10 Distribution management

Introduction

The physical movement and delivery of goods and services to customers is a key objective of supply chain management. The three key aspects of customer service are specification, price and timing. Specification and timing are often measured by the metric, 'on time in full' and are the direct result of distribution management. Distribution management is closely linked with the 'customer intimacy' model of Treacy and Weisma (1993) but many organisations outsource distribution management to third-party hauliers, thus reducing the frequency of direct customer contact.

Web-based software and e-marketplaces have increased opportunities available to e-supply chain managers in all operations, including the service industry.

Information technology and the internet have improved the access to information, enabled currency transactions and improved data accuracy. However, the real effectiveness of supply chain management is the physical movement of materials from source to customer. Important components for e-commerce, online trading and virtual supply chains are factories, warehouses and transport.

It is vital that a physical distribution process is in place to ensure the performance of the e-supply chain for both virtual and physical activities, but it is well recognised that supply chain order fulfilment is the Achilles' heel of the e-business economy.

Learning objectives

Learning objectives for this chapter are:

1. Physical distribution.
   - Distribution strategy.
   - Warehouse operations.
   - Stock management.
   - Transport planning.
2. Strategic alliance.
   - Third-party logistics (3PL).
   - Retailer–supplier partnership (RSP).
   - Distribution integration (DI).
   - Customer relationship management (CRM).
3. Non-profit organisations.

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Physical distribution

In the same way that enterprise resource planning is concerned with information flow, suppliers and inbound logistics, distribution management is likewise concerned with materials flow, customers and outbound logistics. Inbound logistics is characterised by demand variability, and outbound logistics is characterised by variable service levels.

With the management of distribution, that is, the physical transportation of goods from the factory through the various components of the supply chain to the customer, invariably some stock will be held in the system to buffer the variability of demand and to make allowance for vagaries in supply lead times. The focus on outbound logistics is to balance customer service level against cost. The cost of distribution is not just transportation costs but also includes warehousing including special requirements such as refrigeration, insurance and financing of stock and stock slippage (deterioration, damage, pilfering and obsolescence). The more the stock held, the greater the cost of storage and the greater the chance of losses.

The main components of distribution management are as follows:

- Distribution strategy.
- Warehouse operations.
- Stock management.
- Transport planning.

Distribution strategy

A company in a consumer-focused business must have a defined distribution strategy. The first criterion of distribution strategy is to decide whether the management of activities should be by the company or by a third party. With assets (buildings, equipment and transport vehicles), the strategy can go three ways:

Own the assets or some of the assets.
Lease or rent assets.
Contract (outsource).

Some of the various strategy mixes are shown in Table 10.1. Note there are 64 possible combinations, for example, own premises, leased premises, own management of premises, third-party management of premises, own transport, leased transport, third-party supplied and managed transport and so on. Table 10.1 shows 24 of the most likely combinations.

Table 10.1 Distribution strategy combinations

	Warehousing		*Transport*	
	Building	*Operation*	*Trunking*	*Delivery*
Strategy A	Own	Own	Own	Own
Strategy B	Rent	Own	Leased	Own
Strategy C	Rent	Own	Third party	Third party
Strategy D	Own	Own	Third party	Third party
Strategy E	Rent	Third party	Third party	Third party
Strategy F	Rent	Own	Own	Own
Strategy G	Own	Own	Third party	Own

There are some obvious advantages of distribution management by a third party, for example, the distribution expertise of third-party companies, the avoidance of capital outlay and underutilised equipment. It has become a popular practice with many original equipment manufacturers organisations (OEMs) to outsource warehousing and transport to third-party companies. However, as the delivery of the finished products is closest to the customer on the supply chain, there could be some degree of risk if the management of outbound logistics is totally left to third parties. Global retailers (e.g. Zara, Walmart) invest in their own distribution capability to retain a competitive advantage in customer service as the case example on Walmart distribution strategy illustrates.

CASE EXAMPLE: WALMART'S DISTRIBUTION STRATEGY

Walmart is unarguably the largest and leading retailer in the global retail industry with net sales of US$482.2 billion in the financial year ending 2015. It serves nearly 250 million customers every week, managing and operating over 1050 retail stores across the world in over 26 countries.

