also include other intermediaries within the supply chain, such as third-party contractors.

2000s

As the new millennium dawned, business organizations faced many challenges as they endeavoured to maintain or improve their position against their competitors, bring new products to market and increase the profitability of their operations. This

led to the development of many new ideas for improvement, specifically recognized in the redefinition of business goals and the re-engineering of entire systems.

Logistics and the supply chain were confirmed as key elements to overall business success. Indeed, for many organizations, changes in logistics and the supply chain provided the catalyst for major enhancements to their business. Leading organizations recognized that there was a positive 'value-added' role that logistics could offer, rather than the traditional view that the various functions within logistics were merely a cost burden that had to be minimized regardless of any other implications. Logistics was seen as a key enabler for business improvement.

2010s

This period saw the confirmation of the importance of a number of concepts and many businesses developed and improved their systems and operations to embrace these. Many of these concepts remain key and are covered in the relevant chapters of this book. Some examples are:

- environmental concerns resulted in the development of many green initiatives in logistics
- the important role of the supply chain was reflected in new approaches to humanitarian logistics
- the recognition of the difference between lean and agile supply chains brought about revised structures to relevant businesses
- the concept of the networked economy was also embraced, acknowledging that the success of a company is intrinsically linked to others so that enterprises need to cooperate and collaborate across their traditional boundaries
- significant technology developments began to impact on logistics and supply chain activities
- e-commerce, e-fulfilment, AI, Big Data analytics

2020s and beyond

Since 2020, logistics and distribution have undergone profound transformations, largely shaped by the Covid-19 pandemic and its aftershocks. The global crisis exposed critical vulnerabilities in supply chains, especially those reliant on just-in-time models and long-distance sourcing. Border closures, factory shutdowns and transport disruptions led to significant delays and shortages, prompting organizations to reassess resilience and agility in their distribution networks.

In addition, the acceleration of digitalization as enabled by technologies such as AI, IoT, robotics and predictive analytics has been adopted to improve real-time

visibility, automate warehouses and manage risks. E-commerce boomed during lockdowns, requiring last-mile delivery networks to scale rapidly. This demand surge pushed logistics providers to innovate with micro-fulfilment centres, drones and crowd-sourced delivery models.

On the other hand, geopolitical tensions, notably in terms of armed conflicts and ongoing trade frictions, have further emphasized the need for supply chain diversification. Many firms undertook reshoring, nearshoring or friend-shoring operations to reduce dependence on single geographies. Environmental and social governance (ESG) also came to the fore, with consumers and regulators demanding greener and more ethical supply chains.

In parallel, as industries face rising costs in terms of energy prices, raw material cost inflation, labour shortages and new compliance requirements, supply chain visibility, collaborative planning and investment in more sustainable transport modes are areas of concern for top management.

The key recent and likely future issues to be faced in distribution, logistics and supply chain management are reviewed and discussed in Chapter 5.

Importance of logistics and distribution

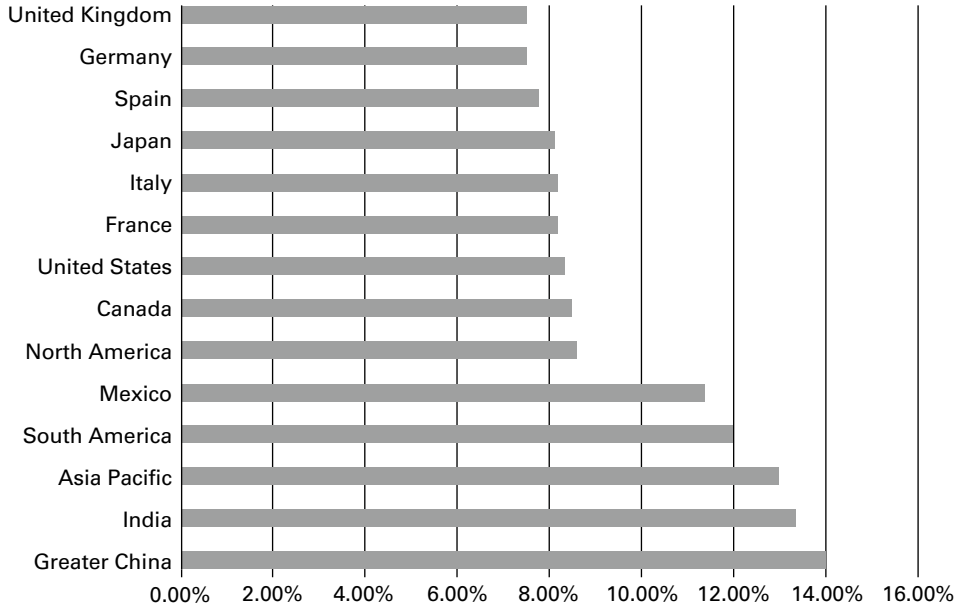
Importance in the economy

Logistics is an important activity making extensive use of the human and material resources that affect a national economy. Due to the difficulty of data collection, only a limited number of studies have been undertaken to try to estimate and compare the extent of the impact of logistics on the economy.

Anecdotal data indicates that about 30 per cent of the working population in the UK were associated with work that is related to logistics. A study undertaken by Armstrong and Associates (2023) was able to present data at a country level, which indicated that, for the many economies reviewed, logistics represented somewhere between 7 and 20 per cent of the gross domestic product (GDP) of that country, a rather significant economic impact. The information, for the latest year available, is summarized in Figure 1.3 for certain key countries.

Figure 1.3 shows that, for the main European and North American economies, logistics represented between 7.5 per cent and 9.5 per cent of GDP. For the larger South American nations this range was higher at around 12 per cent, with India at 13.4 per cent and China at 14.0 per cent. These numbers represent very substantial costs, and serve to illustrate how important it is to understand the nature of logistics costs and to identify means of keeping these costs to a minimum. Countries with the lowest costs are generally those where the importance of logistics was recognized relatively early and where there has been time to create more efficient

Figure 1.3 Logistics costs as a percentage of GDP for selected countries



SOURCE Armstrong and Associates, 2023

systems. It is already apparent that the logistics costs of developing nations will continue to decrease over the next few years as they have decreased in the past few years. About 25 years ago, if the same statistics had been available, these percentage elements would undoubtedly have been a lot higher in all of these countries. In the UK records go back for about 40 years, and logistics costs were then around the 18 to 20 per cent mark.

The Council of Supply Chain Management Professionals in the United States, in its *Annual State of Logistics Report* (2025), provided figures indicating that logistics costs as a percentage of GDP for the United States had risen from 8.1 per cent in 2008 to 8.7 per cent in 2025. This is amidst demand not having fully recovered from the Covid pandemic and a number of capacity and availability shortages being witnessed. The report notes that the 2025 trend involved the largest manufacturers and retailers seeking to monetize their own logistics capabilities while viewing their supply chain successes as a service to market and profit from.

Importance to industry

The breakdown of the costs of the different elements within logistics has also been addressed, but again only in a very limited number of surveys, so data is hard to find. One survey of US logistics costs undertaken by Establish Davis (2016) indicated that in the United States transport was the most important element at 48.4 per cent,

followed by inventory carrying cost at 22.9 per cent, storage/warehousing at 22.6 per cent, customer service/order entry at 3.9 per cent and administration at 2.3 per cent.

In past studies of this nature, the transport cost element of distribution has always been the major constituent part in the United States. US transport costs are especially affected by the long distances travelled, so the transport cost element is markedly higher there than it is in Europe.

The statistics described above are useful to provide a broad perspective on the importance of the relative logistics components. When looking at industry and company level, however, it is essential to be aware that these costs are average figures taken across a number of companies.

The relative make-up of these costs can vary quite significantly between different industries. Listed in Table 1.1 are some examples of the major logistics costs from different types of company, shown as a percentage of sales turnover. These are taken from an industry cost audit carried out in the UK by Dialog Consultants Ltd and they illustrate how extreme these variations can be. There are some quite major variations among the results from the various companies and there can be a number of reasons for these cost differences. For example:

- Logistics structures can and do differ quite dramatically between one company and another, and one industry and another.
- Channels can be short (i.e. very direct) or long (i.e. have many intermediate stocking points).
- Supply chains may be operated by different players: manufacturers, retailers, specialist third-party distribution companies, or indeed by a mixture of these.

Also, it should be noted that in the examples shown in Table 1.1 the relative importance of logistics is measured in relationship to the overall value of the particular products in question, which has implications for comparing relative importance between different companies. For example, cement is a low-cost product (as well as being a very heavy one!), so the relative costs of its logistics are very high. Spirits (whisky, gin, etc) are very high-value products, so the relative logistics costs appear very low. Two key factors related to the relative importance of logistics in industry are:

- Small companies tend to have proportionately higher logistics costs than large companies (about 13 per cent of the cost of sales compared to about 4.5 per cent). This is principally because large companies can benefit from economies of scale.
- Companies with high product values tend to have proportionately lower logistics costs than those with low product values (about 4.5 per cent of the cost of sales compared to about 10.5 per cent). This is because the high value of their goods tends to distort downwards the importance of the respective logistics costs.

These and other associated aspects are discussed in subsequent chapters.

Table 1.1 Logistics costs as a percentage of sales turnover

	Cost as Percentage of Turnover				
Main Company Business	**Transport Cost**	**Warehouse/ Depot Cost**	**Inventory Investment/ Holding Cost**	**Administration Cost**	**Overall Logistics Cost**
	%	**%**	**%**	**%**	**%**
Office equipment	3.20	10.70	0.87		14.77
Health supplies	1.36	9.77	0.66	0.19	11.98
Soft drinks	2.53	2.71	0.44		5.68
Beer (food and drink)	8.16	2.82	0.56	2.19	13.74
Spirits distribution	0.37	0.27	0.07	0.10	0.81
Cement	25.20	9.10	7.10	4.60	46.00
Automotive parts	2.07	6.35	1.53		9.96
Gas supply (non-bulk)	9.41	2.45	0.02		11.98
Computer maintenance	0.45	0.10	0.29	0.05	0.88
Computer supply	0.65	0.78	0.09		1.52
Healthcare	0.96	1.08	1.21		3.25
Specialist chemicals	7.23	1.95	0.20	0.49	9.87
Fashion	0.38	1.31	0.33		2.02
Food packaging	3.14	3.73	0.85		7.72

SOURCE Benchmark survey of UK companies by Dialog Consultants Ltd (unpublished)

The 10 Rs of logistics

CSCMP's earlier definition of logistics included a view on the time-related positioning of resources and introduced the 'five rights'. Essentially, logistics is the process of

ensuring that goods or a service is: in the right place, at the right time, in the right quantity, at the right quality, at the right price:

Right product: Ensuring the correct item is selected and delivered based on customer demand or production needs. This involves accurate forecasting, planning and inventory management.

Right quantity: Delivering the exact amount needed – no more, no less – to avoid stockouts or overstock, both of which can lead to increased costs and inefficiencies.

Right place: Getting goods to the correct location, whether it's a warehouse, retail store or end-user, to support seamless operations and customer satisfaction.

Right time: Making sure deliveries occur exactly when needed, which requires precise scheduling and coordination across the supply chain to avoid delays or early arrivals that disrupt planning.

Right cost: Achieving cost-effectiveness in logistics activities without compromising on service levels, often through route optimization, mode selection and efficient resource use.

These are often cited as the foundational objectives for delivering value to customers while managing resources efficiently. However, in recent years, five additional 'Rs' have been added to reflect evolving priorities in modern supply chains, including:

Right quality: Guaranteeing that products meet the expected standards, specifications and performance requirements, which involves quality control throughout the supply chain.

Right source: Choosing suppliers and partners that provide ethically produced, sustainable and reliable inputs, supporting corporate responsibility and risk mitigation.

Right customer: Targeting and serving the appropriate customer segments to ensure alignment between product features and user needs, enhancing satisfaction and loyalty.

Right condition: Delivering items in a usable, undamaged state by using suitable packaging, handling and transportation methods, particularly important for perishables or fragile goods.

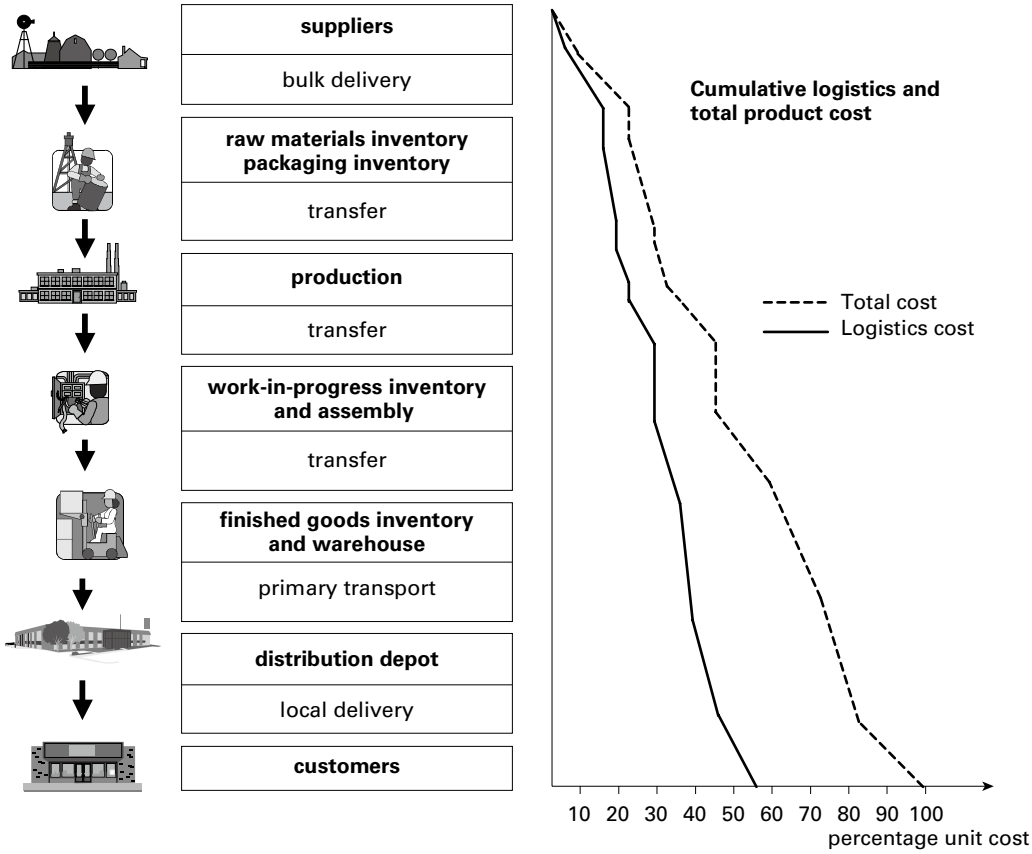
Right compliance: Adhering to all relevant legal, safety, environmental and trade regulations to avoid penalties and support sustainable operations.

Logistics and supply chain structure

The discussion in the previous sections of this chapter has illustrated the major components to be found within a logistics or supply chain system: transport, warehousing, inventory, etc. The fundamental characteristics of a physical distribution structure are illustrated on the left-hand side of Figure 1.4, and can be considered as the flow of material or product, interspersed at various points by periods when the material or product is stationary. This flow is usually some form of transportation of the product. The stationary periods are usually for storage or to allow some change to the product to take place – manufacture, assembly, packing, break bulk, etc.

This simple physical flow that is illustrated thus consists of the different types of transport (primary, local delivery, etc) and stationary functions (production, finished goods inventory, etc).

Figure 1.4 A typical physical flow of material from suppliers through to customers, showing stationary functions and movement functions, linked to a diagram that reflects the 'value-added' nature of logistics



There is also, of course, a cost incurred to enable the distribution operation to take place. The importance of this distribution or logistical cost to the final cost of the product has already been highlighted. As has been noted, it can vary according to the sophistication of the distribution system used and the intrinsic value of the product itself. One idea that helps to emphasize the importance of distribution and logistics is that these different elements of logistics are providing an 'added value' to a product as it is made available to the final user – rather than just imposing an additional cost. This is a more positive view of logistics and is a useful way of assessing the real contribution of logistics and distribution services. Figure 1.4 also provides an example of this cost or added value for a typical low-cost product.

Figure 1.4 concentrates on the physical flows of goods and materials, demonstrating some of the different links and functions that are fundamental to logistics. What is not shown, but will be seen as vital to the success of the process, is the vast amount of information that is essential to enable and support logistics operations. This is key, and will be considered in detail in many chapters of this book.

Integrated logistics and the supply chain

02

Introduction

In Chapter 1, different definitions of logistics were introduced, and the main components of logistics were outlined. It was shown that the various logistics and supply chain functions are part of a flow process operating across many business areas. In this chapter, the emphasis is on the integration of the various logistics components into a complete working structure that enables the overall system to run at the optimum. Thus, the concept of 'total logistics' is described, and the importance of recognizing the opportunities for appropriate trade-offs is discussed. Some key aspects of planning for logistics are reviewed, and the financial impact that logistics has in a business is described. Finally, a number of key developments in logistics integration are considered, including the impact of the globalization of many companies, the use of integrated planning systems, how logistics can help to create competitive advantage and the concept of supply chain (SC) management.

The total logistics concept

The total logistics concept (TLC) aims to treat the many different elements that come under the broad category of distribution and logistics as one single integrated system. It is a recognition that the interrelationships between different elements, for example delivery transport and storage, need to be considered within the context of the broader supply chain. Thus, the total system should be considered and not just an individual element or subsystem in isolation.

An understanding of the concept is especially important when planning for any aspect of distribution and logistics. The simple, practical example in the box helps to emphasize the point.

EXAMPLE The total logistics concept

A company produces plastic toys that are packaged in cardboard boxes. These boxes are packed onto wooden pallets that are used as the basic unit load in the warehouse and in the transport vehicles for delivery to customers.

A study indicates that the cardboard box is an unnecessary cost because it does not provide any significant additional protection to the quite robust plastic toys and it does not appear to offer any significant marketing advantage. Thus, the box is discarded, lowering the unit cost of the toy and so providing a potential advantage in the marketplace.

One unforeseen result, however, is that the toys, without their boxes, cannot be stacked on to wooden pallets, because they are unstable, but must be stored and moved instead in special trays. These trays are totally different to the unit load that is currently used in the warehouse and on the vehicles (i.e. the wooden pallet). The additional cost penalty in providing special trays and catering for another type of unit load for storage and delivery is a high one – much higher than the savings made on the product packaging.

This example illustrates a classic case of *sub-optimization* in a logistics system. It shows that if the concept of total logistics is ignored, this can be a significant cost to a company. As the product packaging costs have been reduced, those concerned with this company function will feel that they have done their job well. However, the overall effect on the total logistics cost is, in fact, a negative one. The company is better served by disregarding this potential saving on packaging, because the additional warehouse and transport costs mean that total costs increase.

This simple example of sub-optimization emphasizes the importance of understanding the interrelationships of the different logistics elements. A more positive action would be to measure and interpret these and other interrelationships using a planned approach to identifying and determining any *cost trade-offs*. This approach will be a benefit to the logistics system as a whole. Such a trade-off may entail additional cost in one function but will provide a greater cost saving in another. The overall achievement will be a net gain to the system.

This type of trade-off analysis is an important part of planning for logistics. Four different levels of trade-offs can be identified:

1 *Within logistics components:* this refers to the trade-offs that occur within single functions (e.g. warehousing, distribution). One example would be the decision to use random storage locations compared to fixed storage locations within a depot. The first of these, random, provides better storage utilization but is more difficult

for picking; the second, fixed, is easier for picking but does not provide such good storage utilization.

2 *Between logistics components:* these are the trade-offs that occur between the different elements in logistics. To reverse the earlier packaging example, a company might increase the strength and thus the cost of packaging but find greater savings through improvements in the warehousing and storage of the product (i.e. block stacking rather than a requirement for racking).

3 *Between company functions:* there are a number of areas of interface between company functions where trade-offs can be made. This is illustrated in Figure 2.1, which lists some potential trade-offs and indicates how the different company functions might be affected. One example is the trade-off between optimizing production run lengths and the associated warehousing costs of storing the finished product. Long production runs produce lower unit costs (and thus more cost-effective production) but mean that more product must be stored for a longer period (which is less cost-effective for warehousing).

4 *Between the company and external organizations:* there may be opportunities for a trade-off between two companies that are directly associated with each other. For example, a change from a manufacturer's products being delivered direct to a retailer's stores to delivery via the retailer's distribution depot network might lead to a cheaper solution overall for the two companies.

These types of trade-offs are thus at the heart of the total logistics concept. For the planning of distribution and logistics, it is important to take this overall view of a logistics system and its costs. The other side of the equation is, of course, the need to provide the service level that is required by the customer. This balance of total logistics cost and customer service level is essential to successful logistics.

Planning for logistics

In order to ensure that the concept of total logistics is put into practice and that suitable trade-offs are achieved, it is essential that a positive planning approach is adopted. In this section, the various planning horizons with their associated logistics decisions are described. In Chapter 6, a more formalized planning framework is discussed. This is developed in subsequent chapters into a more practical and detailed approach to logistics planning.

Planning should be undertaken according to a certain hierarchy that reflects different *planning time horizons*. These are generally classified as strategic, tactical and operational. They are represented on the left side of Figure 2.2. There is an overlap between the different levels, which emphasizes that there are some factors that can be considered at different stages in this planning hierarchy. The relative importance

Figure 2.1 Some potential trade-offs in logistics, showing how different company functions might be affected

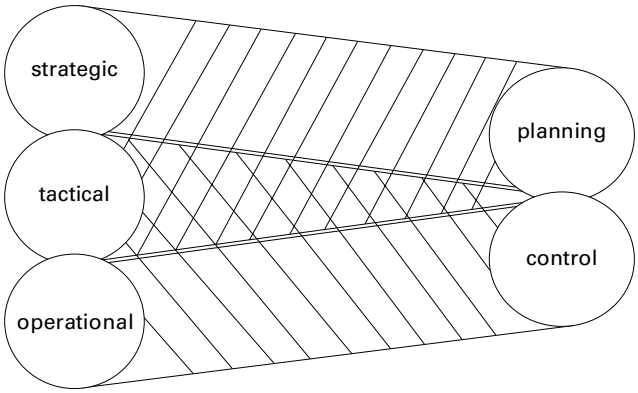
Trade-off		Finance	Production	Distribution	Marketing
Longer production runs		Lower production unit costs	Lower production unit costs	More inventory and storage required	Lower prices
Fewer depots		Reduced depot costs (though transport costs likely to increase)	No impact	Less complicated logistics structure	Service reduction due to increased distance of depots from customers
Reducing stocks of finished goods		Reduced inventory costs	Shorter production runs so higher production unit costs	No need to expand storage facilities	Poorer product availability for customers
Reducing raw material & component stocks		Reduced inventory costs	Less efficient production scheduling due to stock unavailability	Lower stock-holding requirements	No direct impact
Reducing protective transport packaging		Reduced packaging costs	No impact	Reduced transport modal choice	Increase in damaged deliveries
Reducing warehouse supervision		Cost savings through lower headcount	No impact	Reduced efficiency due to less supervision	Lost sales due to less accurate order picking

of these various elements can differ between one company and another. For example, the choice of transport mode might be a strategic decision for a company that is setting up a new global logistics operation, but might just be a tactical decision for another company that is principally a supplier to a locally based market and only occasionally exports over long distances. Choice of transport mode could even be an initial strategic decision and also a subsequent tactical decision for a single company.