However, the most important yet interesting fact about Walmart is defined as its supply chain and distribution strategy, which is also considered the industry benchmark. The company also claims that the primary reason behind its fast-paced growth, continuous financial success and diversified product, market and customer portfolio is its distribution strategy, which is further supported by logistics and operations. Walmart has established highly automated and centralised distribution units that operate around the clock for 365 days a year. In order to ensure that customers in each of its targeted regions are served effectively, the company has established multiple distribution centres in every regional zone. For instance, in the case of the United States, over 45 distribution units have been established, which are dedicated to importing goods from around the world and ensuring each of the stores is managed with the demanded products. These 45 regional distribution units are further supported by over 150 distribution centres that are in direct contact with retail units across the region. It is also important to understand each of the distribution centres caters for the needs of 75 to 100 retail stores. Furthermore, each of its distribution centres has high-tech and modernised systems to move hundreds of thousands of cases each day. In addition, each distribution centre caters for 90 to 100 stores on average that are strategically located with an aim to provide rapid responses to the connected retail stores.

Taking the global distribution context into consideration, it is observed that the company in total has established 158 distribution centres, which are claimed to be the key to organisational success.

Its logistics activities are performed with the help of more than 6450 tractors and over 54,000 trailers that are operated by more than 7000 drivers. Since distribution activities involve logistics too, the company ensures that each of its drivers is not only qualified but also experienced. The strict company's policy can be noted from the fact that it only hires drivers who have driven a minimum of 300,000 accident-free miles. The company achieved an 80% improvement in the efficiency of its truck fleet since 2005,

Source: Adapted from Walmart (2015).

A distribution strategy is significantly influenced by economic factors, channels of distribution and their location and location of service centres and warehouses. Shorter channels are ideal, especially for perishable items, services requiring closeness to customers and urgent products. An intermediary in the channels of distribution can reduce distribution costs where the sources of supply are not in abundance, there are numerous destinations or transportation is difficult or expensive. The choice of location is usually driven by cost objectives for warehouses and manufacturing facilities and by revenue objectives for service-type operations. With the impact of the Internet, the distance of a service centre to the customer has become less important.

Channels of distribution

It is important for a manufacturer of fast-moving consumer goods (FMCGs) that the distribution strategy should consider the opportunities for both present and future business through an appropriate mix of the channels of distribution. Examples are:

Factory to:
- distributor,
- wholesaler,
- supermarket,
- direct to end user (e.g. Dell).

The distribution strategy should also include the company policy of exclusive agents or stockists and direct mail or online orders to end users. Figure 10.1 illustrates an example of the channels of distribution in a typical FMCG business. The selection of a strategy may be influenced by the cost of distribution, and it should be tempered by the business judgement of customer service and future opportunities.

The channels of distribution are also determined by the stages required to deliver products or services depending on the type of business. An organisation exercises more control or influence on the service for a single-stage channel, that is, delivering products or services directly to the customer. If, however, more stages exist with intermediaries between the organisation and the customer, then each party may have some influence over such decisions as stock holding, service levels and market cover. Table 10.2 shows typical examples of stages in distribution channels in different kinds of organisations.

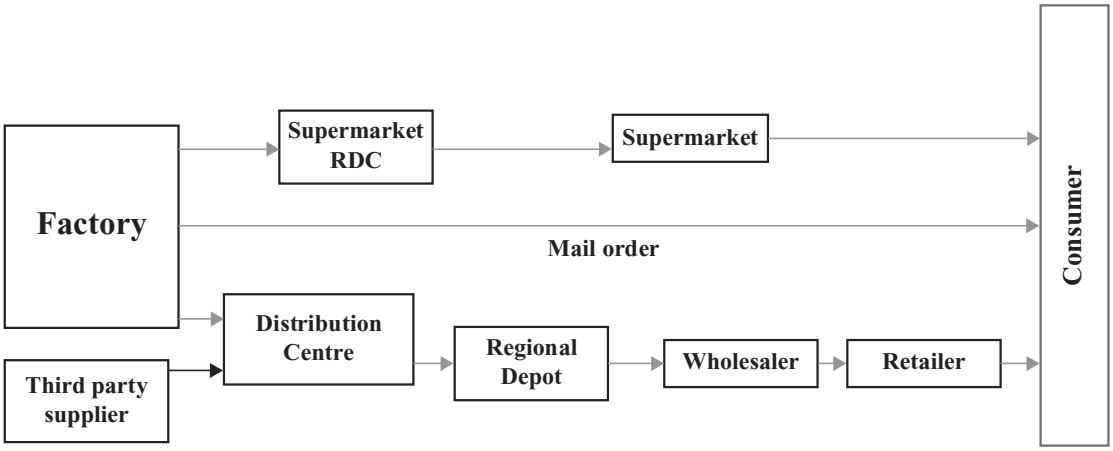

Figure 10.1 Channels of distribution

Table 10.2 Stages of distribution channels

Original equipment manufacturer	*No. of stages*	*Intermediaries*
Manufacturing sector		
Civil engineering	1 (direct)	
Foods manufacture	2	Supermarket
Car manufacturer	4	Overseas agent
		Distributor
		Retailer
Service sector		
Original supplier	No. of stages	Intermediaries
Hairdresser	1 (direct)	
B2C Internet sale	2	Transporter
Hospital	2	Doctor
Charter airline	3	Holiday
Company		Travel agent

Facilities location

Another important aspect of the distribution strategy is the location of distribution warehouses. The location, design and operations of distribution warehouses are all vital ingredients of a supply chain – not only for cost optimisation but also for the quality and safety standards of products and for improving customer service by a faster turnaround at the warehouse. There are computer simulation models available for determining the size and location of a distribution centre, but local body planning regulations, the proximity of a highway and a big demand centre very often will be the prime determinants of the location.

The location of a warehouse can be influenced by many factors both objective and subjective. The factors that generally affect the selection of a warehouse site can be grouped into three sets of factors:

- Cost factors.
- Revenue factors.
- Local factors.

The cost factors have three main components – variable cost, fixed cost and inventory cost. The variable cost of a warehouse operation includes the costs of labour, material and utilities. The accessibility to labour and materials will affect the variable cost. The fixed costs are associated with the provision and maintenance of facilities and the cost of security services. When the number of facilities is reduced, there is a saving in the fixed cost. If we, for example, centralise the inventory of a number of warehouses to a single location, the base stock will remain the same, but the safety stock will reduce according to the following equation:

$$S_n = S_1(n) / \sqrt{n}$$

Where S_n = sum of safety stocks for n locations
S_1 = safety sock for one location
N = number of locations

The location of a retail outlet or service centre has traditionally, and for obvious reasons, been determined by the proximity to customers, or expected growth of the population

(and future customers) in the region. The opening of a warehouse, such as Ikea, in the proximity of a town has been known to increase the revenue in that town. With the impact of e-commerce, traditional 'bricks and mortar' locations are now to some extent challenged by 'clicks and mortar', nonetheless, large new superstores and shopping malls continue to open and prosper.

The local factors influencing the selection of a location include management preferences, congeniality of the district, local infrastructure and transport networks, industrial relations and availability of trained labour. There are often incentives or investment grants available to encourage organisations to establish facilities in areas designated for regeneration or industrial development.

CASE EXAMPLE: WAREHOUSE LOCATION

The brief. After the merger between Fosroc* and Expandite in England, the joint operation had main warehousing facilities in the neighbouring towns of Tamworth and Greenford, with a smaller warehouse at St Helens. As a result of a logistics structure review, the client decided to rationalise the warehousing facilities by centralising and consolidating all finished goods in a single facility on their production site in Tamworth. It was agreed that the best approach to producing a building, which would efficiently meet their requirements, was to design the facility 'from the inside out'.

The approach. Due to the sensitive nature and possible closure of warehousing, it was important to keep the study confidential. The project started with a feasibility study of various configuration options. As the client had available land to build the new warehouse, a study into the location was not needed and this meant that we could start calculating the required size immediately. The stock was analysed and activity data from the three warehousing locations was used to work out the site size needed in conjunction with the proposed layouts. After the decision on the favoured design had been made, the option was developed to the level where the scheme could be put-out to a design and build organisation for tendering. During this stage, detailed analysis was produced of the proposed floor space, equipment requirements and pallet racking locations. Another aspect of the project was the production of staffing requirements together with a staff structure diagram.

The result. The floor space was reduced from the three combined units of 80,000 sq. ft to 50,000 sq. ft in the new single distribution centre by removing duplication of stock and improving operating techniques. Also reduced were staffing levels by 30 and other costs.

Trade counters with minimal stock holdings at the old sites were retained but the major storage facilities were closed. Due to its central location, the new warehouse provides consistent, accurate delivery throughout the mainland UK within three to four working days from receipt of order.