Figure 2.2 also indicates the interrelationship of *planning and control* within this hierarchy. Both of these different elements are essential to the running of an effective and efficient logistics operation. One way to envisage the difference between these two concepts is as follows: *planning* is about ensuring that the operation is set up to run properly – it is 'doing the right thing' or preparing for and planning the operation 'effectively'; *control* is about managing the operation in the right way – it is 'doing the thing right' or making sure that the operation is being run 'efficiently'.

Once again it is not relevant to define exactly which strategic, tactical and operational decisions or tasks within a company should be classified as either planning or control. Most elements need to be planned correctly in the first place, and then subsequently they need to be monitored and controlled to ensure that the operation is

Figure 2.2 Logistics planning hierarchy



running as well as it should be. The practical means of monitoring and controlling logistics are described in Chapter 38.

Some of the major aspects and differences between the three time horizons are summarized in Figure 2.3. The importance and relevance of these different aspects will, of course, vary according to the type and scale of business, product, etc. It is helpful to be aware of the planning horizon and the associated implications for each major decision that is made.

Figure 2.3 The major functions of the different planning time horizons

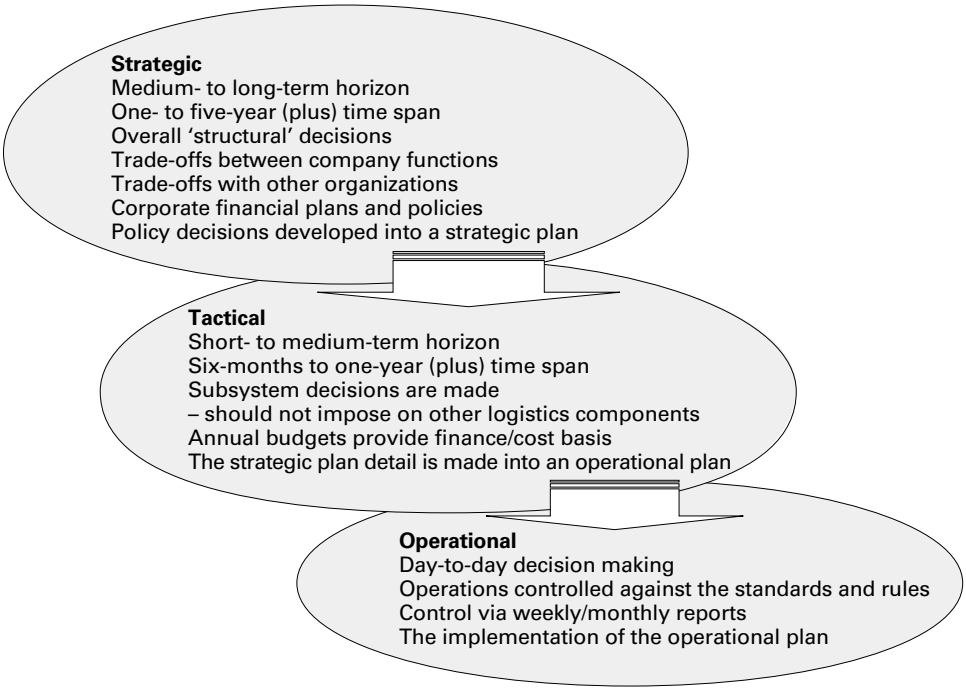
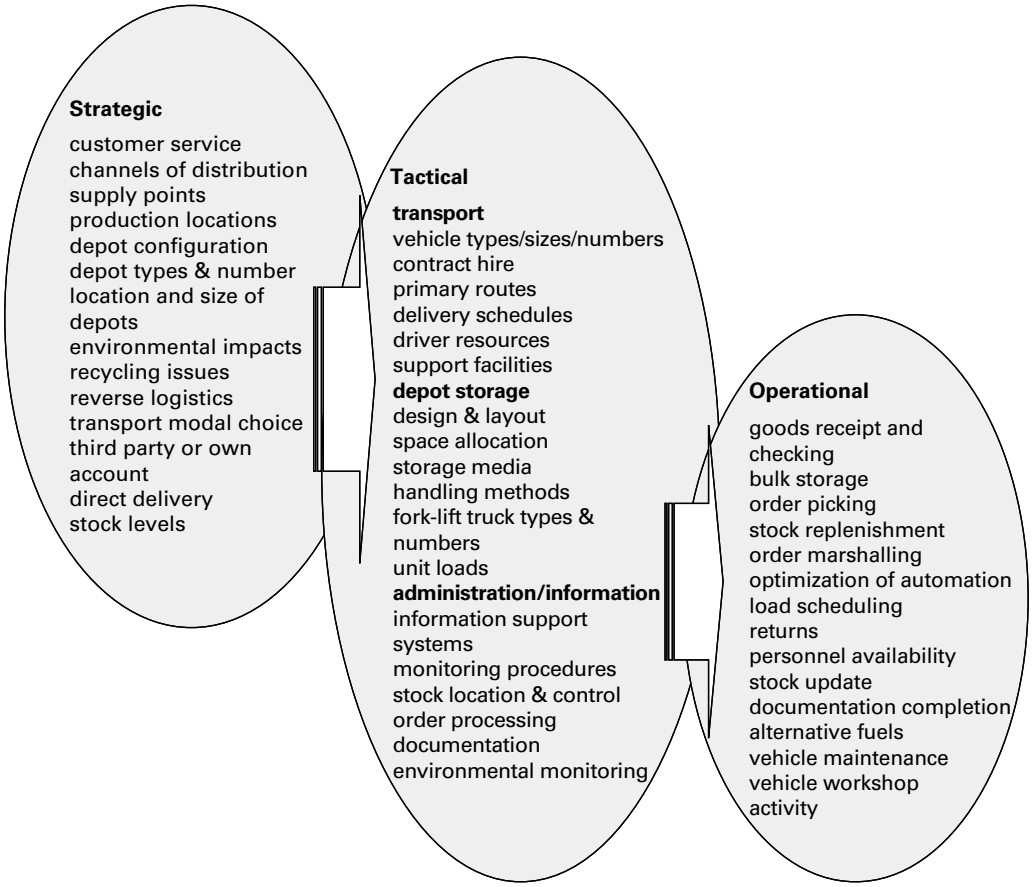


Figure 2.4 Some of the main logistics elements for the different planning time horizons

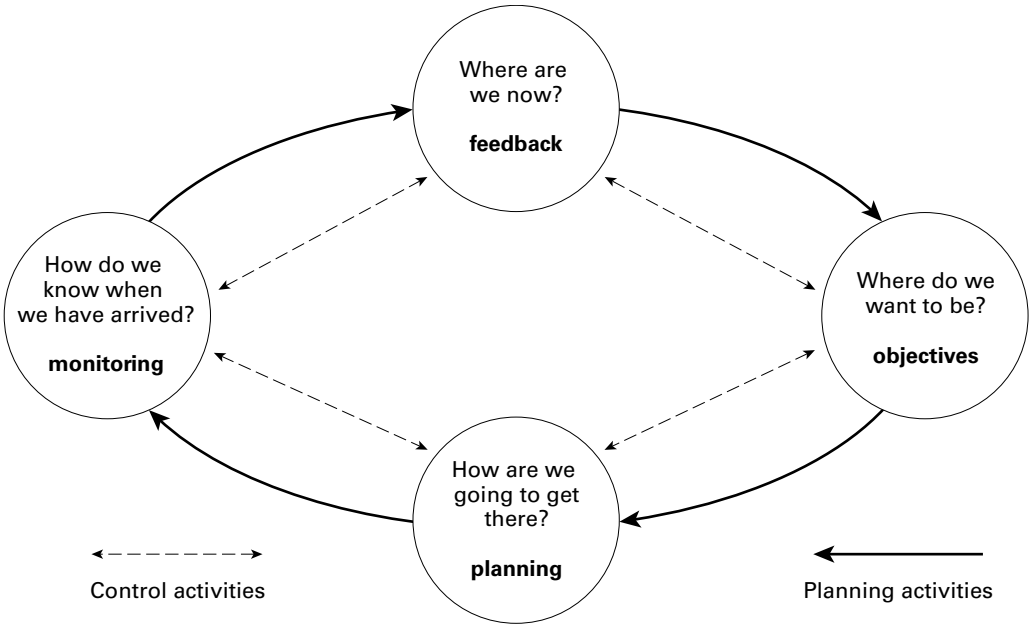


It is possible to identify many different elements within distribution and logistics that can be broadly categorized within this planning hierarchy. As already indicated, these may vary from one company to another and from one operation to another. Some of these – in no particular order – are as indicated in Figure 2.4.

These examples serve to emphasize the complexity of distribution and logistics. In addition, they underline the need for appropriate planning and control. Distribution and logistics are not merely the transportation of goods from one storage point to another. There are many and varied elements that go together to produce an effective distribution and logistics operation. These elements interrelate, and they need to be planned over suitable time horizons.

The planning and control of an operation can also be described within the context of a broader planning cycle. This emphasizes the need for a systematic approach, where continual review takes place. This is a particularly important concept in logistics, because most operations need to be highly dynamic – they are subject to

Figure 2.5 The planning and control cycle



continual change, as both demand and supply of goods and products regularly vary according to changes in customer requirements for new products and better product availability. One example of a fairly common framework is shown as the planning and control cycle in Figure 2.5. The key stages in the cycle are as follows:

1. The cycle begins with the question 'Where are we now?' Here the aim is to provide a picture of the current position. This might be through a regular information feedback procedure or, initially, through the use of a specific logistics or distribution audit.
2. The second stage is to determine the objectives of the logistics process, to identify what the operation should be trying to achieve. These objectives need to be related to such elements as customer service requirements, marketing decisions, etc.
3. The third stage in the cycle is the planning process that spans the strategic and operational levels previously discussed.
4. Finally, there is a need for monitoring and control procedures to measure the effectiveness of the distribution operation compared to the plan. This should be undertaken on a regular weekly, monthly and annual basis.

The cycle has then turned full circle, and the process is ready to begin again. This takes account of the dynamic nature of logistics, the need for continual review and

revision of plans, policies and operations. This must be undertaken within a positive planning framework in order to ensure that continuity and progress are maintained.

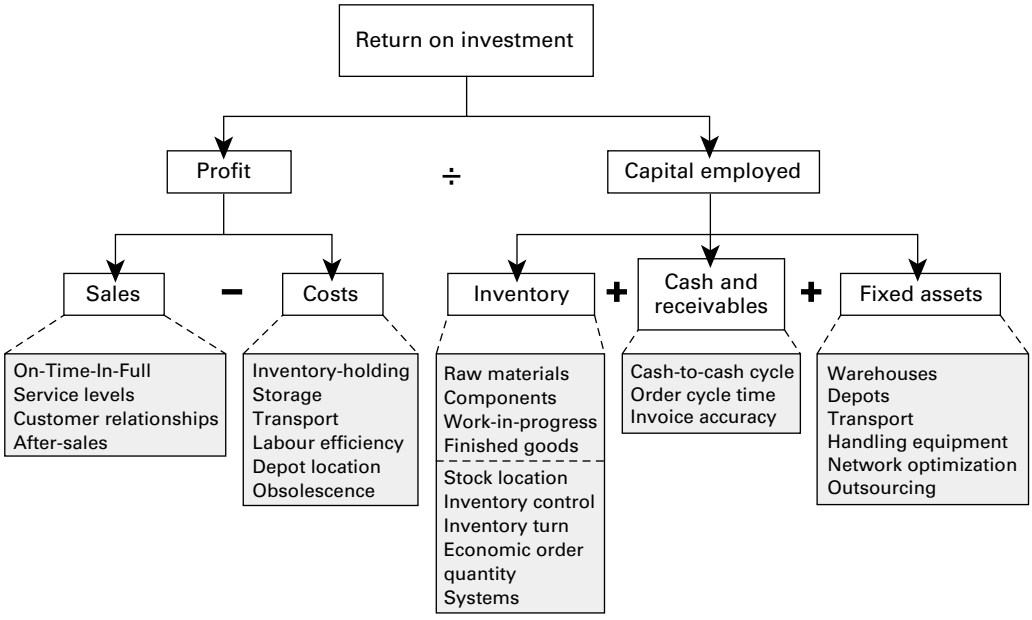
The financial impact of logistics

Logistics can have a variety of different impacts on an organization's financial performance. Logistics was traditionally seen as an operational necessity that cannot be avoided; however, a good logistics operation can also offer opportunities for improving financial performance.

For many companies, a key measure of success is the return on investment (ROI): the ratio between the net profit and the capital employed in the business. For improved business performance, this ratio needs to be shifted to increase profits and reduce capital employed. There are many different ways in which logistics can have both a positive and a negative impact on the ROI. These are outlined in Figure 2.6. This shows ROI as the key ratio of profit and capital employed, with the main elements broken down further as sales revenue *less* cost (representing profit) and inventory *plus* cash and receivables *plus* fixed assets (representing capital employed).

Profit can be enhanced through increased sales, and sales benefit from the provision of high and consistent service levels. One of the aims of many service level

Figure 2.6 The many ways in which logistics can provide an impact on an organization's return on investment



agreements is to try to achieve on-time-in-full (OTIF) deliveries – a key objective of many logistics systems. On the other hand, costs can be minimized through efficient logistics operations. There are a number of ways that this might happen, including:

- more efficient transport, thus reducing transport costs
- better storage and handling leading to reduced storage costs
- reduced inventory holding leading to less cash being tied up in inventory
- improved labour efficiency, thus reducing costs

The amount of *capital employed* can also be affected by the different logistics components. For example, there are many different types of inventory held by companies, including raw materials, components, work-in-progress and finished goods. The key logistics functions impact very significantly on the stock levels of all of these. This impact can occur with respect to stock location, inventory control, stockholding policies, order and reorder quantities and integrated systems, among others. Cash and receivables are influenced by cash-to-cash and order cycle times – both of these being key logistics processes. Finally, there are many fixed assets to be found in logistics operations: warehouses, distribution centres/depots, transport and materials handling equipment. The number, size and extent of their usage are fundamental to effective logistics planning. Also, there may be good opportunities to outsource some or all of these operations, which has a significant effect on reducing fixed assets.

Much of this book is taken up with the practical logistics issues that enable the maximization of profit, the minimization of costs and thus the improvement of ROI.

Globalization and integration

One notable element is the number of companies that operate in the global marketplace. This necessitates a broader perspective than when a national company operates internationally. In the latter, although companies may have a presence across a wide geographic area, this is supported on a local or regional basis through local or regional sourcing, manufacturing, storage and distribution. In the former, the company is truly global, with a structure and policy that represent a global business. Typical global attributes will include: global branding, global sourcing, global production, centralization of inventories and the centralization of information, but with the ability to provide for local requirements, be these electronic standards for electrical goods, language on packaging or left-/right-hand-drive alternatives in the automotive industry. All of these aspects serve to emphasize the added difficulty of operating effectively in a global environment. Global logistics and supply chain networks are far more complicated and it is necessary to plan and manage logistics as a complete and integrated system.

To service global markets, logistics networks become, necessarily, far more expansive and far more complex. Once again, the need is to plan and manage logistics as a complete and integrated system. As well as the attributes already mentioned, companies operating in a global market are often involved with the outsourcing of some manufacturing and the use of 'focused' factories that specialize in a limited number of products.

Linked closely to the globalization of business is the increase in the complexity of supply chain management. As already indicated, globalization almost certainly leads to greater complexity. Complexity provides some significant implications for logistics operations. These include:

- extended supply lead times
- production postponement with local added value
- complicated supply chain networks
- multiple freight transport options
- extended and unreliable transit times
- environmental and ethical issues
- the need for greater visibility in the supply chain

It is probably clear from this that there is a direct conflict between globalization and the move to the quick-response, just-in-time operations that are being sought by many companies. In global companies there is a tendency to see order lead times increase and inventory levels rise because of the distances involved and the complexity of logistics. In companies espousing the just-in-time philosophy there is a desire to reduce lead times and to eliminate unnecessary stock and waste within their operations. For those companies trying to achieve both goals, there is a clear challenge for logistics.

Integrated systems

There are a number of logistics and distribution information systems that have the concept of total logistics as their basis. Thus, quite revolutionary 'trade-offs' can be practised. These have come about because of the realization of the importance, cost and complexity of logistics and also due to the use of Big Data analytics, real-time information and artificial intelligence (AI). This has brought about the development of sophisticated information systems to support and enhance the planning and management of logistics operations, whereby very detailed data collection and analysis can be undertaken that was previously impossible. Some of these alternative approaches to integrated physical and information systems are further described in Chapter 40, where information systems in the supply chain are discussed. In

addition, some key aspects of integration are reviewed in Chapter 13, which considers recent developments in manufacturing techniques. Many of the origins of integrated systems have a background in manufacturing. A number of the key systems are outlined briefly:

- *Direct product profitability:* DPP is a technique of allocating all of the appropriate costs and allowances to a given product. All distribution costs (storage, transport, etc) are therefore assigned to a specific product rather than taking an average over a whole product range. DPP techniques can provide the real costs of supplying specific products to individual customers and so provide invaluable information for effective marketing and pricing strategies (see Chapter 38 and also an example with regard to road transport at the end of Chapter 30).
- *Materials requirements planning (MRP)* and *distribution requirements planning (DRP):* MRP/DRP systems are computerized planning tools that aim to make the necessary materials or inventory available when needed. Also, manufacturing resource planning (MRPII) was developed with the objective of improving productivity through the detailed planning and control of production resources. Distribution requirements planning is the application of MRPII techniques to the management of inventory and material flow – effective warehousing and transportation support (see Chapter 13 for further discussion on these).
- *Just-in-time (JIT):* the overall concept of JIT is to provide a production system that eliminates all activities that neither add value to the final product nor allow for the continuous flow of material – in simple terms, that eliminates the costly and wasteful elements within a production process. The objectives of JIT are vitally linked to distribution and logistics and have been adapted and adopted accordingly. This is explained in Chapter 13.
- *Cost-to-serve*®: This is a process-driven accountancy tool used to calculate customer profitability using the actual business activities and overhead costs that are involved. For distribution and logistics, it can be used to assess how costs are consumed throughout the supply chain. It takes into account that each product and each customer have a different cost profile and use different activities (see Chapter 38).
- *Distributed order management (DOM):* DOM systems are designed to arrange orders across the multiple systems and processes utilized by those involved in replenishing an order. DOM can analyse every transaction and determine the most efficient shipping location considering multiple factors, including speed of delivery, the distance between the shipping point and the customer, as well as stock levels in stores. This clearly requires a unified view of stock across multiple channels in order to know exactly where the products are (see Chapter 40).

- *Supply chain control tower:* The essence of the control tower concept is to provide supply chain visibility across divisions, countries and modalities. The heart of the control tower is an information hub supported by a set of detailed decision-making rules. Thus, SC and logistics decisions can be made automatically (by AI) from Big Data systems to deliver customer service while minimizing inventory (see Chapter 40).
- *Digital twin:* A digital twin is a virtual model of the entire supply and demand network, updated with real-time data. The novelty is that a digital twin simulates operations, monitors performance, predicts disruptions and optimizes decision-making in real time. This enables superior visibility, enhanced resilience and improved efficiency across sourcing, production, transportation and distribution processes. For example, a digital twin virtualizes a supply chain end-to-end from suppliers in Asia to distribution centres in Europe (see Chapter 40).

Competitive advantage through logistics

Attitudes towards distribution and logistics have changed quite dramatically over the years. It was formerly thought that the various elements within logistics merely created additional cost for those companies trying to sell products in the marketplace. Although there is, of course, a cost associated with the movement and storage of goods, it is now recognized that distribution and logistics also provide a very positive contribution to the value of a product. This is because logistics operations provide the means by which the product can reach the customer or end user, in the appropriate condition and required location.

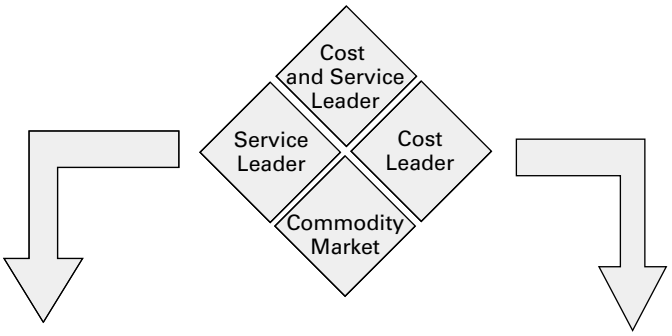
It is therefore possible for companies to compete on the basis of providing a product either at the lowest possible cost (so that the customer will buy it because it is the least expensive) or at the highest possible value to the customer (e.g. if it is provided exactly where, when and how the customer wants it). Some companies may, perhaps unwisely, try to achieve both of these cost and value objectives and probably succeed in neither! It is particularly important to understand which competitive stance a company is trying to achieve when planning a logistics operation.

These ideas are illustrated in Figure 2.7. This shows that a company may compete as a service leader or as a cost leader. As a *service leader* a company is trying to gain a value advantage over its competitors by providing a number of key service elements to differentiate its product. As a *cost leader* a company is trying to utilize its resources so that it offers the product at the lowest possible cost, thus gaining a productivity advantage. Examples of how this might be achieved are given in Figure 2.7.

For a *service or value advantage*, this might include the provision of a specially tailored service or the use of several different channels of distribution so that the product is available in the marketplace in a number of different ways. It might include a guaranteed service level or a regular update on the status of orders.

For a *cost or productivity advantage*, this may include a number of different means of cost minimization, such as maintaining very low levels of inventory and ensuring that all manufacturing and distribution assets are kept at a high utilization.

Figure 2.7 The logistics implications of different competitive positions



SERVICE/VALUE ADVANTAGE

Logistics leverage opportunities

- tailored service
- distribution channel strategy
- reliability
- responsiveness
- information
- flexibility
- environmental credentials

COST/PRODUCTIVITY ADVANTAGE

Logistics leverage opportunities

- capacity utilization
- asset turn
- low inventory
- low wastage

It should also be emphasized that for many companies it is necessary to develop differently configured logistics structures to cater for the variety of service offerings that they need to provide to different markets. It is now appreciated that a 'one-size-fits-all' approach to logistics is usually too limited, because suppliers need to take account of a range of different customer requirements. They need to make sure that they clearly understand the key competitive advantage that they have to offer and they need to ensure that it is applied appropriately in all the market segments that they serve. One-size-fits-all policies rarely work when they are applied in a world where markets can differ so radically. Thus, successful companies are most likely to segment their supply chains according to the particular service and cost

requirements of their customers. This important point is discussed in more detail in Chapter 8.

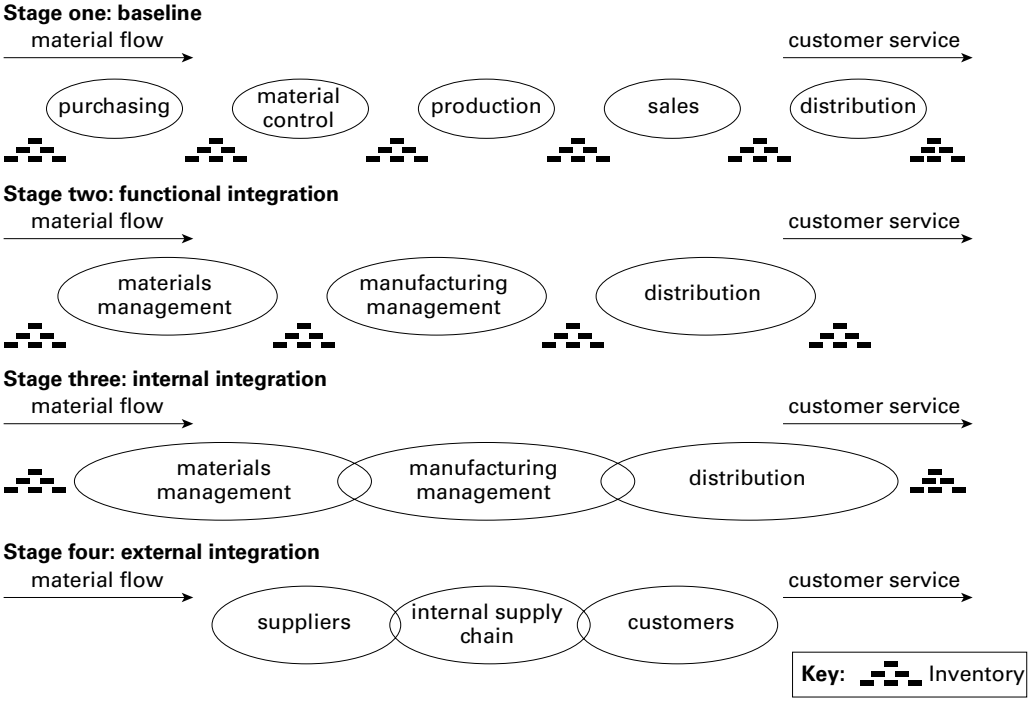
Logistics and supply chain management

The term 'supply chain management' is commonly used to cover many if not all of the various logistics functions. The concept of the supply chain is really an extension of the ideas that have been developed in this and the previous chapter concerning the integrated nature of logistics. The total logistics concept advocates the benefits of viewing the various elements of logistics as an integrated whole. Supply chain management is similar, but also includes the supplier and the end user in the process, or, as indicated in Figure 1.1, the upstream (supply side) and downstream (demand side) partners in the supply chain. This is the major difference between supply chain management and traditional logistics.

There are four distinct differences claimed for supply chain management over the more classic view of logistics, although some of these elements have also been recognized as key to the successful planning of logistics operations. These four are:

1. The supply chain is viewed as a single entity rather than a series of fragmented elements such as procurement, manufacturing, distribution, etc. This is also how logistics is viewed in most forward-looking companies. In an integrated supply chain, however, both the suppliers and the end users are included in the planning process, thus going outside the boundaries of a single organization in an attempt to plan for the supply chain as a whole.
2. Supply chain management is very much a strategic planning process, with a particular emphasis on strategic decision-making rather than on the operational systems.
3. Supply chain management provides for a very different approach to dealing with inventory. Traditionally, inventory was used as a safety valve between the separate components within the pipeline – thus often leading to large and expensive stocks of products. Supply chain management aims to alter this perspective so that inventory is used to optimize the level of inventory in order to balance the integrated flow of product through the pipeline.
4. Effective supply chain management uses integrated information systems that reflect the whole supply chain rather than merely acting in isolation for each of the separate components. These enable visibility of product demand and stock levels throughout the full length of the pipeline made possible through the use of real-time information and Big Data analytics.

Figure 2.8 The different levels of supply chain integration



SOURCE Based on Stevens, 1989

Figure 2.8 illustrates the different extent of integration that might exist within a company, from a very simple baseline where there is little integration to one where integration spreads from a company's suppliers into its own operations and through to its customers. The move towards integration within different supply chains has, however, been relatively slow; indeed, some companies still have fairly limited integration within their own organizations. Full external integration thus generally remains a 'Holy Grail' that most organizations are still striving to achieve. Many companies have moved to functional integration, with some achieving an element of full internal integration. The extent of integration has a big impact on the logistics structure of a company. A company with limited integration will hold stocks in many parts of its operation. A highly integrated company will hold very limited stocks, with the emphasis on the steady flow of product throughout the physical system. The figure illustrates this problem that poorly integrated baseline organizations hold large, expensive, inventories at frequent intervals throughout their supply chain.

The importance of integration

The realization of the need for the effective planning and control of logistics, coupled with the recognition of the important interrelationships that exist within logistics systems, has led to the development of several new approaches towards integrated systems. Big Data applications and analytics have made the practical application of these new approaches feasible. All in all, there has been a very positive move towards an integrated approach to logistics, although for many companies, both large and small, there is still considerable scope for improvement.

More complex and sophisticated systems and concepts have been adopted by a number of large, generally multinational companies. Smaller companies have been slower to adopt these concepts, despite the clear benefits to be gained. The main reasons for this are:

- a lack of organizational integration that reflects the role and importance of logistics
- a failure to develop adequate long-term plans for logistics strategy
- insufficiently developed information structures and support systems to provide the appropriate data systems for good logistics planning and management

For many small and medium-sized companies, there is also the very pertinent factor that they need to learn to walk the logistics path before they attempt to run on it. However, even for companies such as these, there is a great deal to be gained from taking those first few steps towards recognizing that logistics should be viewed as an integrated system and that there is a strong interrelationship between the different elements of transportation, storage, information, etc. In addition, there is the need to adopt a positive approach to the planning and control of those systems.

Fortunately, in the past few years, companies have, to a greater or lesser extent, realized the importance and relevance of logistics to their business as a whole. Thus, organizational structures and planning policies are now beginning to reflect this integrated approach.

Customer service and logistics 03

Introduction

The vast majority of companies consider customer service to be an important aspect of their business. When pressed, however, there are many companies that find it difficult to describe exactly what they mean by customer service or provide a precise definition of customer service measures. Also, traditionally, service provision has been based on very broad assumptions of what customers want, rather than taking into account the real requirements of customers or at least customers' perceptions of what they require.

For any company or organization, it is vital, therefore, to have a clear definition of customer service and to have specific and recognized customer service measures. It is also important to understand that customer service and customer service requirements can and will differ, not just between industries and companies, but additionally between the various market segments that a business might serve. Thus, it must be recognized that customer service provision can be very complex. Customer service is also inextricably linked to the process of distribution and logistics. Within this process, there are many influences that may be relevant to customer service. These range from the ease of ordering to stock availability to delivery reliability. Finally, there is the need to balance the level of service provided with the cost of that provision. The downfall of many a service offering is often the unrealistic and unrecognized high cost of providing a service that may, in the event, be greater than is required by the customer.

The key to achieving a successful customer service policy is to develop appropriate objectives through a proper framework that includes liaison with the customer, and then to measure, monitor and control the procedures that have been set up.

In this chapter, the importance of customer service is introduced, with particular reference to logistics-related customer service elements. The key components of logistics customer service are then described.

Two conceptual models of customer service are considered. The first is a fairly basic model; the second a more sophisticated one that includes an approach to identifying the different service gaps that can be associated with logistics customer

service. The need for an appropriate customer service policy is emphasized and a six-part approach for developing such a policy is outlined in some detail.

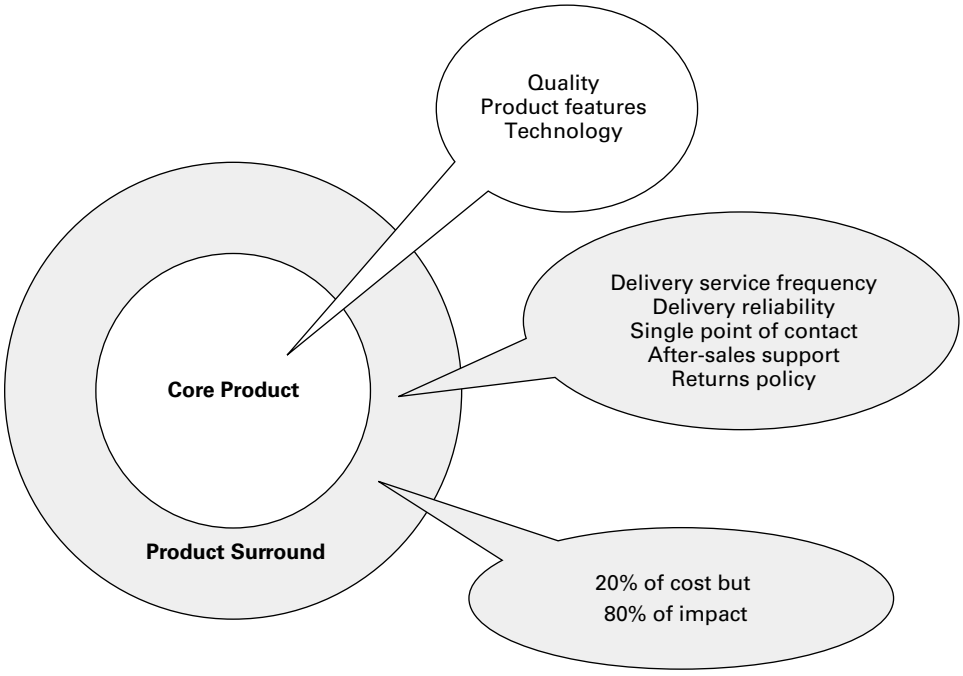
The importance of accurate customer service measurement, in a logistics context, is discussed. Different measures of order fulfilment are described, and the concept of 'the perfect order' is introduced.

The importance of customer service

As already suggested, there are few companies that do not recognize the importance of the provision of good customer service. But why is it so important? There are many different answers to this question. Examples include the growth in competition, the raising of customers' expectations and the similarity of the basic products that are offered.

One way of considering customer service is to differentiate between the core product itself and the service elements related to the product. This is depicted in Figure 3.1. The core product concerns the item itself: the technical content, the product features, the ease of use, the style and the quality. The service elements, which can be called the 'product surround', represent the availability of the product, the ease of

Figure 3.1 Core product versus product 'surround', illustrating the importance of the logistics-related elements



ordering, the speed of delivery and after-sales support. There is a long list (as we shall see later in this chapter), and clearly not all of the service items on our list are relevant to all products.

The marketing departments of many companies recognize that the product surround elements are very important in determining the final demand for a product. In addition, these aspects can sometimes represent only a small percentage of the cost of a product. Based on the Pareto 80/20 rule, the product surround or logistics elements can represent about 80 per cent of the impact of the product but only 20 per cent of the cost. This obviously varies dependent on the product value, but no matter how attractive the product may be, it is essential that the customer service elements are satisfactory and, as we shall see, logistics plays a crucial role in providing good customer service.

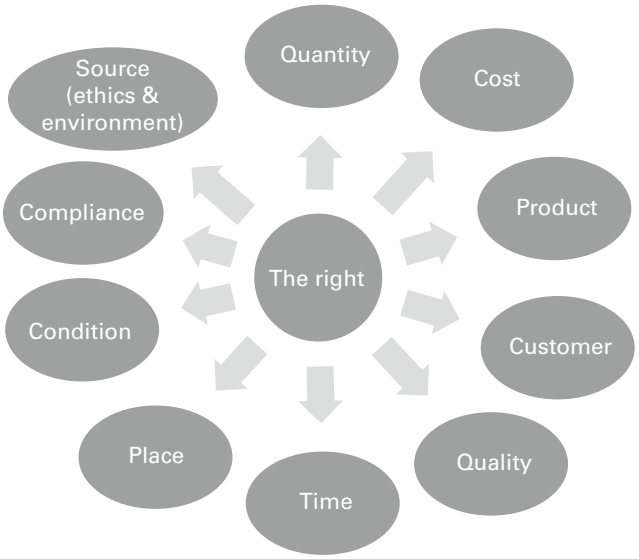
One of the definitions of logistics that was provided in Chapter 1 referred to 'the positioning of resources *in the right place, at the right time, in the right quantity, at the right quality, at the right price*'. This definition can be expanded into what might be considered as the ten 'rights' of customer service. These are the right quantity, cost, product, customer, quality, time, place, condition, compliance and, finally, source (ethics and environmental standards). These summarize and categorize the key logistics-related customer service elements and are shown in Figure 3.2. All of these different aspects can be key requisites of a good customer service offering – indeed, many of them will be essential to ensure that a product achieves its expected sales in the various markets where it is made available. It is notable that all of these elements are affected by the standard and quality of the logistics operations that are essential to getting a product to market. Thus, these elements can provide the basis for identifying the different aspects of logistics that should form a part of any customer service offering, and also, and this is of equal importance, these elements should become the basis of the key measurements that are used to monitor operational success or failure. This will be considered in the final sections of this chapter.

The components of logistics-related customer service

The logistics components of customer service can be classified in several different ways but the two key approaches are, firstly, as transaction-related components and, secondly, as multifunctional dimensions.

Transaction-related components can be divided into *direct* transaction-related elements, where the emphasis is on the specific physical service provided, such as on-time delivery, or they may be seen as *indirect* support (e.g. non-transactional, or

Figure 3.2 The ten 'rights' of customer service, showing the main service classifications



pre- and post-transactional) attributes that are related to overall aspects of order fulfilment, such as the ease of order taking.

This classification is useful to help identify the key logistics customer service elements, which can be divided into three chronological categories. These reflect the nature and timing of the particular service requirements (before, during and after delivery of the product):

1 *Pre-transaction* elements are logistics customer service factors that arise prior to the actual transaction taking place. They include written customer service policy, accessibility of order personnel, single order contact point, organizational structure, method of ordering, order size constraints and system flexibility.

2 *Transaction* elements are the elements directly related to the physical transaction itself and are those that are most commonly associated with distribution and logistics. Under this heading would be included order cycle time, order preparation, inventory availability, delivery alternatives, delivery time, delivery reliability, delivery of complete order, condition of goods and order status information.

3 *Post-transaction* elements involve those elements that occur after the delivery has taken place, such as availability of spares, call-out time, invoicing procedures, invoicing accuracy, product tracing/warranty, returns policy, customer complaints and procedures and claims procedures.

Logistics customer service elements can also be classified by their *multifunctional dimensions*. The intention is to assess the different components of customer service across the whole range of company functions, to try to enable a seamless service provision. Time, for example, constitutes a single requirement that covers the entire span from order placement to the actual delivery of the order – the order cycle time. One of the main advantages of this approach is that it enables some very relevant overall logistics measures to be derived. These will be considered later in this chapter. The four main multifunctional dimensions are:

1. *time:* usually order fulfilment cycle time
2. *dependability:* such as guaranteed fixed delivery times of accurate, undamaged orders
3. *communications:* such as the ease of order taking or effective queries response
4. *flexibility:* the ability to recognize and respond to a customer's changing needs

Each of these can be broken down into further detailed elements. One example of this is shown in Figure 3.3, which describes the different time-related components.

The total order fulfilment cycle time has been split into the five main time-related components from order receipt to final delivery. In addition, there is a preliminary step from order placement to order receipt, although this is not considered by some companies because it is deemed to be part of their customers' ordering process rather than their own. When identifying and measuring order fulfilment cycle time it is important to be able to break it down to all of the key components. Thus, if there is a customer service problem it can be measured and traced quickly and easily and the actual detailed problem can be identified and remedied.

As indicated already in this chapter, there are many different elements of customer service, and their relevance and relative importance will vary according to the product, company and market concerned.

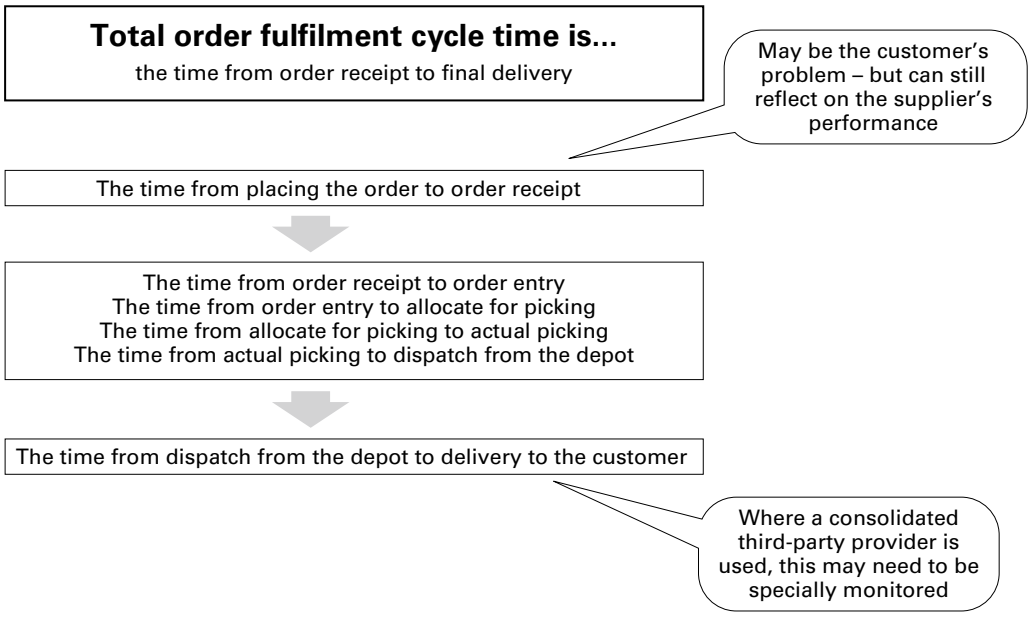
Two conceptual models of service quality

Service quality is a measure of the extent to which the customer is experiencing the level of service that they are expecting. Two different models of service quality are considered: a very basic model and a more complicated, extended model.

Basic service model

A very simple, yet effective, view of service quality is that it is the match between what the customer expects and what the customer experiences. Any mismatch from this can be called the 'service quality gap'. Note that the customer viewpoint is what

Figure 3.3 The constituent parts of total order fulfilment cycle time



the customer perceives or believes to be happening, not necessarily what is actually happening in terms of what the supplier is providing (or thinks they are providing). Perceived quality is always a judgement that the customer makes – whatever the customer thinks is reality, no matter what the supplier may believe to the contrary! This is another reason why careful measurement of customer service is necessary: to be able to demonstrate that certain agreed standards are being achieved.

Thus, service quality is what the customer thinks that it is:

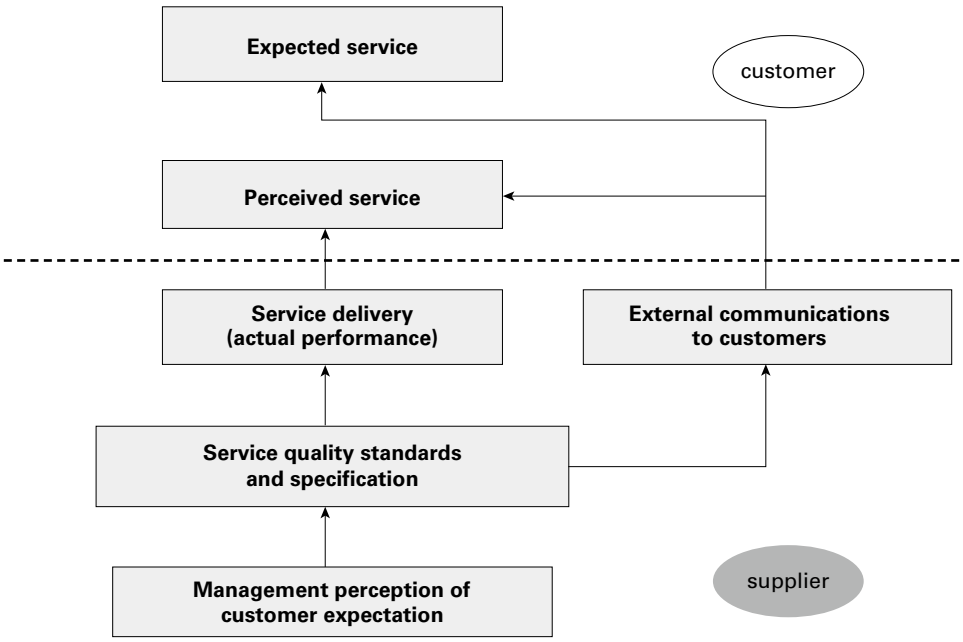
$$\text{Service quality} = \frac{\text{perceived performance}}{\text{desired expectations}} \times 100$$

Extended service model

A rather more complicated approach can also be used as a conceptual model of service quality. This is particularly useful in helping to identify and measure the critical elements of service for key customers. The main factors are outlined in Figures 3.4 and 3.5. The aim of this approach is to identify the various different service gaps that can or might appear throughout the customer service process. Measures are then set up to assess the relative importance of each of these gaps and to monitor them on a regular basis.