*Fosroc Expandite is one of the largest manufacturers of construction and civil engineering products in the world.

Source: Supply Chain Planning UK Ltd (2007).

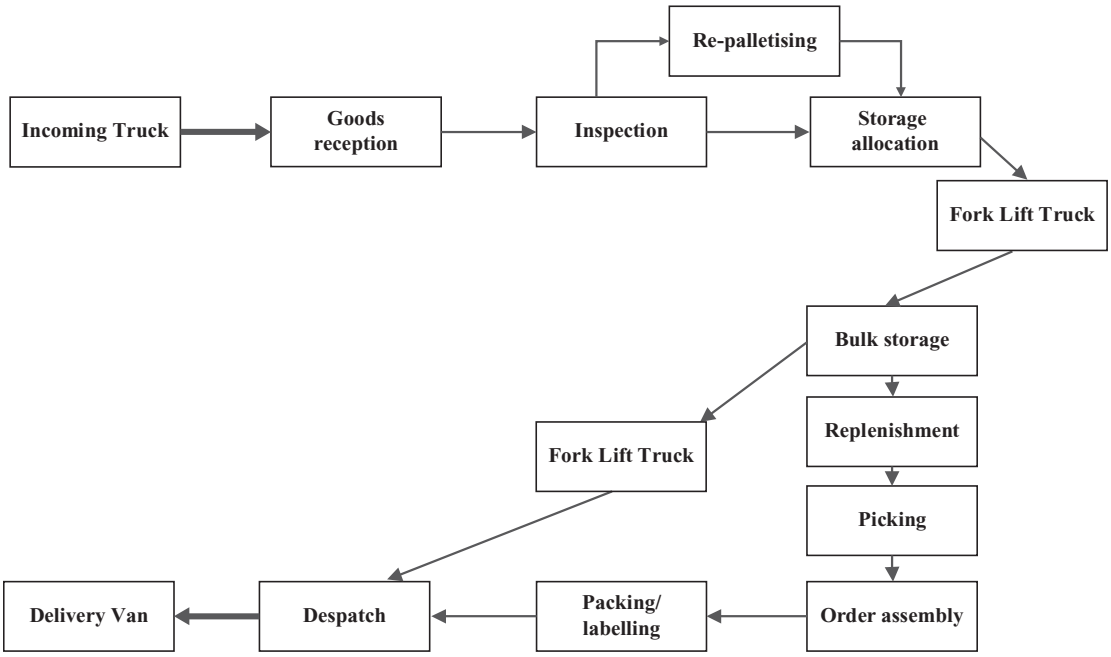

Figure 10.2 Warehouse operations

Warehouse operation

The operations of a distribution warehouse in general can be represented by Figure 10.2. There are good opportunities for re-engineering the warehouse functions when the total process from reception to despatch is critically examined.

The design issues of a warehouse include:

1. Storage systems:
   Block stock
   Back-to-back racking
   Double deep racking
   Narrow aisle racking
   Drive-through racking
   Mobile racking
2. Handling systems:
   Counterbalanced trucks
   Reach trucks
   Turret trucks
   Stacker cranes
   Automated guided vehicles
   Overhead cranes
3. Product quality:
   Ambience
   Chilled store (e.g. margarine)
   Cold store (e.g. ice cream)

4. Safety and control systems:
   Detection systems
   Sprinkles and fire hydrants
   Warehouse management system software

In view of the above inter-related design issues, there should be a structured approach for designing a warehouse. We suggest the following steps:

1. Calculate pallet positions by taking into account:
   - Annual volume
   - Stock policy (amount of safety stock)
   - Units or kg per pallet
   - Variability of stock-keeping units (SKUs; peak, growth)
   - Lead times from suppliers
2. Evaluate functional options of storage and handling systems.
3. Establish quality requirements (e.g. chilled).
4. Establish systems and infrastructure.
5. Select the location of the warehouse.
6. Estimate budget costs (±20% accuracy).
7. Evaluate financial and risk options including own or rent.

EXAMPLE: PALLET CALCULATION

The calculation of pallet positions is illustrated by the following worked-out example

- Given data
  - Annual demand: 12,000 tonnes
  - Load per pallet: 400 kg
  - Stock turn: 13
  - Weekly peak: 1.2 × average
  - SKUs: 4 (same weight)
- Calculation
  - Weekly demand = 12000/52 = 230.8 tonnes
  - Pallets for 4 weeks = (230.8x4)/0.4 = 2308
  - Allowing 20% for peak and 85% pallet utilisation, pallet positions = (2308 x 1.2)/0.85 = 3258 pallets

The following case example illustrates an outline design process of the physical requirements of a warehouse in response to an invitation to tender.

CASE EXAMPLE: WAREHOUSE DESIGN

Background. Zigafroos Consolidated Industries (ZCI) is the UK's leading importer of high-quality consumer electrical goods for the independent retailer. The current storage centre in Edgware, London, is at the end of the lease period and is not

considered adequate for future operations. The company is also considering offering the operation of the storage centre to a third-party logistics partner. You are therefore invited to tender for the sourcing, design and operation of a new dedicated storage centre. The tender will be a two-stage process, with the first stage concentrating on defining the physical requirement for the new facility.

The operation. ZCI purchases products from multiple overseas sources. Stock is delivered to the storage centre in 20 or 40 ft sea van containers and is generally loose loaded. Stock is stored pending orders and picked for a network of independent regional wholesalers. Currently, there are 25 wholesalers covering all of the UK. Stock availability is declared to wholesalers electronically and orders are passed to ZCI weekly. Stock picking is at the individual carton level and orders are built up for delivery to wholesalers on multi-SKU pallets. The manufacturer arranges transportation into the UK, customs and port clearance and transport to the warehouse are subcontracted by ZCI as is delivery to the wholesalers. ZCI is planning on 5% growth year on year.

Given data. In addition to the above information, ZCI has provided the results of an internal study to estimate the peak pallet holding for 2002. The calculation is shown in a spreadsheet that contains the following summary data for 2002:

- Annual sales: 217,390 boxes
- Product groups: 49
- SKUs: 1839
- Peak stockholding: 8385 pallets*

*Euro pallets: 800 mm × 1000 mm.

Next steps. Based on these submissions, the Zigafroos board will shortlist prospective partners and issue a comprehensive request for proposals.

Please deliver your proposal to our Edgware offices for the attention of Mr Harry Zoogorilla.

Exercise

Provide your recommendation on size and configuration for the new Zigafroos Storage Centre. Address the following issues:

1. Size of warehouse required: design for five years of growth.
   - Maximum pallet positions for design.
   - Approximate area for the chosen storage method.**
2. Outline layout.
   - Pallet and shelving configurations.
   - Picking and despatch area.
3. Recommended mechanical handling equipment.

Provide the rationale for your choice of design and equipment and an indication of your company's experience with this type of operation.

**As a rough guide for estimating the approximate area for given pallet positions you may use the data in Table A.

Table A
Approximate area (sq. m) requirement per 100 pallets.
Pallet dimension: 1200 mm × 1000 mm.

	2 high	*3 high*	*4 high*	*5 high*
Wide aisle	138	92	69	46
Narrow aisle	117	78	59	47

Note: If six or higher is required, then the area needed can be prorated.

SAMPLE SOLUTIONS

Answer to Question 1

Compound growth for 5 years @ 5% = 27.6%
Peak stockholding after 5 years = 1.276 × 8385
= 10,701 pallets
Assuming a five-high narrow aisle, approximate storage area:
= 10701 × 47/100
= 5034 sq. m

Answer to Question 2

The outline layout will depend on the configuration of the space available. Assuming a greenfield site, a configuration could be:

Width of the warehouse: 100 m
Span between columns (bay): 17 m
Storage space = 3 bays
= 3 × 17 × 100
= 5100 sq. m
Picking and despatch area = 2 bays
= 2 × 17 × 100
= 3400 sq. m
Total warehouse area = 8500 sq. m

Answer to Question 3

For a narrow aisle five-high warehouse recommended mechanical handling equipment:

Storage and retrieval: Reach trucks
Despatch area: Counterbalanced forklift trucks
Picking area: Hand pallet trucks

Stock management

As indicated earlier in Chapter 7, stocks are kept as a buffer along the supply chain in various warehouses, factories (work in process) and retail store shelves. These inventories can cost between a minimum of 15% and 40% of their value per year (storage space, handling costs, energy costs including heating and refrigeration, stock slippage and insurance). Therefore, careful management of stock levels makes good business sense.