The boxes in Figure 3.4 represent the key factors in the process of providing a service to customers. The starting point is the supplier's perception of what they think is the customer's service expectation. From this, the supplier should develop appropriate service quality standards and specifications. These should then be communicated to and agreed with the customer. Subsequently, the service is provided by the supplier via the logistics operation. The customer will then have a certain expectation of the service level to be provided and can compare this to the service that he or she perceives is being received.

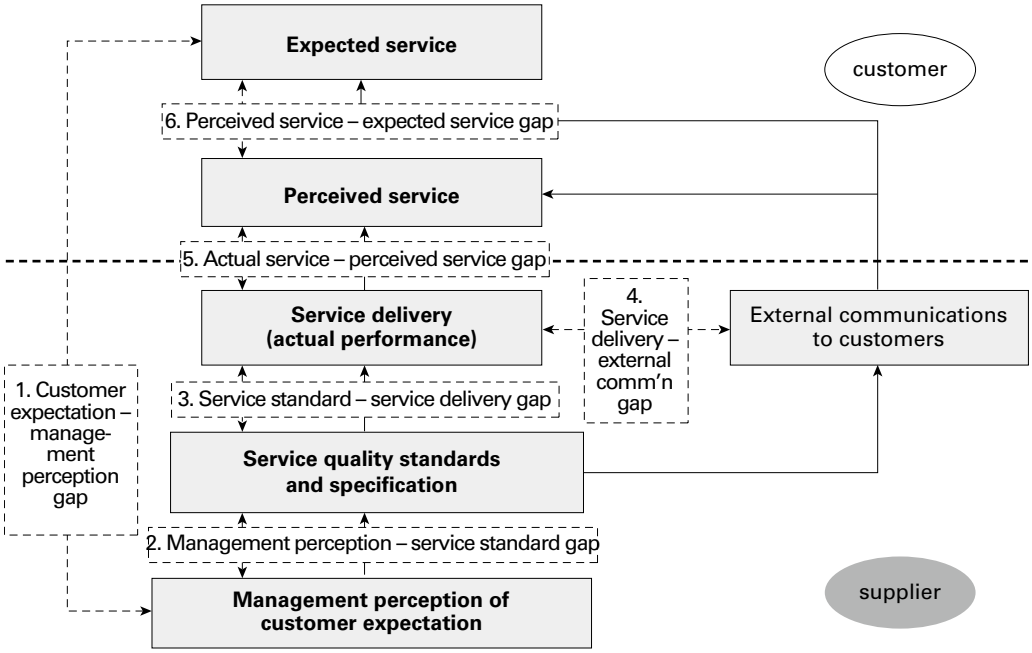
Figure 3.4 A conceptual model of service quality: the basic elements



(Based on work by Parasuraman and Zeithaml)

In Figure 3.5, this concept is developed to illustrate the potential areas for service failure. Working backwards, the main issue is likely to be the one between the service that the customer expects and the service that the customer perceives to be provided (Gap 6). This is the perceived service–expected service gap, and for both the customer and the supplier it is the major aspect of service quality that needs to be measured. How is this undertaken? As described later in this chapter, there are a number of different types of customer service studies that can be carried out to achieve this. However, it is also important to be able to identify why any such service failure has occurred, and the different reasons can be identified by measuring the other service gaps that appear in Figure 3.5. These are as follows:

Figure 3.5 A conceptual model of service quality: the service gaps



SOURCE Based on work by Parasuraman and Zeithaml

- Gap 5: actual service–perceived service gap: this is the difference between the service that the supplier is providing and the service that the customer thinks is being received. This gap may, typically, be caused because the supplier and the customer are measuring service in a different way.
- Gap 4: service delivery–external communication gap: this is the difference between the actual service that is provided and the promised level of service that was communicated to the customer. This gap may be caused by a misunderstanding in communication.
- Gap 3: service standard–service delivery gap: this is the difference between the actual service that is provided and the planned level of service based on the service specification that has been set. The cause for this gap may be inefficiency within the delivery service.
- Gap 2: management perception–service standard gap: this is the difference between the service specification that is set and the supplier management assessment of customer service requirements. This gap is likely to be caused by an inadequate initial operational set-up.

- Gap 1: customer expectation–management perception gap: this is the difference between the service that the customer expects and the service level that the supplier thinks that the company wants. This gap is usually caused because the supplier does not understand the real customer requirements.

Conceptual models of this nature are valuable to help the understanding of the underlying issues that are involved. They need to be interpreted into a practical format to enable actual service policies to be derived. The remaining sections of this chapter address this requirement.

Developing a customer service policy

Every company that provides products and services to its customers should have an appropriate customer service policy. Such a customer service policy needs to be developed based on identifiable customer service requirements, and a suitable logistics operation must be established to provide this service. The next few sections of this chapter describe how this can be done.

A customer service policy must be very clearly and carefully defined because there are many different elements of customer service and because there are many different types of customer, even for the same product. A can of fizzy drink, for example, may be bought in a supermarket, a bar/pub, a corner shop, a petrol station or from a self-service dispensing unit. It is unlikely that a manufacturer of fizzy drinks would wish to provide exactly the same level and style of service to all of these very different customer types. This is why many companies segment their customers into different customer categories. It is also an additional reason for having a distinct customer service policy so that it is clear to both the supplier and the customer exactly what level of service will be provided.

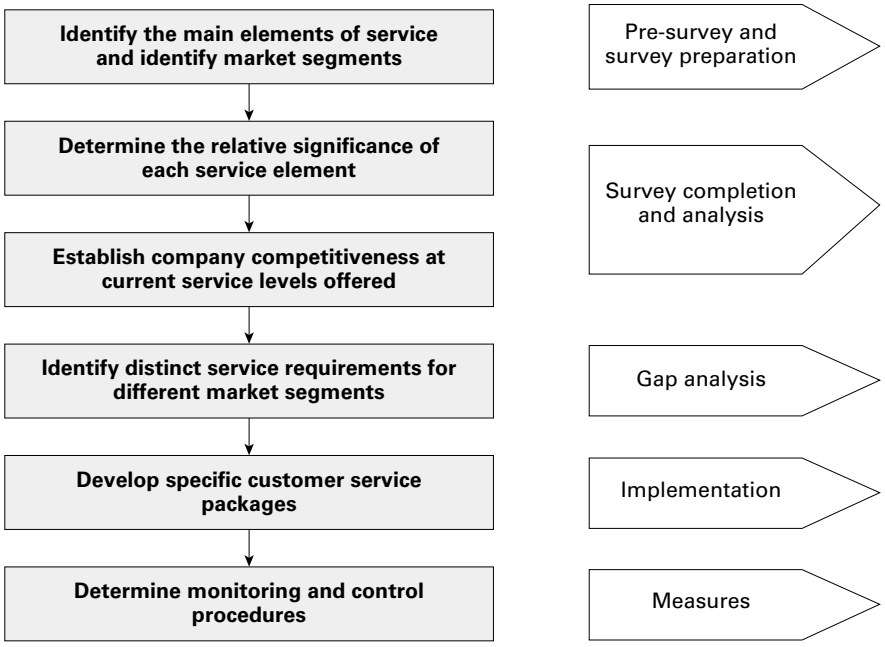
Many studies have been undertaken to measure the effects of poor customer service. These studies conclude, quite categorically, that where stock is not available or where delivery is unreliable many buyers will readily turn to an alternative supplier's products to fulfil their requirements.

It is also important to understand what minimum requirements are necessary when identifying any particular service policy. A supplier is really working towards meeting customers' minimum requirements to cross the threshold of customer satisfaction. If these minimum requirements are not met, the supplier cannot even expect to be considered as a feasible supplier. Once these requirements are met and the supplier begins to exceed them, it then becomes possible to achieve customer satisfaction and begin to add value to the supply relationship.

Once the positive need for a customer service policy has been accepted, it is useful to adopt a recognized approach to determine the basic requirements and format of this policy. One such approach is outlined in Figure 3.6 and described in the

remainder of this section. As well as showing the major steps that should be taken, the figure also indicates how these steps can be carried out. This is a six-step plan to identify key customer service components and then to design and maintain a suitable customer service package.

Figure 3.6 An overall approach for establishing a customer service strategy



The main steps are:

1 **Identify the main elements of service and identify suitable market segments.** The first step is to identify those elements of service that are most highly rated by customers. Only then can the company's resources be concentrated on these key factors. The main means of determining these key elements are by market research techniques. A typical approach might be:

   a the identification of the main decision-maker or buyer of the product

   b the use of personal interviews to determine the importance of customer service and the different elements within customer service

   c the use of group interviews to determine the same

   The importance of this stage is to identify relevant measures of service that are generated by customers themselves and not imposed arbitrarily by 'best guesses' from outside. A major output from this stage of the study is to enable an appropriate survey questionnaire to be designed.

In addition, it is important at this stage to identify the different market segments or customer types that exist. It is highly unlikely that a universal level of customer service will be appropriate for all customers. Most customer populations consist of a range of customers of different size and importance. Part of this preliminary stage is, therefore, to try to identify broad customer categories and to ensure that any questionnaire is designed to enable the different requirements of these different categories to be identified.

It should be noted that there is a variety of types of customer service study that can be used. These are summarized in Table 3.1. For some companies it is relevant to use several of these for different purposes.

Table 3.1 Different types of customer service study

Approach	Comment
Complaint analysis	Qualitative. Statistically limited. Limited to those who do complain.
Critical incident studies	Qualitative. Relevant to individual customers only. Limited scope.
Customer panels	Limited coverage. Qualitative information. Would not show priorities.
Key client survey	Useful Pareto approach. Not valid across whole client base. Qualitative and quantitative.
Customer survey/ questionnaire	Good overall coverage (statistical sampling). Qualitative and quantitative.

The most common approach for the major element of a study is likely to be a detailed questionnaire-based customer survey. This can be undertaken in a number of different ways including telephone, email, mail/post, face-to-face, web-based or mobile phone. The key advantages and disadvantages of these different approaches are described in Table 3.2. In addition, information may be gained, with care, through the evaluation of customer reviews on company websites or independent review sites.

Survey or questionnaire design is a vital part of the overall process, and when putting together a questionnaire it is sensible to refer to one of the many books that have been written that address the topic specifically. The major steps can be summarized as follows:

1. clarify the purpose and objectives
2. identify any specific information required

3 select the most appropriate survey type
4 determine the resources required to undertake the survey
5 determine who should undertake the survey
6 determine who should complete the survey
7 identify key customer/market segments
8 identify key service elements to include
9 prepare the question and answer format
10 design the analysis and reporting format
11 determine the sample size and selection
12 pilot the survey
13 adjust and finalize

Table 3.2 The advantages and disadvantages of different survey approaches

Type	Advantages	Disadvantages
Fixed phone	Can probe interviewee. Control over response rates. Can control questions answered. Can ensure appropriate respondent. Can be quick.	Expense. Possible interviewer bias. Time restrictive. Not anonymous.
Email	Inexpensive. Fast response.	Limited interaction. Limited response. Not anonymous.
Web	Inexpensive. Quick response. Flexible time for respondent to complete.	No control over respondents. Limited to internet/computer users.
Mail	Inexpensive. Flexible time for respondent to complete. Anonymous. No interviewer bias.	Time consuming. Limited response. Non-response to some questions. Can't probe/clarify answers.
Face-to-face	Can probe. Can ensure appropriate respondent. Can control questions. Allows greater complexity. All questions answered.	Expensive. Limited sample. Very time consuming. Possible interviewer bias. Not anonymous.
Mobile phone	Easy to administer. Versatile response (pictures, diaries by respondent). Real-time response (immediate, on-the-go).	Smartphone variety. Different operating systems. Network speeds and availability. Difficult implementation. Low response rates.

2 **Determine the relative significance of each service element.** Recognized research techniques can be used within the questionnaire to enable the measurement of the relative importance of the different service components that are identified. For a fairly small list of components a simple rating table can be developed. This uses some form of order ranking ('most' to 'least' important) or rating scale (1 to 6 according to importance). An alternative technique is the development and use of a repertory grid. This method provides a much more sophisticated format for considering and measuring the relative importance of different combinations of service components, rather than just scoring them on an individual basis. A particular strength of this approach is that it enables the inclusion of interviewee perceptions without researcher interference or bias. A simple example of a basic rating table is shown in Figure 3.7. It is also possible at this stage of the customer service review to identify what the minimum requirements are for customer service – that threshold below which it is unlikely that a customer will consider a company as a feasible supplier.

Figure 3.7 Rating table for selected customer service factors

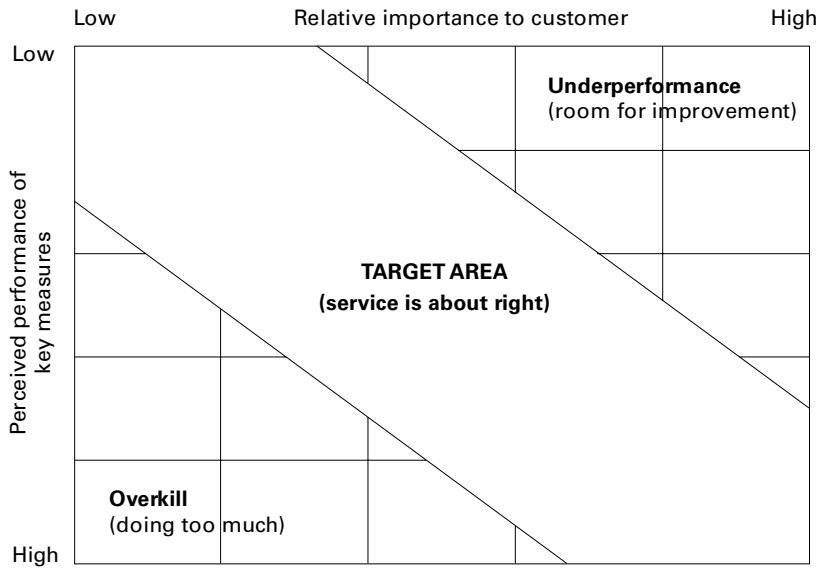
How would you rate these different elements of customer service?

(Score from 1 to 6: 1 = Not at all important, 6 = Extremely important)

	Please Highlight					
Frequency of delivery	1	2	3	**4**	5	6
Reliability of delivery	1	2	**3**	4	5	6
Stock availability and continuity of supply	1	**2**	3	4	5	6
Orders filled completely	1	2	3	**4**	5	6
Accuracy of invoices	1	2	3	**4**	5	6
Customer query handling	1	**2**	3	4	5	6

3 **Establish company competitiveness at current service levels offered.** Having identified the key service components and their relative importance to the customer, the next step is to measure how well the supplier company is performing for each of these key components. This can also be achieved using the questionnaire. The list of key components can be rated by the respondent on perceived performance. This will provide an indication of where the company is underperforming and overperforming and where it has got it about right. Figure 3.8 shows that there is a target area for service in which the company should be operating. It also highlights those areas where there is room for improvement and those areas where too much effort is being spent. It is important to be performing well in key areas, but there is also little benefit in performing extremely well in those areas that are of little consequence to the customer.

Figure 3.8 Company competitiveness at current service levels: target chart

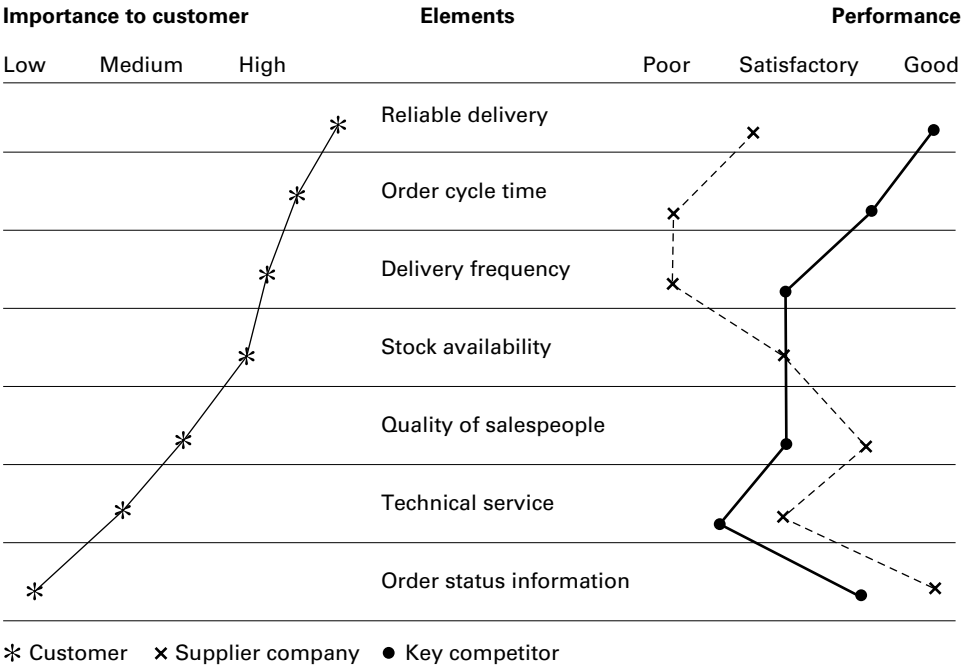


It is also important to be aware of the supplier company's own position compared to that of its major competitors. Customer respondents can be asked to rate each competing supplier company in a similar way as part of the questionnaire. The results will indicate how each competitor performs with respect to the different service components. The supplier company's performance can then be compared to the competition's performance, especially in the key service elements that were identified in the previous stage of the study. This will provide some very useful information on how well the company is performing compared to its competitors, but more importantly this can be related directly to the customers' key customer service requirements. Figure 3.9 gives an example of this.

Here it can be seen that the supplier company is performing reasonably well overall compared to its key competitor (the right-hand side of the figure), but that the competitor is actually performing much better than the supplier company in those elements that are most important to the customer (the left-hand side of the figure). The usefulness of such an approach is clearly demonstrated by this simple example. This is often known as competitive benchmarking. Results from this type of survey can be used to develop a detailed customer service strategy.

4 **Identify distinct service requirements for different market segments**. As already indicated, the needs of different customer types can vary quite substantially. This may be true in terms of product quality, method of ordering, level of service or any other of the many different service elements that can be identified. Within a total market, it is possible to identify distinct sub-markets or segments.

Figure 3.9 Competitive benchmarking showing opportunities for improving service when comparisons are made with customer requirements and the performance of key competitors



A typical example is the supply of stationery items. These might be supplied to retailers for sale to the public, to wholesalers for further distribution or direct to public-service bodies or private companies for their own consumption. Each segment of the overall market may require a distinctly different level of service, or may react differently to certain deficiencies of service. The fizzy drink example discussed earlier in this chapter provides another illustration of markets requiring different types of service requirement. Once distinct market segments have been identified, a number of specific customer service policies can be developed, each of which should suit the relevant groups or segments.

Determining the detailed service requirements can be undertaken by what is known as 'gap analysis'. This is the practical means of enabling actual service policies to be derived based on the approach discussed in the conceptual models described earlier and in Figure 3.5. This is achieved by using the survey results to identify the major performance gaps (such as 'reliable delivery' in our example in Figure 3.9) for each market segment or customer group that is being considered. The key customer service elements should be ranked in order of importance to the customer (to identify the essential ones) and degree of change required (to identify the easy ones or 'quick wins'). Brainstorming and/or some form of process analysis can then be used to identify appropriate remedies or solutions for improving these

key elements of service. These are then assessed and ranked according to factors such as cost of change, ease of change, etc. An example of such an assessment for one of these solution areas is shown in Table 3.3.

Table 3.3 Assessment of possible solutions to performance gaps

	Order picking accuracy			
Possible solutions	**Importance**	**Timescale**	**Cost**	**Difficulty**
Re-train operatives regarding the importance of picking accuracy	medium	short	low	low
Install voice picking and barcode system to verify pick locations and items picked	high	medium	medium	medium
Install pick-by-light system	high	medium	medium	medium
Use collaborative robots ('cobots') to guide pickers through process	high	long	high	high

NOTE See Chapter 21 for details of the possible solutions

5 **Develop specific customer service packages.** This is the implementation phase and it will depend on the results obtained from the stages that have been described. Alternative packages for the different market segments need to be costed accordingly and the most suitable packages determined.

6 **Determine monitoring and control procedures.** It is vital to ensure that any service policy that is implemented is also monitored. This requires an effective focus on the measurement of the service provided, involving a systematic and continuous concentration on monitoring and control. In practice, and perhaps surprisingly, adequate customer service monitoring is quite rare. This is often because companies do not have a recognized customer service policy to measure against, but it may also be because companies find it difficult to construct quantifiable standards that are capable of measurement.

The first task, then, is to identify the factors that need to be measured. These should be based on the major elements identified in the customer service packages that are developed. The second task is to produce a measure or series of measures. This can be undertaken in different ways for different elements, but must be fair and appropriate for the task in hand. The development of such measures, together with relevant examples, is described later in this chapter.

One final point concerns the need to ensure that any service measures are periodically reviewed. Businesses change fairly rapidly, with new products and new customers appearing continually. A regular updating of service measures is

relevant, so that old measures are discarded as they become redundant, and new measures are created as they become necessary. Some large companies carry out regular customer service studies designed to identify such changes in service requirements.

Levels of customer service

It has already been stressed that there is a need to balance the level of customer service with the cost of providing that service. This balance is not easy to define, although it can be described quite easily as the point where the additional revenue for each increment of service is equal to the extra cost of providing that increment.

It is seldom possible to devise a policy that is absolutely optimal in terms of the cost/service balance. Companies usually adopt one of two main approaches: 1) a cost minimization approach where specific service objectives are laid down and met at a minimum cost; 2) a service maximization approach where a distribution budget is fixed, and the 'best' service supplied within this cost constraint. The most appropriate approach to adopt will depend on particular product, business or market situations.

One factor that is clear, however, is the relationship between cost and service. This is shown in Figure 3.10. The cost of providing a given service is markedly higher the nearer it reaches the 'perfect service' – that is, the 100 per cent mark. Thus, an increase of 2 per cent in service levels will cost far more between 95 and 97 per cent than between 70 and 72 per cent. It should also be noted that a service increase from, say, 95 to 97 per cent may well have little, if any, noticeable impact on the customer's perception of the service being provided, even though it is a costly improvement.