In traditional stock management, there are two basic approaches (see Chapter 7), namely, the pull approach and the push approach. In a pull system, a warehouse is viewed as independent of the supply chain and inventory is replenished with order sizes based on a predetermined stock level for each warehouse. The stock management model for the pull system is normally geared to establish re-order level (ROL) and re-order quantity (ROQ). That is, when the stock drops to a certain level, a re-order is triggered of a predetermined amount. The re-order quantity takes into account past demands and the lead times for a re-order to be satisfied. The aim is to have as small amount of inventory as possible on hand at any one time, and the re-order quantity should likewise be as small as possible. However, in some processes, such as a batch system, there will be a minimum amount that can be produced, and in other cases, there can be economies of scale that will determine the optimal size of an order. The push method is used when economies of scale in procurement outweigh the benefits of minimum inventory levels as achieved in the pull method. The warehouse does not decide the quantity of the order but will receive a delivery as determined by the production schedule. Normally, a fixed interval review model with a forecast demand for manufacturing planning is used in a push system.

With the support of information technology, businesses are moving towards a virtual inventory system with a single stock concept that can be held anywhere in the system, be it on order with the supplier, in production or at the point of sale (POS). This is the concept of virtual inventory management (VIM) or electronic inventory. Thus, instead of considering stocks of raw materials, work in progress at the various stages of production and finished goods in warehouses each as separate stocks of inventory, purely because of their physical location, inventory is now considered as being part of one single stock.

The movement and management of inventory in a warehouse are further enhanced by the application of advanced technology such as warehouse management systems (WMS) and radio frequency identification (RFID).

The evolution of WMS is very similar to that of many other software solutions. Even though WMS continues to gain added functionality, the initial core functionality of a WMS has not really changed. The primary purpose of a WMS is to control the movement and storage of materials within an operation and process the associated transactions. Directed picking, directed replenishment and directed put away are the key to WMS. The key functionality of a WMS must include:

- A flexible location system.
- User-defined parameters to direct warehouse tasks by using live documents.
- Built-in levels of integration with data collection devices or an established ERP system.

Automatic identification

Barcodes are used to track the progress of products through a supply chain. In warehouses, barcodes can keep track of products in terms of identifying storage locations and types of items. However, coded products can be scanned only one by one and a barcode

cannot identify the product itself. These disadvantages of barcodes can be mitigated by the use of automatic identification such as RFID.

RFID is an automatic identification method, relying on storing and remotely retrieving data using devices called RFID tags. An RFID tag is an object that can be attached to or incorporated into a product, pack or pallet in a warehouse for the purpose of identification using radio waves. They may not ever completely replace barcodes, due in part to their higher cost, but with the advantage of more than one independent data source on the same object, the application of RFID is likely to grow in supply chain management.

CASE EXAMPLE: THE FDA TRACKS DRUGS SUPPLY

The US Food and Drug Administration (FDA) announced in February 2004 new steps to strengthen protection against the problem of counterfeit drugs in the supply chain. The agency's Counterfeit Drug Task Force recommended RFID tags to track drugs from the source to the point of sale.

The Prescription Drug Marketing Act of 1987 requires a drug distributor to provide documentation of drug products throughout the distribution system. This chain of custody of medicines is also known as 'pedigree' regulation. The Task Force outlined the new measure in a report to safeguard the drug supply with the use of electronic track and trace technology such as RFID. This would create an electronic pedigree for tracking the movement of drugs through the supply chain. This report recommends that drug manufacturers and distributors continue to work towards that goal and that their implementation of RFID technology is used first on products that are most susceptible to counterfeiting.

In order to ensure the appropriate usage of RFID technology, the recommendations from the Task Force also include:

- Consumer education about RFID and the labelling of RFID-tagged products.
- When RFID-tagged drugs are dispensed to consumers, there should be the protection of consumer privacy to prevent unauthorised information stored in RFID tags.

Dr L M Crawford, Acting FDA Commissioner, said:

> We intend to work with industry and standard-setting organizations to explore the feasibility of allowing the FDA to access relevant electronic pedigree information, as that information would greatly improve our ability to minimize exposure of consumers to counterfeit drugs by facilitating rapid criminal investigations of illicit transactions. The FDA also applauded the initiatives announced by the pharmaceutical companies Pfizer, GlaxoSmithKline and Purdue Pharma.

Source: FDA (2004).