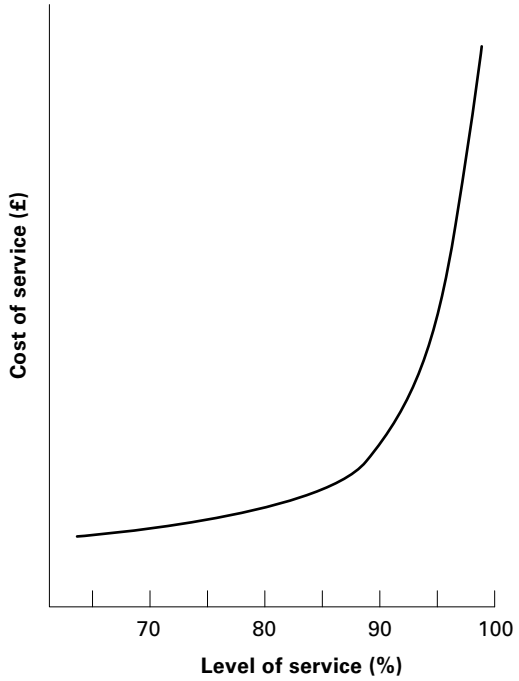
Measuring customer service

It is probably quite clear from reading this chapter that there are a number of different measures of customer service that might be used. The most important message is that, whatever measures are used, they must reflect the key service requirements for the customer in question. This is not always as obvious as it might seem.

Order fulfilment

One particular example is that of order fulfilment. It is possible to measure this in a number of different ways:

Figure 3.10 The relationship between the level of service and the cost of providing that service



- the number of orders completely satisfied, say 18 out of 20, over a period (90 per cent)
- the number of lines delivered from a single order, say 75 out of the 80 lines requested (94 per cent)
- the number of line items or cases delivered from a single order, perhaps 75 out of the 80 lines requested, but only 1,400 of the 1,800 total line items (78 per cent)
- the value of the order completed, say €750 of a €900 order (83 per cent)

Any or all of these might be used, and there is no right or wrong one. The most appropriate is the one that best suits the operation in question. As will be shown later, it may also be relevant to use a combination of these measures.

Order cycle time

There are other measures that can be made. These measures might, for example, be aimed at assessing the timeliness of delivery operations. Many express parcels companies set great store by the speed of their delivery operations, and calculate in detail

the time taken from receipt of order or parcel collection to final delivery. This idea is also used for conventional operations. Thus, order fulfilment can also be measured with respect to the order cycle time or the actual lead time from the receipt of the order to its final delivery to the customer. For a typical stock order this will be made up of the following discrete times:

- order receipt to order entry
- order entry to allocation for picking
- allocation to dispatch
- dispatch to delivery

The perfect order

Some companies now recognize what is called 'the perfect order'. This is a measure that attempts to take into account all of the main attributes that go towards the completion of an order that absolutely satisfies customer requirements. The key components of the perfect order are generally:

- delivered complete to the quantities ordered
- delivered exactly to the customer's requested date and time
- no delivery problems (damage, shortage, refusal)
- accurate and complete delivery documentation

There are also several variations of 'the perfect order'. These may include elements such as accurate invoicing or whatever else is important to the customer. A simpler version that is often used is known as on-time-in-full (OTIF), which measures orders that are delivered both 'on time' and 'in full'. Whatever is included, perfect order fulfilment can be measured as:

$$\text{perfect order fulfilment} = \frac{\text{number of perfect orders}}{\text{total number of orders}} \times 100\%$$

Organizations must therefore set clear, customer-service-driven measures of performance that reflect the real standards they are aiming to achieve. These, typically, ask severe questions of many logistics operations. For realistic measurement, any discrepancies should be assessed cumulatively. Thus, if they include:

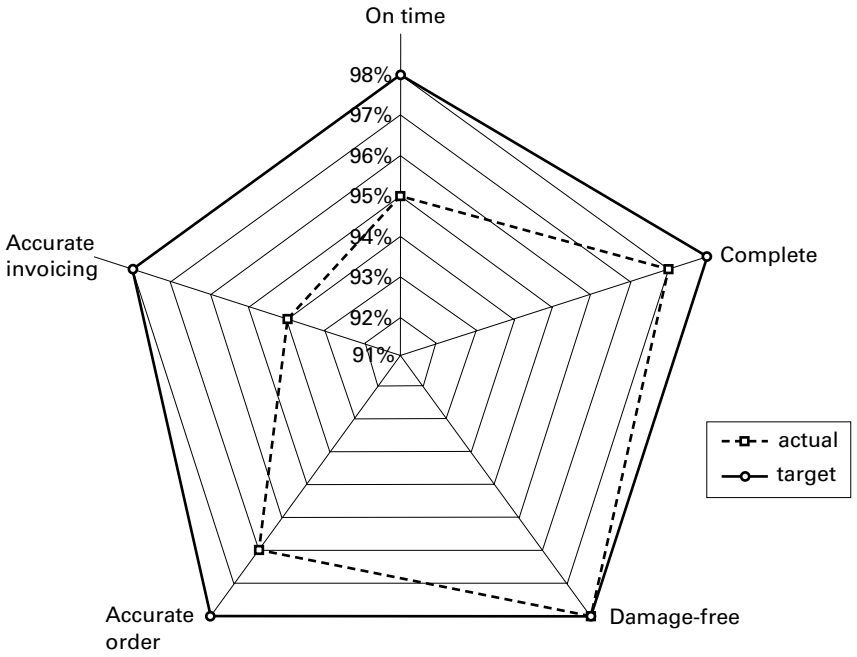
orders received on time	actual 95%	target 98%
orders received complete	actual 98%	target 99%
orders received damage-free	actual 99%	target 99%
orders filled accurately	actual 97%	target 99%
orders invoiced accurately	actual 94%	target 98%

then the actual customer service measure achieved is (95 × 98 × 99 × 97 × 94) = 84 per cent. This is not as good as it first looks when considering each measure individually.

Methods of presenting data

Clear and simple visual methods of presenting data are also important. Figure 3.11 shows a radar gram of these data such that the actual and target figures can be compared at a glance. Chapter 38 provides some additional comment on the development and presentation of key performance indicators.

Figure 3.11 Radar gram showing the perfect order targets and achievements



Service level agreements

Many customer/client relationships are defined by the use of a service level agreement (SLA). A service level agreement is a contract drawn up between a supplier or service provider and the end user or customer that defines the level of service agreed and expected. These are usually external – between one company and another – but may be internal in some large organizations where an internal service is being provided to another department. SLA requirements are generally output-based in that their purpose is specifically to define what the customer will receive. Some SLA

requirements may, however, be input-based, particularly internal ones, to ensure that both parties are providing appropriate resources to enable the supply or service to be provided effectively. Such resources might include, for example, timely information, physical availability of resources, etc.

Service level agreements are legal documents, usually separate from, but complementary to, a signed contract document, which governs the delivery of services between a provider and the client. An SLA is likely to include:

- a description of the products and services being provided
- the terms and conditions under which the products and services will be delivered
- a description of how the performance of the service will be measured – the monitoring and reporting service levels, including metrics and standards
- the procedure for reporting problems, including dispute resolution, remedies for breach of contract, penalties for sub-standard, late or non-delivery, etc
- the consequences if service obligations are not fulfilled – escape clauses or constraints; contract change and termination

SLAs detail the acceptable level of service achievable within the economic and logistical constraints of the provider/customer relationship. To be effective, the levels of expected performance have to be set realistically. If they are too low, this can result in poor service further up the supply chain. If they are too high, this can result in frustration and cost for the supplier. Both extremes are likely to lead to an adversarial relationship between supplier and customer. The level of service needs to be specific and measurable. This allows service performance to be benchmarked, and where necessary this can be rewarded or penalized accordingly.

The SLA is likely to include elements that can be categorized in two specific areas – services and management:

- Service elements include the specifics of the products and services provided (and what is excluded, if there is room for doubt), conditions of service availability, standards such as delivery time windows for each level of service, the agreed responsibilities of each party and escalation procedures.
- Management elements should include definitions of metrics, measurement standards and methods, a process for reporting and addressing service issues, a dispute resolution process for service-related disagreements and a set mechanism for reviewing and revising the agreement. This last item is important because service requirements and supplier capabilities can change over time. It is necessary to ensure that the SLA is updated at regular intervals to reflect the dynamic environment in which logistics operates.

The importance of customer service

The role of customer service as a critical success factor for most companies is very significant. Satisfying the customer is the key to achieving competitive success. Companies that fail to appreciate this do so at their peril because they may lose significant market share. Service is the key factor of differentiation in a customer's decision to buy one brand rather than another. In other words, good customer service can provide the distinctive difference between one company's offer and its competitors'. Thus, customer service strategy must play a major role in the determination of company strategy.

One key lesson that also comes through is the important role that logistics plays in providing good customer service. The ability to improve service levels and to maintain this improvement is a challenge that faces many companies. The major factors are:

- the growth in customer expectations – thus service fulfilment is a priority for any successful strategy
- the professionalism of buyers – buyers generally recognize the importance of service as well as price in the product offering
- markets are increasingly service-sensitive – there is often little else to differentiate between products
- the diminution of brand loyalty, particularly with respect to fast-moving consumer goods (FMCG), where immediate product availability is the vital factor
- the use of approaches, such as relationship marketing, where fulfilling service expectations is the key and customer retention is a priority
- the use of Big Data analytics that offers more accurate, more timely, more reliable and thus more effective measures of service to be used

Channels of distribution

04

Introduction

The alternative ways in which products can reach their market are discussed in this chapter. Different types of distribution channels are outlined, and an approach to channel selection is described. Finally, the key decision of whether to run an own-account distribution operation or to outsource to a third party is introduced.

Physical distribution channel types and structures

Terminology

'Physical distribution channel' is the term used to describe the method and means by which a product or a group of products are physically transferred, or distributed, from their point of production to the point at which they are made available to the final customer.

For consumer products the end point has been, historically, a retail outlet but, increasingly, it may also be the customer's home, because some channels bypass the shop and go direct to the consumer. Indeed, for some products, such as music and films, the physical product can be transferred via the internet. This is broadly known as business-to-consumer (B2C).

For industrial products the physical channel is generally from a manufacturer/supplier to an end point, which is likely to be a factory. This is known as business-to-business (B2B).

In addition to the physical distribution channel, another type of channel exists. This is known as the 'trading' or 'transaction channel'. The trading channel is also concerned with the product, and with the fact that it is being transferred from the point of production to the point of consumption. The trading channel, however, is concerned with the non-physical aspects of this transfer. These aspects concern the

sequence of negotiation, the buying and selling of the product, and the ownership of the goods as they are transferred through the various distribution systems.

One of the more fundamental issues of distribution planning involves the *choice and selection* of channels. The question that arises, for both physical and trading channels, is whether the producer should transfer the product directly to the consumer, or whether intermediaries should be used. These intermediaries are, at the final stage, very likely to be retailers, but for many of the other links in the supply chain it is now very usual to outsource to a third-party operator to undertake the operation.

Direct and indirect distribution channels

Physical distribution channels have, classically, been described as either direct or indirect channels of distribution. With the growth of internet shopping and home delivery, a number of additional channels have been developed so there is a less clear distinction between the two traditional alternatives of either direct or indirect.

Generally, a distribution channel typically consists of a series of intermediaries through which goods proceed until they reach the final buyer or end consumer. These channels can include a variety of intermediaries, the most common of which are retailers, wholesalers and distributors. These types of channel have generally been known as indirect channels of distribution. A distribution channel where the consumer can obtain the goods straight from the manufacturer has been known as a direct distribution channel.

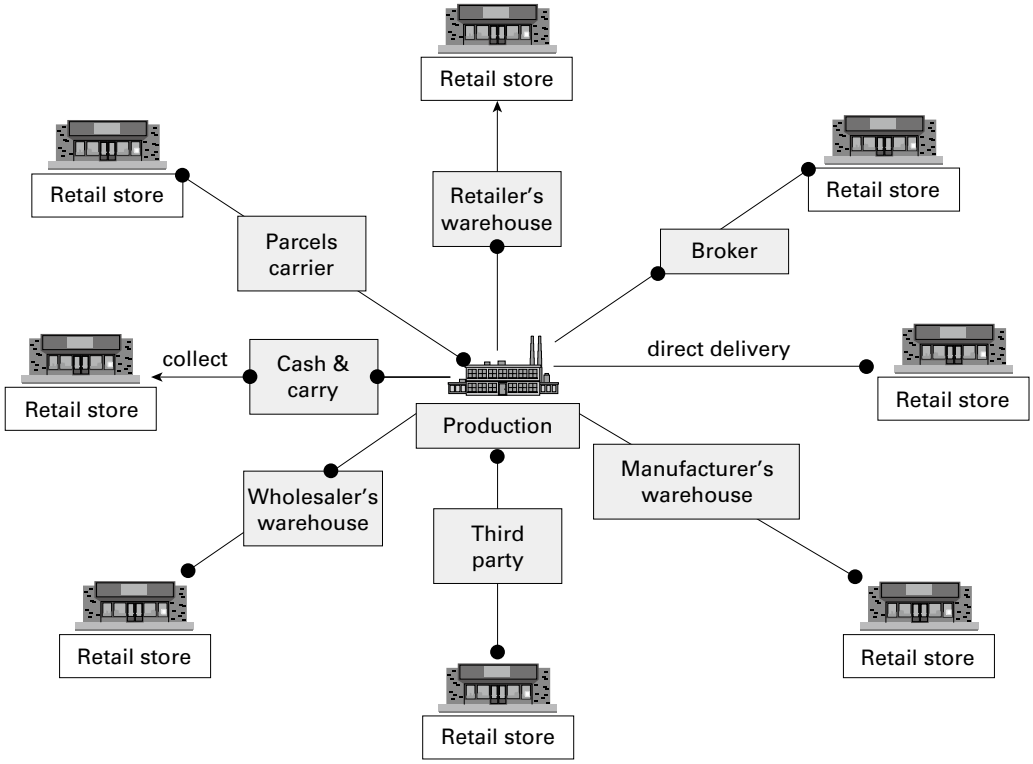
In order to take account of the more recent development of new (and re-visited) channels of distribution, channels are categorized here as manufacturer-to-retail or direct-to-consumer/user.

Channel alternatives: manufacturer-to-retail

There are several alternative physical channels of distribution that can be used, and a combination of these may be incorporated within a channel structure. The diagram in Figure 4.1 illustrates the main alternative channels for a single consumer product being transferred from a manufacturer's production point to a retail store. (Throughout this book, the term 'retail store' is used; this is the same as a 'retail shop', which is a term preferred in some parts of the world.) The black dots in the diagram indicate the points at which products are physically transferred from one channel member to another. It is useful to take note of these when interpreting the diagram while reading the descriptions of the channels below.

As previously mentioned, there are, of course, other important channels of distribution that are used – channels that go directly to the end user or consumer (whether

Figure 4.1 Alternative physical distribution channels for consumer products to retail stores



industrial or home): these are the direct deliveries to the consumer/user discussed separately later in the chapter.

The alternative physical distribution channels in Figure 4.1 are:

- Manufacturer direct to retail store. The manufacturer or supplier delivers direct from the production point to the retail store, using its own vehicles. As a general rule, this channel is only used when full vehicle loads are being delivered, thus it is quite an unusual distribution channel.
- Manufacturer via manufacturer's distribution operation to retail store. This used to be one of the classic physical distribution channels and was the most common channel for many years. Here, the manufacturer or supplier holds its products in a finished goods warehouse, a central distribution centre (CDC) or a series of regional distribution centres (RDCs). The products are transported in large vehicles (known as primary distribution, line-haul or trunking vehicles) to the sites, where they are stored and then broken down into individual orders that are delivered to retail stores on the supplier's retail delivery vehicles. All of the logistics

resources are owned by the manufacturer. This type of physical distribution channel has decreased in importance due to the development of a number of alternative channels of physical distribution.

- Manufacturer via retailer distribution centre to retail store. This channel consists of manufacturers either supplying their products to retailers' national distribution centres (NDCs) or RDCs for final delivery to stores, or supplying them to consolidation centres, where goods from the various manufacturers and suppliers are generally consolidated into shelf-ready loads for dispatch direct to the stores. These centres are run by the retail organizations or, as is often the case, by their third-party contractors. The retailers then use third-party delivery vehicles to deliver full vehicle loads to their stores. This type of distribution channel has developed significantly as a direct result of the growth of the large multiple retail organizations that are a feature in high streets and large retail parks.
- Manufacturer to wholesaler to retail store. Wholesalers acted as the intermediaries in distribution chains for many years, providing the link between the manufacturer and the small retailers' shops. However, this physical distribution channel has altered with the development of wholesale organizations or voluntary chains (often known as 'symbol' groups in the grocery trade). They originated on the basis of securing a price advantage by buying in bulk from manufacturers or suppliers. One consequence of this has been the development of a distinctive physical distribution channel because the wholesalers use their own distribution centres and vehicle fleets.
- Manufacturer to cash-and-carry wholesaler to retail store. Another important development in wholesaling has been the introduction of cash-and-carry businesses. These are usually built around a wholesale organization and consist of small independent shops collecting their orders from regional wholesalers, rather than having them delivered. The increase in cash-and-carry facilities has arisen as many suppliers will not deliver direct to small retail stores because the order quantities are very small.
- Manufacturer via third-party distribution service to retail store. Third-party distribution, or the distribution service industry, is a significant alternative, mainly due to high distribution costs and the constantly changing and more restrictive legislation that has occurred. Thus, a number of companies have developed a particular expertise in logistics operations. These companies can offer general distribution services but may also provide a 'specialist' service for one type of product (e.g. china and glass, hanging garments) or for one client company. Developments in third-party distribution, or distribution outsourcing as it is also known, are considered in some detail in Part Six, Chapters 34 to 37.
- Manufacturer via small parcels carrier to retail store. This channel is very similar to the previous physical distribution channel, as these companies provide a

'specialist' distribution service where the 'product' is any small parcel and next-day delivery is generally available. Small parcels carriers now also specialize in making home deliveries, as discussed below. In addition, pallet distribution networks fulfil a similar role for single pallet deliveries.

- Manufacturer via broker to retail store. This is a relatively rare type of channel, and may sometimes be a trading channel and not a physical distribution channel. A broker is similar to a wholesaler in that it acts as intermediary between manufacturer and retailer. Its role is different, however, because it is often more concerned with the marketing of a series of products, and not necessarily with their physical distribution. Thus, a broker may use third-party distributors, or it may have its own warehouse and delivery system.

Channel alternatives: direct-to-consumer/user

The alternative physical distribution channels described in the previous section refer to those consumer products where the movement is from the manufacturer to the retail store. In this section, the channels going direct to the end consumer/user are outlined. These can be B2C (business-to-consumer) generally for deliveries to the home or B2B (business-to-business) for deliveries to industrial or business premises:

- Mail order (B2C). The use of mail order or catalogue shopping is very popular for certain types of goods, although internet shopping is now a popular alternative. For mail order, goods are ordered by catalogue, and delivered to the home by post or parcels carrier. The physical distribution channel is thus from manufacturer to mail order house as a conventional primary transport (line-haul) operation, and then to the consumer's home by post or parcels carrier, bypassing the retail store.
- Factory direct to home (B2C). The direct factory-to-home channel is another alternative. It can result from direct selling methods, often as a result of newspaper or magazine advertising. It is also commonly used for one-off products that are specially made and are not stocked in a warehouse to provide a particular level of service to the customer.
- Internet shopping for home delivery. Shopping from home via the internet is a very common means of buying products. Initially, physical distribution channels were similar to those used by mail order operations – by post and parcels carrier. The move to internet shopping for grocery products has, however, led to the introduction of additional specialist home delivery distribution operations. These are almost all run by third-party companies. In the grocery industry, home delivery is usually undertaken on small specialist vehicles where orders are picked and packed in distribution centres or in retail supermarkets. (See Chapter 12 for a more detailed discussion on the implications for distribution channels that have resulted from developments in home delivery.)

- A completely new channel development is that of computer-to-computer, as some products, such as music, software, films and books are distributed directly online.
- Factory-to-factory/business-to-business (B2B). The factory-to-factory or business-to-business channel is an extremely important one, as it includes all of the movement of industrial products, of which there are many. This may cover raw materials, components, part-assembled products, etc. Options vary according to the type and size of product and order. This may range from full loads to small parcels, and may be undertaken by the manufacturers themselves or by a third party.

Different channel structures

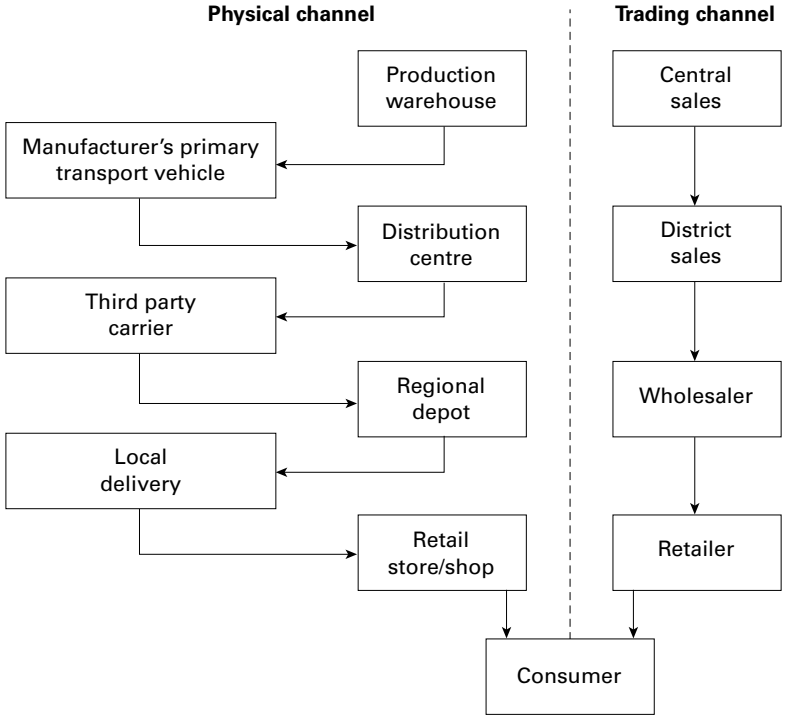
It can be seen from the list of alternative channels that channel structures can differ very markedly from one company to another. The main differences are:

- the types of intermediaries (as shown above)
- the number of levels of intermediaries (how many companies handle the product before it reaches the final customer)
- the intensity of distribution at each level (are all types of intermediary used at the different levels or just selective intermediaries?)

It should also be noted that a policy of disintermediation is being followed by some companies – this involves the planned elimination of channel members from certain supply chains. The aim is to cut out steps in the distribution process to eliminate costs and improve speed to market. For some companies, disintermediation is becoming a part of overall supply chain design.

Some small and medium-sized companies may have fairly simple channel structures. Many companies, however, have a number of different products and a number of different types of customer. Companies such as these will therefore use several different channels to get their products to market. This, together with the large number of variable factors and elements possible within any channel structure, makes it difficult to identify what might be called a 'typical' channel of distribution. Figure 4.2, however, provides a representation of a typical single-channel structure. The different physical and trading channels are also illustrated in this figure.

Figure 4.2 A typical channel of distribution, also showing the difference between the physical and the trading channel



Channel selection

Channel objectives

For successful channel selection, it is important for a company to identify the most suitable objectives that ensure that it can get its products to its customers in the most appropriate fashion. Channel objectives will necessarily differ from one company to another, but there are a number of general points that are likely to be relevant to most companies. These should normally be considered by a company in the course of its distribution planning process to ensure that the most appropriate channel structure is developed. The key points that should be addressed are as follows:

- *To make the product readily available to the market consumers at which it is aimed*. Perhaps the most important factor here is to ensure that the product is represented in the right buying environment for customers. For a consumer product this might be, for example, retail store and internet. Having identified the correct marketplace for the goods, the company must make certain that the appropriate physical distribution channels are selected to achieve this objective.

- *To enhance the prospect of sales being made*. This may be the responsibility of either the sales group or the logistics group or jointly as a team. It can be achieved in a number of ways. The most appropriate factors for each product or type of retail outlet will be reflected in the choice of channel. For example, the general aims of delivery to stores/shops might be to get good positions and displays in the store, and to gain the active support of the retail salesperson, if this is relevant. The product should be 'visible, accessible and attractively displayed'. In this instance, channel choice might be affected by the following requirements:
  - Does the deliverer arrange the merchandise in the retail store?
  - Are special displays used?
  - Does the product need to be installed, demonstrated or explained?
  - Is there a special promotion of the product?
  - Does the supplier pay for favourable shelf location for the product?
- *To achieve cooperation with regard to any relevant distribution factors*. These factors may be from the supplier's or the receiver's point of view, and include minimum order sizes, unit load types, product handling characteristics, shelf-ready upon delivery to store, materials handling aids, delivery access (e.g. vehicle size) and delivery time constraints, among others.
- *To achieve a given level of service*. Once again, from both the supplier's and the customer's viewpoints, a specified level of service should be established through a formal service level agreement which is then monitored, measured and maintained. The customer normally sees this as crucial. Relative performance in achieving service level requirements is often used to compare suppliers and may be the basis for subsequent buying decisions. This was discussed in detail in Chapter 3 and is covered in Chapter 14.
- *To minimize logistics and total costs*. As always, cost is very important, as it is reflected in the final price of the product. The selected channel will reflect a certain cost, and this cost must be assessed in relation to the type of product offered and the level of service required.
- *To receive fast and accurate feedback of information*. A good flow of relevant information is essential for the provision and maintenance of an efficient distribution service. It might include sales trends, inventory levels, damage reports, service levels, cost monitoring and EPOS information shared with suppliers.

Channel characteristics

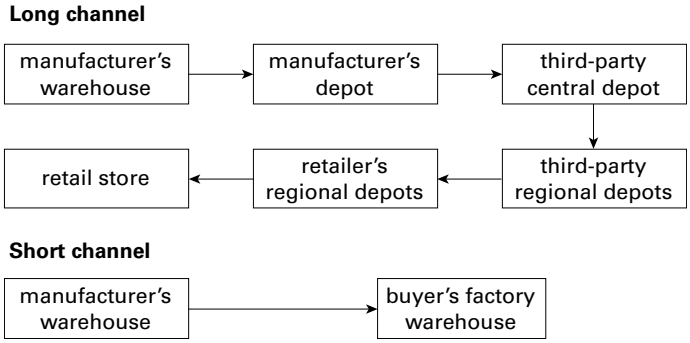
As well as identifying the relevant channel objectives, as described in the previous section, there are a number of channel characteristics that also need to be considered. These include market, product and competitive characteristics. These different factors

will affect the decisions that need to be made when designing a channel to be used in a distribution system. They can be summarized as follows.

Market characteristics

The important consideration here is to use the channels that are the most appropriate to get the product to the eventual end user. The size, spread and density of the market is important. If a market is a very large one that is widely spread from a geographic point of view, then it is usual to use 'long' channels. A long channel is one where there are several different storage points and a number of different movements for the product as it is transferred from the point of production to the final customer. Where a market has only a very few buyers in a limited geographical area, then 'short' channels are used. A simple example of what are known as 'long' and 'short' channels is illustrated in Figure 4.3.

Figure 4.3 'Long' and 'short' distribution channels



Product characteristics

The importance of the product itself when determining channel choice should not be underestimated. This is because the product may well impose constraints on the number of channels that can be considered. For example:

- High-value items are more likely to be sold direct via a short channel, because the high gross profit margins can more easily cover the higher sales and distribution costs that are usual from short channels. In addition, the security aspects of highly priced items (e.g. jewellery, smartphones) make a short channel much more attractive because there is less opportunity for loss and theft than with a long channel. Short channels also reduce the requirement for carrying large inventories of high-value goods and thus help to avoid the associated issues of poor use of working capital and the cost of obsolescence.
- Complex products often require direct selling because any intermediary may not be able to explain how the product works to potential customers.

- New products may have to be distributed via a third-party channel because final demand is unknown and supply channels need to be very flexible to respond to both high and low demand levels. Existing own-account operations may find it difficult to deal effectively with the vagaries of new product demand.
- Time-sensitive products need a 'fast' or 'short' channel, for shelf-life reasons in the case of food products such as bread and cakes, and relevance in the case of newspapers and tender documents.
- Products with a handling constraint may require a specialist physical distribution channel, e.g. frozen food, china and glass, hanging garments and hazardous chemicals.

Competitive characteristics

Competitive characteristics that need to be considered concern the activities of any competitors selling a similar product. Typical decisions are whether to sell the product alongside these similar products, or whether to try for different, exclusive outlets for the product in order to avoid the competition and risk of substitution. It may well be that the consumer preference for a wide choice necessitates the same outlets being supplied. Good examples include confectionery and most grocery items.

Of particular significance is the service level being provided by the competition. It is essential that channel selection is undertaken with a view to ensuring that the level of service that can be given is as good as, or better than, that which is being provided by key competitors. This may well be the main area for competitive advantage, especially for those products where it is very difficult to differentiate on quality and price.

Company resources

In the final analysis, it is often the size and the financial strength of the company that is most important in determining channel strategy. Only a fairly large and cash-rich company can afford to set up a distribution structure that includes all of its own storage and transport facilities. A company may like to do this because it feels that it gives it greater control and that it can allow the company to provide more easily the service it thinks its customers require. However, smaller and less financially secure companies may have to use intermediaries or third-party organizations to perform their distribution function because they do not have the financial resources to allow them to run their own distribution operations.

Designing a channel structure

Many of the factors previously described in this chapter will need to be considered when designing a channel structure and selecting the appropriate channel members.

A formalized approach that might be adopted when undertaking the design of such a channel structure is outlined below:

- Identify key marketing and customer service requirements: this will be required in order to determine the basis for the channel structure. (See Chapter 3 for more detailed information on how this can be done.)
- Set and coordinate distribution objectives and specify distribution tasks: this is aimed at determining what the company requires with regard to the products that are sold and the customer requirements for these products. The 'Channel selection' section in this chapter covers many of the key aspects.
- Develop alternative appropriate channel structures: the preceding steps will have covered the collection of all of the necessary information and data. In this step, the different elements should be assessed to allow for suitable appropriate channel structures to be identified.
- Choose the best channel structure: at this stage the most appropriate channel structure from the feasible alternatives can be determined. This might be a single channel or a series of different channels that may be required to enable the effective distribution of different product types to different types of customer.
- Select channel members: the final task is to identify which channel members best fit into the chosen channel structure. (See Chapter 36 where the process for selecting third-party contractors is described.)

Outsourcing channels

Third party or own account?

It is probably true that the most important channel decision for those operating in distribution and logistics is whether to use an own-account (in-house) operation or whether to outsource to a third-party logistics (3PL) service. If the decision is to outsource then there are a number of associated factors that need to be considered concerning how much of the operation to outsource and which of the many third-party companies to choose to undertake the outsourced operation. These and other key questions related to outsourcing are addressed in detail later in the book: the different services offered (Chapter 34), the main decision criteria (Chapter 35), the selection process (Chapter 36) and the management of outsourced operations (Chapter 37) are all covered. In addition, the opportunity to move to the next phase of outsourcing – fourth-party logistics – is described in Chapter 5. Nevertheless, as outsourcing is such a key element when considering channels of distribution, two important questions regarding outsourcing are considered here: what are the reasons

for companies outsourcing their distribution operations, and what are the reasons for companies not outsourcing?

The reasons why companies outsource their distribution operations

Some of the key reasons why companies outsource their operations are:

- To reduce cost: this is generally the main reason that a company will give for outsourcing. It often arises after a company has compared or benchmarked (see Chapter 39) its operation against another similar operation and identified major cost differences. Outsourcing is a quick and relatively easy way to address this.
- To improve service: another major reason for outsourcing as there are scale benefits in warehousing and, particularly, reach and service frequency benefits in delivery.
- To concentrate on core competence: distribution is often seen as an ancillary activity and not a key part of a company's manufacturing or retailing speciality.
- To reduce assets: warehouses and vehicles can be transferred to the third-party contractor and thus they do not appear on the company's balance sheet.
- To employ capital more effectively: capital previously employed to purchase buildings or rapidly depreciating assets such as trucks may be more profitably employed elsewhere in the business.
- To facilitate access to new geographic markets: as a company wishes to expand its market area, it is often quicker and more effective to use an existing physical distribution operation (outsource) rather than have to set up a new own-account operation.

The reasons why companies do not outsource their distribution operations

Some of the key reasons why companies do not outsource their operations are:

- Logistics is seen as a core competency in the company: companies feel that service is key to their product offering and that distribution should not be outsourced because they may lose this as a competitive advantage.
- Costs will not be reduced: this is because the contractor will be paid a profit margin on top of the cost of the operation.
- Loss of control: companies feel that they will lose direct control of their own operation and this may impact customer service flexibility.

- Over-dependency risk: companies fear that they will become over-dependent on the contractor and that, over time, it would become impossible to reverse the decision.
- Loss of key skills: companies may be concerned that they would lose some of the key skills and key knowledge that is important to a key part of their business.

There are other reasons given that can influence this key decision of whether or not to outsource. For further discussion see the section in Chapter 35, 'Drivers and drawbacks of outsourcing logistics'.

Key issues and challenges for logistics and the supply chain

05

Introduction

In this chapter a number of key issues are raised and discussed with the aim of highlighting the most important challenges that are being addressed by logistics and supply chain professionals. There are constant changes and developments in the structure, organization and operation of logistics, notably in the interpretation of logistics within the broader supply chain. Although many of these are covered in greater detail in the appropriate chapters within this book, some are introduced in this chapter in order to provide a clearer picture of the broad areas of change that are occurring within logistics and the supply chain.

It is worth emphasizing that, aside from external issues and developments in technology, some changes in logistics are largely conceptual in nature whereby certain aspects of logistics and the supply chain are viewed with a new or different approach. Many people, especially experienced logistics practitioners, may feel that some of these concepts and approaches are very much like old ideas dressed in new clothing. To a certain extent this is true; for example, much of the new process-oriented approach to logistics (see Chapter 7) is an echo of what used to be called 'work study'. The use of flowcharts for analysing workflows in distribution and logistics has, in fact, been very common for many years.

What some of these new concepts and approaches are achieving, however, is to re-emphasize certain ideas, update their approach and content and rekindle the fires of enthusiasm for constant review and change. Logistics exists in a very dynamic and ever-changing environment, so this is undoubtedly a positive development. Another relevant point is that a number of these concepts are not applicable to all operations and organizations. This may be due to the size of the organization or to the extent

of the market; for example, small nationally oriented organizations are usually unaffected directly by globalization. Nevertheless, for large multinational companies these are very important questions that need to be addressed.

Initially, the broader context of the digital supply chain is described, followed by developments and influences from the external environment. These aspects generally have an impact across the supply chain as a whole. The remaining sections concern changes which are more specific to particular components of logistics. The broad categorizations of change refer to:

- the digital supply chain
- the external environment
- manufacturing and supply
- logistics and distribution
- retailing
- the consumer

The digital supply chain

There are several technological developments that have implications for the supply chain in its broadest context. In the opening section of this chapter, an overview of these elements and how they help create what might be called the digital supply chain is outlined. Many of the different technologies are discussed in more detail in Chapter 40 of this book.

As with many evolving ideas and concepts that are associated with the supply chain, the basis for these developments is strongly associated with changing customer expectations. Customers choose and select products across multiple platforms and demand service that is both personal and fast. They also may have concerns about both product and supply chain sustainability. These requirements must be met in changing and challenging circumstances, including elongated and complex supply chains, disruptive events such as global health crises and political insecurity. These, in turn, may result in severe or sporadic supply shortages.

Although it may appear as rather ambitious to try to accommodate all requirements such as these, there are existing and developing concepts that make this far more feasible. One key concept is the idea of the Fourth Industrial Revolution (4IR), also known as Industry 4.0, whereby developing digital technologies have begun to significantly alter the scope of what is achievable. These terms describe the way economies can develop through the integration of innovative technological, societal and business practices to encourage a fresh combined approach to commerce and industry. Evolving from this is Supply Chain 4.0 (SC:4), which incorporates the

combination of associated technologies that have enabled the introduction of an 'era of digital transformation in new real-time data gathering across the supply chain, smart analysis, and algorithms to better simulate and predict different supply chain scenarios and foster data-based decision-making' (PwC, 2020).

The remainder of this section considers these aspects of the digital supply chain. SC:4 is described, the various enabling technologies are listed and the associated resulting key outputs are briefly reviewed. As indicated earlier, the different technologies are discussed in more detail in Chapter 40.

Supply Chain 4.0 (SC:4)

As indicated above, the concept of Supply Chain 4:0 (SC:4) describes how developing digital technologies can significantly alter the scope of what is achievable and attainable within the supply chain.

The move towards SC:4 is enabled by many different approaches and developments. These might be informational, through digital services such as logistical control towers using Big Data and the Internet of Things (IoT), or the use of internet-connected devices that interact automatically. In addition, there are digitally-enabled logistics services that can improve cross-border movements in a single simplified process based on technology enhancements. Innovative delivery options significantly change operational opportunities for physical shipments, including the use of drones and autonomous vehicles or 3D printing which eliminates the need to hold finished inventory. The implications for traditional distribution are immense.

One aspect of SC:4 that is already commonly discussed is that of sustainability and the circular economy: an important consideration for many manufacturing and logistics operations, where a key facet of their planning is to ensure that environmental concerns are catered for through the elimination of waste material, recycling and reduced emissions. Finally, the concept of the shared economy is also very much reflected in developments in logistics. This not only includes shared warehousing and shared transport operations, already apparent in multi-user third-party logistics services, but also the increasing use of parcel collection from and delivery to the home and office – often enabled by smartphone technology.

Industry 4.0 and SC:4 encompass the age of smart machines, production facilities and storage systems that can autonomously exchange information, prompt actions and control operations without human intervention. This is enabled through the Internet of Things and other interconnected networks of machine devices and vehicles, but this 'revolution' is seen as a clear separation between humans and machine robots. Industry 5.0 and SC:5 anticipates the next stage in the cycle, as man and autonomous machine are reconciled to work together, producing the synergy of human intelligence and cognitive computing interacting harmoniously. Manufacturing and distribution are expected to reach new levels of speed and perfection while also

protecting the environment through the incorporation of renewable energy and minimal waste.

Supply Chain 5.0 (SC:5)

The next evolutionary stage from SC:4 is Supply Chain 5.0 (SC:5). SC:5 marks the next evolutionary stage in the development of global supply networks, following the digitization and automation focus of SC:4. While Supply Chain 4.0 emphasized the integration of cyber-physical systems, the Internet of Things (IoT), Big Data analytics and artificial intelligence to enhance efficiency and visibility, SC:5 places people, sustainability and resilience at the core of the supply chain ecosystem. SC:5 is a paradigmatic shift from technology-driven optimizations to human-centric, collaborative and purpose-driven supply chains.

At its foundation, SC:5 is characterized by the synergistic co-production of advanced technologies with human intelligence. Generative AI, digital twins and autonomous systems continue to play a vital role, but the emphasis is now on augmenting human decision-making rather than replacing it. This shift recognizes that human creativity, ethical judgment, and strategic foresight remain essential for managing increasingly complex and uncertain environments.

Another defining feature of SC:5 is the integration of sustainability and circularity principles. SC:5 aligns with broader societal goals such as the United Nations Sustainable Development Goals (SDGs) and net-zero commitments, embedding carbon reduction, responsible sourcing and resource efficiency into supply chain design. Firms are expected not only to deliver value but to do so responsibly, transparently and inclusively.

SC:5 is expected to better respond to challenges, as exposed by disruptions induced by the Covid-19 pandemic, geopolitical tensions, and climate change inspired by resilience and adaptability principles. This involves building flexible multi-sourcing models, regionalized networks and dynamic risk-management frameworks that allow supply chains to thrive under uncertainty. SC:5 represents a balanced, human-technology trusted collaboration.

Innovative technologies

The key contributors to the digital supply chain are the innovative technologies that make the concept feasible. Many of these and others are described in Chapter 40, but a brief list and some implications for the supply chain are given here:

- Big Data: extremely large data sets that may be analysed by software designed to reveal patterns, trends and associations, especially relating to human behaviour and interactions (e.g. from sensors, etc). This leads to Big Data analytics.

Table 5.1 The evolution of supply chains: from SC:1 to SC:5

Stage	Period	Attributes	Technologies & Practices	Strategic Objective
SC 1.0	Pre-industrial & early industrial	Manual, localized, fragmented operations	Ledgers, manual inventory, basic transport	Product availability
SC 2.0	Mass production (20th century)	Centralized, efficiency-driven, economies of scale	Assembly lines, standardization, containerization	Cost reduction and increased productivity
SC 3.0	Globalization (late 20th/early 21st centuries	Outsourcing, offshoring and extended global networks	ERP systems, lean practices, just-in-time	Global focus / reach, optimization of flows
SC 4.0	Digitalization & Industry 4.0	End-to-end integration, data-driven decision-making	IoT, Big Data, blockchain, AI/ML, automation, robotics	Visibility, efficiency, agility
SC 5.0	Human-centric & sustainable supply chains	Human-tech synergies, resilience, sustainability	Generative AI, digital twins, autonomous systems, circular economy practices	Societal value, resilience, sustainable growth

- Artificial intelligence (AI): the ability of a computer or a robot controlled by a computer using machine learning to undertake tasks that are usually done by humans because they require human intelligence and discernment; e.g. home-based assistants (Amazon Echo) can link with home smart appliances, identify stockouts and automatically re-order (e.g. milk in fridge); warehouse pick routes etc.
- Internet of Things (IoT): describes the network of physical objects – 'things' – that are embedded with sensors, software and other technologies for the purpose of connecting and exchanging data with other devices and systems over the internet, e.g. shelving, vehicle sensors and telematics.
- Control towers: the essence of the control tower concept is to provide supply chain visibility across divisions, countries and transport modes. The heart of the control tower is an information hub supported by a set of detailed decision-making rules and a trained team of operators; e.g. SC and logistics decisions will be made automatically (by AI) from Big Data systems to deliver customer service while minimizing inventory.

- Blockchain: a permanent digital record of transactions that is stored across a distributed or decentralized network of computers. The blockchain is not split across many computers, but copied to all computers in the link – a single source of information on which all stakeholders can rely.
- Distributed order management: DOM systems are designed to arrange orders across the multiple systems and processes utilized by those involved in replenishing an order. DOM can analyse every transaction and determine the most efficient shipping location considering multiple factors, including speed of delivery, the distance between the shipping point and the customer, and available stock levels. This clearly requires a unified view of stock across multiple channels in order to know exactly where the products are.
- Digital marketplace: a technology platform to improve/simplify buying logistics requirements – e.g. a freight exchange/marketplace, an e-forwarder, a tender platform (for outsourcing).
- Crowd-shipping: also known as crowd-logistics, ordinary citizens using social networking collaboratively to act as couriers, creating new informal logistics networks for local distribution of small items ordered online – small parcels.
- Robotics/automation: many warehouse and logistics jobs can be undertaken by robots, e.g. container stacking, warehouse put away, picking and packing.
- Autonomous vehicles: vehicles and drones (self-driving robots) used for delivery purposes.
- 3D printing, also known as 'additive manufacturing': enables the remote production of three-dimensional objects. This can eliminate large elements of an upstream supply chain.

Digital supply chain: key aspects

What does a digital supply chain look like? The use of an amalgam of the many innovative technologies outlined above implies the need for a very different structure and operational approach. Yet, in many ways, there is a natural progression that has occurred and is still occurring. It is the linking of these new ideas and techniques that is the key to any fundamental change. The digital supply chain can be characterized in several different ways but there are five major elements that can be considered as key to the formulation of an autonomous and self-optimizing supply chain:

- Supply chain transparency and sustainability: this involves multi-level data flow and seamless connection of all data across the supply chain for products, logistics, customers and finance, together with a completely transparent and sustainable supply chain that includes the reuse of materials and the integration of suppliers and other players.

- Closed-loop and integrated planning and execution: end-to-end planning from customers to sub-suppliers covering all planning time horizons. This to include integrating financial and capacity plans, demand and supply balancing, collaborative workflows and automated decision-making using advanced analytics.
- Smart logistics flows: includes inbound and outbound transportation considering all modes; automated warehouses transport management systems (TMS) and warehouse management systems (WMS); optimized and dynamic distribution; omnichannel order management.
- Dynamic supply chain segmentation: the use of segmentation strategies to support key business requirements, covering all realistic service, margin, cost and inventory parameters. The adoption of supply chains that are flexible and which can be further segmented for each customer order, as well as reshaped for alternative market conditions and product components.
- AI-driven supply chain management: data networks and AI connect along the supply chain to provide enhanced demand forecasts via demand sensing. Patterns and trends can evolve based on machine learning within the supply chain and trigger appropriate responses. This enables a fully autonomous supply chain making appropriate and effective optimization decisions.

The external environment

There are many ways in which external issues have an impact on logistics, and a number of the key aspects are considered in this section.

One factor that has a particular impact is the importance of *green* or *environmental issues*. This has occurred through an increasing public awareness of environmental issues, but also as a result of the activity of pressure groups and the recognition by governments that global environmental policies need to be initiated. It has led to the introduction of environmental legislation, which has had important consequences for logistics and the supply chain (see Chapter 42 for a detailed discussion on logistics and the environment). Some of the key policies and developments include:

- the banning of road freight movements at certain times and days of the week
- the promotion of rail over road transport
- the recycling of packaging
- the 'greening' of products
- the design of products to facilitate repair, reuse, recycling and the minimization of packaging

For many companies, the need for a sound environmental policy is seen to be essential and plays an important part in determining appropriate logistics and supply chain strategies and operations.

For most cities throughout the world, one very visible external impact on logistics is *road congestion*. Severe road traffic congestion can have a very negative effect on some of the key concepts in logistics – in particular just-in-time (JIT) and quick-response systems. It is likely that congestion will get worse as most forecasts predict a significant increase in vehicle numbers at a time when, in most countries, with the exception of China and India, there are very limited road-building programmes. Many Western countries try to reduce congestion through a combination of road tolls, truck bans, access restrictions, time restrictions and usage tax – all of which can have a significant impact on logistics costs and performance. There is no generally accepted solution. Companies try to alleviate the problem through strategies such as out-of-hours deliveries, stockless depots and the relocation of DCs closer to delivery points.

Changes and developments in logistics thinking and logistics systems have also contributed to another issue that has a significant impact on logistics operations – this is the problem of the *restricted availability of suitable management and labour*. The need for an understanding of the strategic elements of logistics and the need for an appreciation of the integrated nature of logistics are important for managers who are operating in today's supply chain-oriented networks. Some managers do not have the opportunity to obtain the relevant experience or knowledge that provides this. Some are also likely to have worked in functional silos rather than cross-functional teams and their focus has generally been in an operational rather than a planning context. This applies to managers from both in-house and third-party operations. Add to this the rapid introduction of new technology, and it is understandable why there is such a shortage of managers with suitably broad knowledge and experience.

This problem is also reflected in the nature of the labour available to work in the many different logistics and distribution functions. In particular, new technological developments in operational logistics have meant that the skill requirements have changed and that the necessary skill levels have become much higher for some logistics jobs. There are also significant labour shortages in some geographic areas and for some specific logistics jobs, such as transport drivers.

There are regular occurrences of unpredictable and unexpected events that can create serious disruptions to supply chain and logistics activities. These may happen for a variety of reasons, such as natural disasters, terrorism, corporate failures and industrial disputes. These events have highlighted the *vulnerability of many supply chains* (sometimes called *supply chain disruption*) and have shown that there are potential risks to many supply chain and logistics operations that may not have been adequately addressed (see Chapter 41).

One major example is, of course, the Covid-19 pandemic. Supply chains across the world were severely disrupted, but in many ways the resilience and flexibility of supply chains have proved to be critical in helping to alleviate some of the major problems related to the provision of essential medical supplies, food and other key necessities. But it has not been easy. Basically, some of the fundamental elements of supply chain planning and design were affected – consumer behaviour, supply sources, routes to market, order sizes – which have resulted in the need for flexibility and agility in responses.

This need is likely to promote a move towards the digital supply chain including many of the technologies indicated at the beginning of this section. Another aspect that may be reconsidered is the globalization of supply, particularly the potential problems associated with single-source operations and long, inflexible supply routes.

At a more parochial level, Brexit – the departure of the UK from the EU – has shown how vulnerable supply chains can be as a result of change, in this case a re-enforcement of trade agreements, customs regulations and physical barriers, among others. Consequences involve the reassessment of sourcing, revised storage locations, inventory level changes and transport choices.

Globally, there are examples of companies moving to a single source for the supply of a key component, only to experience severe supply issues, resulting in production at the companies' plants being disrupted or halted. Reasons for the supply failure have been due to the supplier becoming insolvent or because of plant failure through fire or natural disaster. The Fukushima tsunami in Japan in 2011 caused Toyota's manufacturing to shut down all over the world because the factories of some of its suppliers were devastated. Renesas manufactured a key component – chip controllers – and it was unable to deliver these into the Toyota JIT supply chain.

Vulnerability has become recognized as a significant issue as the complexity and length of supply chains have increased and inventory levels have been significantly reduced. Appropriate risk assessment techniques and contingency plans have been developed to enable supply chains to be more resilient (see Chapter 36 for an example of a risk assessment methodology commonly used for outsourcing). Many companies have developed more resilient supply chain models that aim to allow for a greater volatility in supply.

Manufacturing and supply

Many developments in manufacturing and supply, or inbound logistics, have influenced and affected the supply chain. These have occurred through both technological and organizational change (see Chapter 13 for detailed discussion on some of these). Within the context of *raw material sourcing and production*, these include:

- *New manufacturing technology* (computer integrated manufacturing (CIM), 3D printing, nanotechnology) which can accommodate more complex production requirements and more product variations, thus creating more complicated logistics flows (see also Chapter 40).
- *New supplier relationships*, with the emphasis on single sourcing and lean supply, which involves suppliers and buyers working more closely together by sharing information and expertise to ensure that product supply is maintained.
- *Focused factories*, with a concentration on fewer or even a single source for a product, but resulting in longer transport journeys to the customer.
- *Global sourcing*, emphasizing the move away from local or national sourcing to sourcing from any location, again resulting in longer transport journeys to the customer.
- *Postponement*, where the final configuration of a product is delayed to enable reduced stockholding of finished goods in the supply chain. This also means that the final finish of products can become a logistics activity (see Chapter 13).
- *Co-makership* involving the development of partnerships between supplier and buyer to help take costs out of the supply chain through quality and information improvements. This represents a positive move away from the more traditional adversarial relationship that has been common between buyers and suppliers.
- *Co-location*, with the joint physical location of supplier operations on or next to customer production sites (see Chapter 14).

Increases in *product range* and other product characteristics have also affected logistics requirements. Examples include: product life cycles which have become shorter, bringing pressure on inventory systems as it becomes more difficult to minimize stock obsolescence; a wider product range, both expected by customers and provided by suppliers, which increases inventory requirements and costs; increases in demand for time-sensitive products – especially fresh and prepared foods – which can provide additional logistics problems with respect to the impact on stock levels and in particular the speed of delivery required.

The *lean manufacturing* concept was developed from a worldwide benchmarking programme in the automotive industry which was published in a book called *The Machine that Changed the World* (Womack, Ross and Jones) in 1990. It identified huge opportunities for closing the gap between the best in the world and other manufacturers. The approach that was developed became known as 'lean manufacturing', and is based on the Toyota system of production management (see Chapter 13). It is an approach that has been followed in recent years by many manufacturing companies from a variety of different industries. The five principles of lean thinking concentrate on the elimination of waste and are as follows:

1. Specify what does and does not create value from the customers' perspective and not from the perspective of individual firms, functions and departments.
2. Identify all the steps necessary to design, order and produce the product across the whole value stream to highlight non-value-adding waste.
3. Make those actions that create value flow without interruption, detours, backflows, waiting or scrap.
4. Only make what is 'pulled' by the customer order just-in-time.
5. Strive for perfection by continually removing successive layers of waste as they are uncovered.

These ideas are discussed further in Chapter 13. Lean thinking owes a lot to the philosophy of just-in-time and is an extension of this type of approach.

The concept of the *agile supply chain* is the development of a strategic structure and operation that allows for the rapid response to unpredictable changes in customer demand. The emphasis is on the need for companies to work together across the supply chain in order to fulfil customers' requirements, and to be flexible in the way that they are organized for production and distribution. This will allow them to be responsive to changes in customer requirements. The concept recognizes the key importance of the final customer and strives to set up a system and structure that can service customer requirements in the most effective way.

Two dictionary definitions serve to emphasize the difference between lean thinking and the agile supply chain: *lean* 'having no surplus flesh or bulk'; and *agile* 'quick in movement, nimble'. Some of the reasons for the need for agility in the supply chain include: shorter product life cycles (for example, desktop and laptop computers have about a six-month life cycle before they are superseded, and mobile phones and tablets can become outdated in even shorter time periods); an increase in the variety of final products (typically in colour and style refinements); the unnecessary build-up of stock, which can quickly become obsolete because demand requirements change so rapidly; developments in direct selling and buying – notably via internet and mobile shopping – which means that customers expect to acquire the most up-to-date products immediately.

The agile approach to supply chain management aims to create a responsive structure and process to service customer demand in a fast-changing marketplace. Key characteristics of an agile approach are:

- production is planned across functional boundaries and flexible fulfilment (postponement) is used
- inventory is held at as few levels as possible and much stock is held as work-in-progress awaiting final configuration, which will be based on actual customer requirements

- replenishment at the different levels in the supply chain is driven by actual sales data collected at the customer interface
- finished goods are sometimes delivered direct from factory to customer
- supply chain systems are highly integrated, giving clear visibility of inventory at all levels

Factory gate pricing (FGP) is another initiative that is intended to reduce logistics costs – in this case the inbound supplier's transport costs incurred while delivering to customers' manufacturing sites or distribution centres (DCs). Traditionally, many products, particularly industrial components and raw materials, have been delivered direct to customers via suppliers' own transport or a third-party contracted to the supplier. This approach disguises the real transport cost because it is included within the cost of the product. Now, some products are bought 'at the factory gate' (or 'ex works' in import/export Incoterms® terminology) without any transport cost included, so that the product price is transparent. Buyers can then decide whether to ask the supplier to deliver, with the transport cost indicated separately, or to collect the product using their own company transport or by using a third-party resource that they can control.

FGP provides an opportunity for buying companies to reduce transport costs by improving the utilization of their own, or their outsourced, transport operations because collections can be made using returning empty delivery vehicles. This alternative approach also gives the buyer much more control over when goods are received and how much is received. This can help them to avoid stockouts of essential products and also to ensure that they do not become unnecessarily overstocked with any products. Many companies that have adopted a broad FGP policy have done so by using third-party logistics service provider (3PL) companies to plan and undertake all the collections of the products that they buy.

Some large consumer goods companies have also recognized the advantages of more structured and controlled inbound supply chain management, and are taking this in-house. Thus, they are organizing and controlling their own inbound shipments rather than leaving this to their suppliers. Both Walmart and PepsiCo in the United States have taken this route (see also Chapter 14).

An associated development is that of *inbound to manufacturing* (I2M). This is a service used in support of a manufacturer's need to ensure that materials and components are purchased in the best way in support of their customers' variable manufacturing demands. Global manufacturers are seeking to reduce their overall supply chain costs by improving the inbound control of the supply of raw materials and components and thus reducing the inventory that they consume in their manufacturing process, reducing operational costs and using expensive factory space more productively. I2M is the supply chain management of the inbound flow of materials from collection points at component suppliers' facilities to the consumption point in

manufacturers' production lines, which are usually situated in developing countries. Usually a vendor-managed inventory (VMI) programme is established in support of this service.

Logistics and distribution

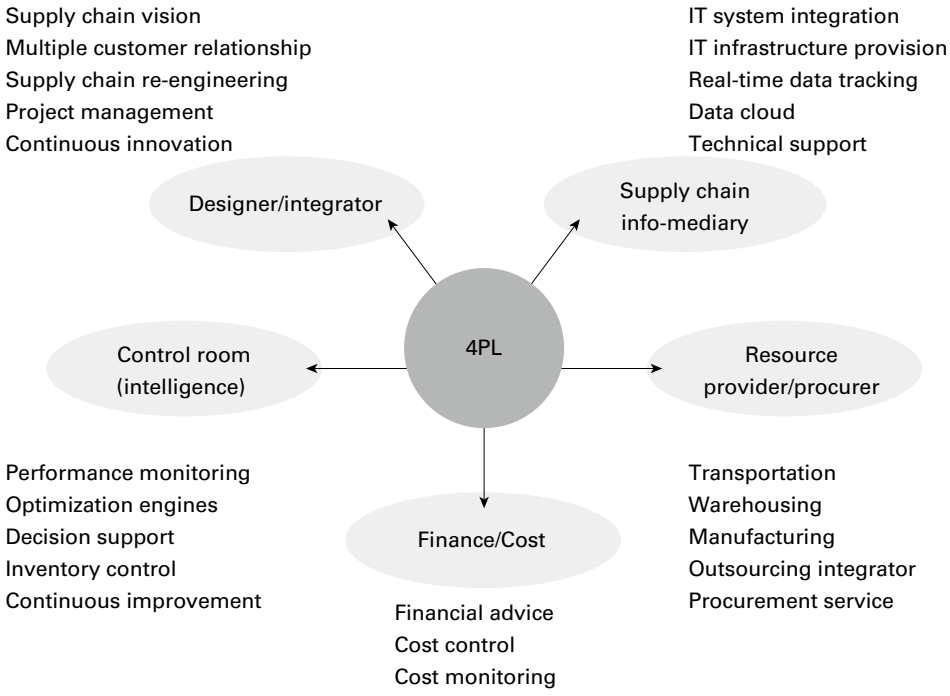
There are constant changes and developments in logistics and distribution, and the majority of these are included in the appropriate chapters within this book. Some of the more topical ones are, however, noted in this section. As well as the extent of change, the speed of change is also relevant as new concepts and ideas can very quickly become standard practice. The take-up of new ideas can vary from one company to another. Thus, an idea or concept may be standard practice for one company but totally new for another. It may be vital for one company, but completely irrelevant for another.

One major area with constant change and development is third-party logistics (3PL) or outsourcing. This is a logistics expertise that has existed for many years and is discussed in great detail in Part Six. *Fourth-party logistics* (4PL) is a development from 3PL that is hailed as the future for supply chain management outsourcing. 4PL is where an external organization is able to provide a user with an overall supply chain-wide solution by incorporating the resources and expertise of any number of third parties to best effect. The fourth-party provider will be involved in both the design and the management of a client's logistics system and will act as a coordinator for many different types of service, which may include distribution, information systems, financial services, etc. Figure 5.1 summarizes the key elements.

A fourth-party service provider or co-venturer can offer a number of enhanced services, which can provide a total supply chain perspective. This can include visibility and cost/performance measurement along the supply chain as well as tailored structures and systems offering open systems and technical vision. Accenture have defined a fourth-party logistics service provider as 'an integrator that assembles the resources, capabilities and technology of its own organization and other organizations to design, build and run comprehensive supply chain solutions'. The main impetus is for the overall planning to be outsourced and that the complete supply chain operation should be included within the remit of the 4PL. Note that a fourth-party logistics service provider is a different concept from a lead logistics provider (LLP) because the LLP uses a degree of its own physical assets and resources together with the assets of other 3PLs. LLPs and 3PLs deliver solutions across well-defined parts of the supply chain, usually in specific elements of logistics activity. The remit of the 4PL is a much wider one.

There are a number of different ways in which fourth-party logistics may be able to solve some of the key problems that users of third-party logistics companies

Figure 5.1 Fourth-party logistics, showing the main areas of service that could be provided



have experienced. The major drawbacks are likely to be the cost of using a 4PL and the loss of control over the supply chain function within the company. The main advantages are likely to be:

- *Strategic*: minimizing the time and effort spent on logistics by the user; having a single point of contact for all aspects of logistics; the management of multiple logistics providers within a single organization; easier provision of broader supply chain services (IT, integration strategy, etc); a fourth-party specialist can source expertise with best-in-class credentials.
- *Operational*: a new entity should mean it is easier to eradicate outdated logistics practices; overcome old industrial relations issues and transfer selective personnel; establish a new and more flexible working environment and create a new company culture.
- *Service and cost*: the user company's capital can be freed up for core/mainstream use by selling assets; continuous monitoring and improvement of supply chain processes, performance and costs can be coordinated; different supply chain processes can be benchmarked against world-class companies; continuous monitoring and reassessment of service level achievements can be more easily undertaken.

- *Additional benefits*: provision of 'knowledge management' – the bringing together and effective sharing of knowledge among the identified stakeholders; provision of supply chain accountability for achieving desired performance; the provider assumes risk on behalf of the user – generally in return for a share of the profit.

There is a view that 4PL is merely a refinement of 3PL; in fact there is a very significant difference between the two:

- A 4PL is non-asset-based, unlike a 3PL, which is generally seeking to fill its asset capacity of distribution centres, vehicles and freight.
- Historically, 3PLs have operated vertically in the supply chain, providing specific services in warehousing, transportation and other logistics activities. In contrast, 4PLs work horizontally across the whole supply chain and use the services of a variety of 3PLs to help provide end-to-end solutions for customers.
- 4PLs essentially act as managers of the client's supply chain whereas 3PLs execute supply chain functions.
- Typically, the 4PL only owns IT systems and intellectual capital and is therefore asset light. This allows the 4PL to be neutral in terms of asset allocation and utilization, with the ability to manage the supply chain process, irrespective of which carriers, forwarders or warehouses are used. Thus, the 4PL does not have to consider using its own assets, but can take the shipper's perspective, using the best operators for the different logistics requirements.
- The 4PL focuses on satisfying and retaining its customers by understanding the complexity of the customer's requirements and providing end-to-end solutions based on sound processes, which address their customers' overall supply chain needs.

It has been argued that 4PLs have stepped into the vacuum created by 3PLs, due to the 3PLs' disinclination to develop beyond their traditional warehousing and transportation role. Indeed, 3PLs usually focus on servicing functions such as warehousing, transport or freight management, whereas the 4PL targets the logistics or supply chain process as it impacts the customer's entire business. In 2025, DHL began to offer a comprehensive suite of supply chain and logistics solutions. For example, DHL can undertake the review of the client's existing supply chain and will make recommendations on where change is beneficial, acting as a supply chain architect in order to integrate different systems and different supply chains.

5PL (*fifth-party logistics*) is the most advanced and strategic level in the evolution of logistics services. It refers to logistics providers who manage and optimize entire supply chains through the integration of multiple technologies and logistics networks, often across multiple 3PLs and 4PLs. A 5PL provider is responsible for designing, building and orchestrating complex supply chain ecosystems – typically

Table 5.2 Key characteristics of 5PL

Feature	Description
Network Orchestration	Manages and coordinates multiple 3PL and 4PL providers.
Technology-Driven	Leverages AI, IoT, blockchain, cloud computing and Big Data.
Strategic Focus	Aligns logistics strategy with business models and customer needs.
Demand-Driven	Responds dynamically to real-time market and customer demand.
Asset-Light	Typically doesn't own physical logistics assets; focuses on digital integration.

using digital platforms, AI, automation, blockchain and advanced analytics. Their focus is on network-wide optimization, not just transport or warehousing. Table 5.2 below explains some key features that 5PL brings.

Modern supply chains that are inspired by the Supply Chain 5.0 paradigm include 5PL providers that play a strategic role as orchestrators of complex, end-to-end logistics ecosystems. Rather than handling physical goods themselves, they integrate and manage the activities of multiple 3PL and 4PL partners through advanced digital platforms. Their core value lies in enabling real-time visibility, dynamic decision-making, and agile responses to disruptions. By leveraging technologies such as AI, IoT, blockchain and digital twins, 5PLs optimize networks for speed, sustainability and resilience. They are instrumental in helping organizations reduce costs, lower emissions, improve customer experience and adapt rapidly to changing market demands – all while aligning logistics strategies with broader business and ESG goals.

Logistics is no longer a back-office cost, but has become a boardroom priority and the complexity of global supply chains, rising customer expectations and increasing pressure from regulators and investors mean that logistics decisions now shape market competitiveness. 5PL becomes a game-changer because as a strategic orchestration layer, it effectively connects data, partners, platforms and decisions across the entire value chain. Instead of optimizing isolated logistics functions, 5PL providers synchronize end-to-end flows, from upstream supplier coordination to last-mile delivery. For example, a 5PL might analyse real-time inventory, weather patterns and port congestion to dynamically reroute shipments – avoiding costly delays without human intervention.

Moreover, 5PL creates strategic resilience. With geopolitical instability, climate risk and demand volatility becoming the new normal, companies need the ability to pivot fast. A well-integrated 5PL platform provides scenario modelling and risk

forecasting tools, enabling executives to make faster, data-informed decisions under pressure.

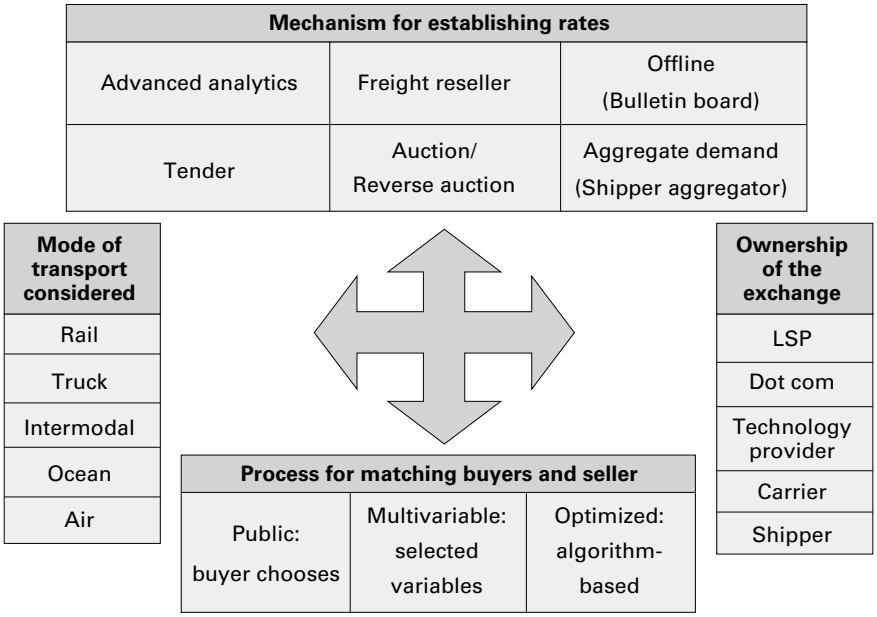
While the promise of 5PL is compelling, implementing it requires effort and resources. The journey begins with a clear understanding of their current logistics maturity. The drivers include real-time data, systems interoperability and culture. The next step is defining what orchestration looks like for the business. Some companies may need global visibility and control across 3PL providers, while others may seek sustainability reporting, blockchain-based sourcing validation, or dynamic warehousing. The key is to align 5PL capabilities with strategic objectives. Selecting the right 5PL partner is equally critical. This isn't a typical vendor relationship but a long-term, collaborative relationship. Executives should vet partners based on technological sophistication, sector experience, cybersecurity credentials and cultural fit.

One important information-based development in logistics is the *digital freight exchange or digital platform*. These are online transaction systems for shippers and carriers that enable online freight purchasing. Basically, they are internet-based trading mechanisms that facilitate the matching of shipper demand with carrier availability. They range in complexity from simple electronic bulletin boards (these allow shippers and carriers to post their needs, manually compare the two lists and then contact each other) to sophisticated algorithm-based systems (these identify suitable matches through the filtering and comparison of rates, carrier performance, service offering and equipment types).

Figure 5.2 provides a summary of some of the major differences between alternative freight exchanges. As indicated, these are: the various mechanisms that are used for establishing rates (bulletin boards, auctions, aggregation, etc), the different modes considered, the different types of owner and the matching processes.

Initially, it was thought that freight exchanges might take the place of the contract agreements that are made between many shippers and carriers, but it is apparent that contracts need to be negotiated face-to-face and that internet contact alone is insufficient because of the extent of detail required in a contract. There is possibly some scope for the use of freight exchanges in the early stages of the outsourcing selection process, specifically when putting together a request for information (RFI) (see Chapter 36) in order to develop a shortlist of suitable 3PLs to take to the final tendering stage. Also, where a company prefers some form of consultancy support to undertake the selection process, some freight exchanges can offer useful advice and suitable processes to help accomplish this successfully. It must also be remembered, of course, that freight exchanges work with a limited number of transport contractors (those that have signed up to the site) so this will pose an immediate restriction on the number of contractors that will get the opportunity to be considered for the shortlist. Thus, freight exchanges are ideal for organizing non-contract ('spot') or occasional transport requirements but are limited in their ability to cater for complicated long-term service contracts.

Figure 5.2 The different characteristics that distinguish digital freight exchanges from each other



One very major trend that continues to be of great significance is the idea of the *networked economy*. This is linked very closely to a number of different concepts that have already been discussed, including the digital supply chain, the agile supply chain and the development of 4PLs as described above. The networked economy recognizes the difficulty for a company to act totally independently because the success of most enterprises is inextricably linked to many other companies – whether suppliers, manufacturers, service providers or retailers. Globalization has increased the complexity of supply chains, so associated issues are multiplied making this interdependence even more important. To facilitate the development of successful networks it is necessary for enterprises to improve cooperation, increase trust and create positive collaborative environments – not an easy task within the context of traditional business relationships.

So how has the world of logistics reacted to the requirements of a networked economy? Well, in many ways it has taken the lead and developed a major role. What we have seen has been the significant move within logistics towards the integration of the many different elements of logistics into what is known as the 'total logistics concept' as described in Chapter 2. From this the recognition of the need to evolve this integration across the external boundaries of supply and demand has arisen. Thus, the concept of 'supply chain management' has come to reflect this need. This is, in many ways, the forerunner of the idea of the networked economy.

For very practical reasons, supply chain management has developed because it is the logical means of supplying and moving product efficiently through to the final customer – by disregarding (or at least minimizing) the effects of the boundaries that have grown up between the different companies involved. It has thus been both a forerunner and also an enabler of the networked economy (see Chapter 2 for further discussion).

Linked very closely with the idea of the networked economy, *horizontal collaboration* is a concept where competitive companies in the same industry share logistics operations where these operations are regarded as a commodity and therefore not a basis for competition. This enables companies to gain through a reduction in logistics costs as well as the potential for an improvement in service levels. With shared delivery transport there are also environmental benefits from improved fuel and energy savings. Early users of horizontal collaboration have included Henkel, Procter & Gamble, PepsiCo, HJ Heinz, GlaxoSmithKline, Sara Lee and Colgate-Palmolive.

Collaboration has occurred between semi-direct and direct competitors, and as opportunities have increased a number of 3PLs have begun to offer collaborative services to their clients. Manufacturers Kimberly-Clark and Unilever identified that they shared well over 60 per cent of their delivery addresses and were able to benefit from significant cost savings and service improvements by combining deliveries to retail outlets. Subsequently, they have been able to collaborate in the development of a manufacturing consolidating centre, which has further enhanced mutual benefits.

Many companies remain very reluctant to allow their products to be stored and distributed alongside those of their competitors because they fear the loss of important competitive information. Many 3PL users will stipulate in their contract arrangements that the 3PL cannot also undertake logistics operations for any key competitors. This attitude is now changing as the benefits of horizontal collaboration have been recognized. Some of the key issues in proceeding with a collaboration project are: finding the right partner (both in terms of company ethos and product, distribution and customer compatibility); establishing levels of trust and cooperation; complying with legal requirements concerning competition; and the protection of competitive information.

Aftermarket or service-parts logistics is now recognized as a key aspect for many businesses, particularly high technology ones. There has been an important aftermarket requirement for many years, but it has rarely been viewed as important. An effective operation is one that is based on ensuring the rapid fulfilment of post-sales high-value or critical parts in support of customers worldwide. These services typically include: parts logistics; returns management; field technical support; field stocking network, usually enabling between one- and four-hour response times; centralized DCs; depot and field repairs; parts planning; asset recovery and recycling management.

Post-sales service can differentiate a company's offering and provide growth opportunities. However, the complexities associated with managing a global or pan-regional service-parts supply chain stop many manufacturers from achieving this. Suppliers often struggle with the visibility and control required to deliver the right parts or services to the right place, at the right time and at an acceptable cost. Traditional outbound logistics operations can rarely provide the service levels required, nor the return flow of items that is key (see Chapter 42 for a discussion on reverse logistics). Many businesses, especially technology and electronics companies, now outsource these activities to service providers who can offer an integrated closed-loop supply chain that is specifically designed to be a responsive outbound service combined with a reverse material flow. Third-party providers have developed skills in this area that involve the development of advanced IT and visibility systems to support the logistics offering.

Retailing

There are several trends in the retail sector that have had, and continue to have, an impact on developments in logistics and the supply chain. Many of these logistics-related changes have emanated from the grocery multiple retail sector, which continues to play a major role in introducing innovative ideas.

Overall, in many countries, the number of retail outlets has been in decline, but the average size of outlets has increased considerably. Although many town and city shopping areas have experienced a distinct fall in the number of shops, there has been a significant growth of large out-of-town 'one-stop' superstores and hypermarkets, as well as the construction of large retail parks where many multiple chain stores and shops are located. There has been a steady decrease in the number of small independent shops, although in recent years many of the large grocery multiples have moved into this space. Of increasing significance has been the introduction and use of home and mobile internet shopping and delivery which has been magnified because of the coronavirus pandemic. These changes have all had an influence on logistics retail strategies and operations.

One far-reaching implication has been that of *inventory reduction* within the retail supply chain, which has evolved from a number of different inventory-reduction policies and which can affect many elements of a supply chain. These policies include:

- The maximization of retail selling space: an important retailing policy has been the move to maximize selling space in retail stores in order to increase sales opportunities. This has usually been achieved at the expense of shop stockrooms, leaving nowhere for stock to be held in a retail outlet except on the shop floor,

thus leading to vastly reduced stockholding at the retail outlet. This can have significant implications for customer service and retail delivery operations, as it is essential to have extremely fast and effective replenishment of store inventory to avoid stockouts.

- A reduction in DC stockholding: this has been undertaken in order to promote cost saving through reduced inventory levels in the supply chain. A direct consequence has been to put additional pressure on the accuracy and speed of inventory-replenishment systems.
- A reduction in the number of stockholding DCs: many companies have reduced the number of stockholding depots in their logistics structure as a result of cost-saving exercises that involve depot rationalization and a move to stockless depots.
- JIT philosophies and concepts: some manufacturing concepts such as just-in-time have been applied to the retail sector. This has been achieved through a number of developments in information technology, particularly electronic point-of-sale (EPOS) systems, which provide a much more accurate and timely indication of stock replenishment requirements at retail store level (see Chapter 40).
- Vendor-managed inventory policies: in the United States and elsewhere, a number of companies have adopted vendor-managed inventory policies whereby the supplier rather than the retailer is responsible for shop stock replenishment (see Chapter 14).
- The streamlining of some of the activities within the retail environment through the movement of activities back into the DC (labelling, unpacking, etc): this has been augmented by the introduction of consolidation centres where goods are received from many suppliers and are consolidated into loads for individual shops. Goods are unloaded, unpacked and marked with price tags, ready to be put straight onto the retail shelves. These store-ready items are then consolidated into loads and delivered to shops.

The consequences are that stocks and buffers in retail stores have been reduced or eliminated in favour of the continuous flow of products into the stores. This necessitates more responsive delivery systems, more accurate information and more timely information. Thus, logistics operations must perform with greater efficiency but with fewer safeguards.

The out-of-stock problems created by inventory reduction at retail outlets have highlighted a number of other related issues. These are classified under the title of *on-shelf availability* or *the last 50 metres*. In its simplest definition, this refers to the ability to provide the desired product in a saleable condition when and where the customer wants it. This definition describes the effect of the problem but, in fact, there are many interrelated causes throughout the supply chain that can create the problem. Product availability tends to reduce as the product moves through

the supply chain. A baseline rule of thumb comes from Institute of Grocery Distribution (2005) research that indicated that manufacturers achieve about 98 per cent availability, which reduces to 95 per cent in retailers' DCs and to about 90 per cent by the time the product reaches the shelves in the retail outlet. A 90 per cent or above availability is always the target, in order to reduce costs and improve revenue. According to Retail Insight (2023), when items are hidden, unavailable, or damaged on shelves, the resulting lost sales can be as much as 8 per cent of revenue for retailers. This leads 27 per cent of customers to question their loyalty.

Poor in-store execution can create shortages, due to the lack of replenishment staff in shops, insufficient shelf space or ineffective stock management at the shop. It is estimated that loss of sales can be quite significant because, although some shoppers will delay purchase or purchase a substitute, most are likely to buy the product online or from another store.

Seven areas for improvement in supply have been identified; the two most important are fairly obvious, being the accurate measurement of on-shelf availability and the greater attention of management to address the issue. The others are to improve replenishment systems, merchandising, inventory accuracy, promotional management and ordering systems. More sophisticated real-time data systems can provide stock information about every SKU in the store. Thus, it should enable suitable alerts before an out-of-stock event occurs.

Competitive strategy in retailing continues to develop, a key development being the concept of *time-based competition*. This concept has evolved from the idea that the supply chain can be broken down into a number of closely linked stages: inbound logistics, manufacturing, branding, packaging, outbound logistics, display, etc. At each stage of the process value is added to the product in terms of its physical development and availability, but, additionally, this comes at a certain cost. This 'pipeline' flow has to be managed to best effect to create the highest value for the customer but at the lowest cost. As well as the normal cost minimization approach, one way of achieving this is by reducing the time within the pipeline, which can reduce cost and also give a competitive advantage to the product compared to the competitions' products. There are three major areas benefiting from effectively managed time-based competition:

- time to market: the speed at which it is possible to bring a product from its design stage to the marketplace
- time to serve: the speed of meeting a customer's orders
- time to react: the speed it takes to adjust manufacturing output to unexpected or extreme changes in demand

Strategies for lead time management can be constructed using a pipeline 'map' drawn up to identify value-adding time and wasted time. Plans can then be developed to

help eliminate wasted time and the cost associated with it. This type of approach was initially adopted in the retail sector – particularly fashion and clothing products.

The principles and methods of achieving time-based competition are discussed in various sections of this book, including value/time analysis (Chapter 7), supply chain mapping (Chapter 16), time compression, quick response (QR) and efficient consumer response (ECR) (all in Chapter 17).

E-commerce (electronic commerce or EC) is the buying and selling of goods and services, or the transmitting of funds or data, over an electronic network, primarily the internet. This is a particularly important development for the retail sector, but as well as business-to-consumer (B2C) these types of business transaction can also be business-to-business (B2B), consumer-to-consumer or consumer-to-business.

As well as a large year-on-year increase in e-commerce transactions, there is also a major challenge to most logistics operations due to the extreme seasonality of much of the demand created via or moving to e-commerce. In Western countries this is seen in the run-up to Christmas with major peaks in demand, which are exacerbated by one-day special offers that are a feature of internet selling. The logistics structures and operations of some retailers are not sufficiently robust to respond to these demands.

More detailed discussion of the issues surrounding e-commerce, particularly home/mobile shopping and e-fulfilment, can be found in the next section of this chapter, 'The consumer', and in Chapter 40.

One final comment concerning e-commerce is to note that the internet is now playing a part in the 'physical' distribution of products themselves – as a mode of transport for digital products. Digital products are sold commercially and distributed to the satisfaction of customers – although there are no official figures that indicate how much is actually distributed in this way. The further development of concepts such as 3D printing could, one day, have an important impact on the future of logistics and supply chain principles and practice.

Retailing has changed significantly in recent years, having developed from local shops and stores to one-stop-shop, large-scale, out-of-town multiple stores and now to e-tailers fulfilling individualized and personalized internet-based demand. The existence of these different channels to market can lead to some confusion for the consumer because the different channels do not offer similar product price and availability for the same product. *Omnichannel fulfilment* and marketing is aimed at a seamless approach to the consumer experience through all available shopping channels, such as mobile internet devices, computers, brick-and-mortar shops, television, etc.

An omnichannel approach should use software to track customers across all channels, not just one or two. All shopping channels should work from the same database of products, prices and promotions so that merchandise and promotions are not channel specific, but are consistent across all retail channels. There are major

implications for the supply chain with this approach and that involves developing integration across the different channels – this has become known as omnichannel retailing, fulfilment or marketing. Thus, the provision of an integrated physical distribution channel needs to be established that comprises the supply of products to the end consumer using any or all of the available channels.

The key consideration, from a logistics perspective, is how to fulfil the final delivery/collection of the goods to/from the consumer in a seamless way, whether this is in-store, in the home or via a suitable collection point – and to develop a suitable and cost-effective supply chain that achieves this. Omnichannel fulfilment is discussed in detail in Chapter 12.

The consumer

Non-store shopping, both *home and mobile shopping*, continues to increase and has direct implications for retailing operations This phenomenon was initially introduced through the use of direct selling and mail order catalogues where products could be ordered by post or phone. In several countries, home shopping has now achieved 'breakthrough' levels in the grocery sector and made significant inroads into more conventional retail shopping. The enablers for such a change were the widespread use of home computing, the internet with broadband and online banking. Mobile shopping (m-commerce) is the buying and selling of goods and services through wireless handheld devices such as mobile phones and tablets. The Covid-19 pandemic accelerated the use of home and mobile shopping. All of these developments have had a fundamental impact on logistics. The very nature of the final delivery operation has, for home delivery, altered dramatically, with wide implications for the whole of the supply chain.

This major move to non-store or home shopping was, for many years, always 'just around the corner' but it is now reasonable to say that its time has arrived. The main consequence for logistics is the parallel increase in home delivery. In some sectors (e.g. white goods, brown goods), home delivery has been common practice for many years, but the advent of home shopping has substantially increased the demand for the home delivery of many other types of goods. The rapid growth in online selling companies, such as Amazon, and the fact that all major grocery companies have wholly embraced the concept means that home shopping is now very common, with all the implications for logistics that home delivery brings.

It is important to differentiate between home shopping and *home delivery* – also known as *e-fulfilment* and *the final mile*. 'Home shopping' refers to the different ways of shopping for and ordering products from home. 'Home delivery' refers to the physical delivery of the product to the home (strictly speaking, e-fulfilment is the delivering of orders made via the internet but these terms are used interchangeably).

'The final mile' is an expression used to accentuate the particular problems, and solutions, of delivery to the final consumer. The growth of home delivery has led to the need for some fundamental rethinking in logistics operations that wish to serve the home market. The very nature of the final delivery operation to the home is noticeably different from a standard delivery operation, and home delivery requirements also affect other elements in the supply chain. Typical implications are:

- the customer may not be available to take and sign for goods
- there may not be anywhere safe to leave the goods if there is no one at home
- there may be restricted delivery time windows, often during the evening and this can have an impact on delivery vehicle and driver utilization
- new distribution systems need to be set up (small deliveries on small vehicles into residential areas, community depots, etc)
- there are increased opportunities for existing delivery systems (postal service, parcels delivery operations)
- customer ordering systems can be linked directly to manufacturers' reordering systems, and goods ordered can flow directly from manufacture to the customer
- there is a high rate of returns – reverse logistics and outside the grocery sector, returns levels can vary between 30 and 50 per cent
- some shops become more like showrooms where stock replenishment is no longer an issue

Those companies involved in grocery home delivery have had to develop specialist small vehicles that allow them to deliver different types of grocery products together: ambient, fresh, chilled and frozen. A number of different logistics solutions are still used for the storage and picking elements. Most operations either stock and pick within designated areas of existing DCs or pick from the large retail hypermarkets. The use of specialist home delivery (e-fulfilment) depots is limited (see Chapter 12).

Internet orders tend to be small, with few order lines, few items per line and are generally for individual items rather than whole cases. Thus, the picking workload and cost of operation is much greater for a given throughput of goods, compared to a standard operation. Picking solutions vary. For low throughput operations picking is likely to be undertaken using multiple order picking on compartmentalized picking trolleys. Thus, up to 20 orders may be picked at a time by the picker. In high throughput operations, zone picking can be used whereby a tote bin representing a single order is transferred via a conveyor to the different picking zones until the order is completed. In some instances, batch picking may be used via a conveyor to an automated high-speed sortation system that sorts the final orders. Other types of technology may also be used, such as pick-to-light and dynamic pick faces for slow-moving lines (see Chapter 21).

Some storage and handling problems have been identified, such as the number of picking errors that can occur in this type of single-item picking operation, damage to the product and the less-than-perfect quality of some fresh food items. As companies have become more familiar with and practised in these operations, these problems have reduced.

There are several different types of company that provide home delivery services. These include:

- platform companies, such as Amazon, that undertake delivery themselves
- new technology companies, like Starship Technologies, that harness the power of automation (autonomous delivery robots) designed to transport goods from a distribution location to a customer's doorstep
- existing 3PLs that have expanded their traditional operations to include own local delivery operations
- parcel delivery companies that already have intricate home delivery operations
- legacy postal companies that already deliver to the home
- courier services that have developed specific home delivery operations

Final mile delivery is seldom a dilemma if there is a householder to receive the goods that are sent. However, there are many occasions when this is an issue. Several alternative solutions have been considered to overcome this, and other, home delivery problems. They include:

- Urban or city warehouses which are located closer to high-density housing areas to enable fast same-day and two-hour delivery availability.
- The concept of purpose-built semi-trailers for use as mobile parcels sortation hubs, linked to electrically assisted delivery bikes. This latter concept is specifically suited to city/town centre deliveries.
- The provision of secure boxes outside or attached to a property. The average grocery delivery is likely to contain some chilled and some frozen goods, so this approach poses problems for the grocery sector. It is an option, however, that does circumvent the issue of restricted delivery times and so could become attractive for some types of home delivery – although there is a significant set-up cost for supplying the secure boxes.
- Alternative points of delivery, such as a place of work or a petrol station, are used as an alternative to home delivery. Picked and packed goods are delivered to await customer collection. Also, parcel towers, parcel vending machines and coded lockers are available, either in-store or in building forecourts. These types of operation allow for returns to be facilitated.

- To cater for busy lifestyles, grocery companies are offering 'in-home delivery' whereby smart lock technology is used. Temporary access is granted to a delivery driver through a code issued via a smart app. The code is deleted once the delivery is completed. The driver can enter a house and put away frozen and chilled food and leave ambient products as instructed. The delivery is captured on a chest-cam which can subsequently be referred to, as necessary.
- Concepts such as the gig economy and crowd-sourcing have been applied to home delivery, as the personalized delivery of freight or internet orders. This is known as crowd-shipping or crowd-logistics, lending itself towards opportunities in final mile delivery. Using app technology, those with a car (or even a bike) can offer local delivery services when they have the time available. Such services have a limited geographic reach.
- Various autonomous customer delivery options are under trial. These include the use of autonomous drones (under consideration by companies such as Amazon) and autonomous vehicles that can operate on existing roads and walkways. Potential savings are high as these types of delivery eliminate the high-cost labour element, but safety and reliability are problematic.

The key topic of *customer service* has been previously discussed (see Chapter 3). It should be re-emphasized that customer service issues continue to be of significant importance and to have a major impact on logistics, such that the logistics function has become the key element in customer service strategy. Issues include:

- the development of 'customer-facing' organizations and operations – designed and aimed specifically to satisfy customer demands and expectations (rather than the more traditional sales-oriented approach of aiming just to sell what is manufactured)
- a move towards service policies based on market segmentation – thus recognizing that customers and markets can have different requirements and may need to be supplied in different ways (see Chapter 8)
- JIT and quick-response systems requiring markedly more frequent and reliable delivery
- 'brand image' becoming less strong – the dominant differentiator being the availability of the product
- the service implications of increased home delivery operations

One example of the ever-changing importance of customer service has been the move to develop an alternative approach to the supply chain by creating what is called *demand chain management* (DCM). Here the intention is to move the emphasis away from the supply of products and towards the demand for products – to reflect the importance of what the customer requires rather that what the supplier wants to

provide. Ultimately, this is linking the two concepts of supply chain management (SCM) with customer relationship management (CRM), or linking logistics directly with marketing.

Big Data analytics allow for the manipulation and use of extreme amounts of very detailed data (see also Chapter 40). Thus, the two concepts, SCM and CRM, can be integrated to eradicate any isolation between producer and consumer, and to do this by moving from supplier-facing systems and activities to customer-facing systems and activities. Perhaps this is only a subtle change in thinking – another new consultancy concept? – but it does have the good intention of emphasizing the need to concentrate on the customer rather than the supplier.