Transport planning

Transport planning is a key decision area of distribution management. Transportation is a non-value-added item to the cost of the product and absorbs, in general, the biggest share

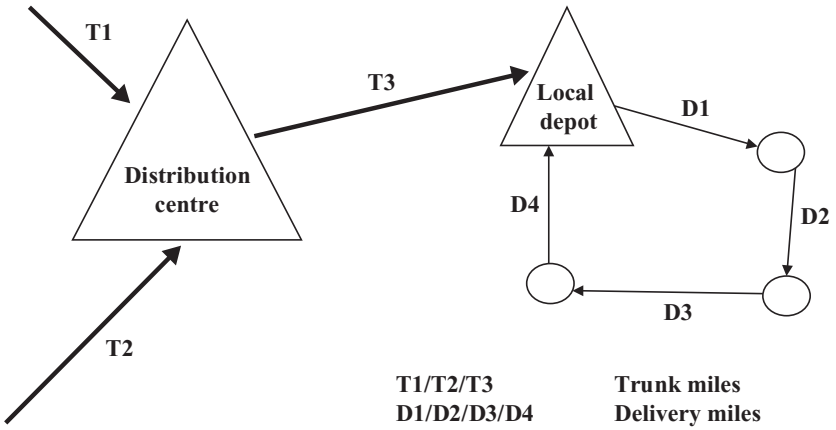

Figure 10.3 Distribution routes

of the logistics cost. Students often argue that unless a product is in the right place it is of little value and thus transportation does add value. Not so! The concept of adding value relates to the transformation process, that is, the conversion of inputs of raw materials, labour and machinery into a finished product. Storage, inspection and transportation all add cost but do not add value. Some of these costs will be unavoidable; materials have to be moved, goods have to be distributed, but storage, handling and movement only add to the cost, and not to the value of the product.

The main factors in transport decisions are (see Figure 10.3):

Transport mode selection.
Trucking routing.
Delivery planning.

There are various means of transportation such as railway, river, canal, coastal shipping and pipelines for products such as oil. In some countries, for some products, air transport might prove to be the most viable option. Generally, however, because of dependability, flexibility, speed and door-to-door service, road transport has proved to be the best option. For the UK, the Channel Tunnel has added to the convenience of road transport to and from Europe.

There are significant opportunities in optimising the selection of hauliers or types of trucks. In order to take advantage of the competitiveness and the up-to-date development of vehicles, companies are building partnerships with hauliers.

After the selection of the mode, the planning of trunking or primary transport for single-drop repetitive journeys between known or well-known locations (e.g. factory to warehouse), is relatively straightforward. However, the routing and scheduling of delivery vehicles to customers is extremely variable and therefore require more systematic planning. There are computer-based procedures to optimise delivery to customers. The objective is not to minimise the total mileage but to maximise the utilisation of vehicle time (delivery window) and space (by volume or weight) and ensuring customer service.

CASE EXAMPLE: FRESH FOODS: CHRISTIAN SALVESEN

Christian Salvesen is a major logistics business specialising in the strategic management of outsourced supply chains.

A key task of Christian Salvesen is defined in its mission statement as: 'To meet customer service requirements consistently and reliably through a mutually cost effective supply chain'. This usually takes some time to achieve, not because it is either complex or controversial, but because the supply chain can mean different things to different people. Furthermore, although the objectives are unanimous, the way in which each organisation achieves them through their respective supply chains is different.

According to the logistics director, 'It is these two elements – customer service and resource efficiency – that drive any supply chain'.

Let us examine Christian Salvesen's experience in implementing these principles in the area of the supply of fresh foods through Evesham chilled depot. Here is a product group whose availability is measured in hours. Meticulous planning and coordination are required for customer demand in rigid 'delivery windows' and plans have to cope with the most unpredictable element of a supply chain – Mother Nature.

Evesham is a chilled depot of approximately 20,000 sq. ft situated in the Vale of Evesham in Worcestershire, which is one of the major produce growing areas in the UK. It has a staffing level of 94 and nearly half of them are qualified reefer vehicle drivers. It is a stockless depot for cross-docking operation under temperature-controlled conditions. The main function of the depot is to act as a consolidator of suppliers' produce and chilled products received from various parts of the country for subsequent onward despatch to the majority of the UK and Irish regional distribution centres. It is a stockless depot for cross-docking operations.

Operating on a 24-hour/seven-day-a-week (24/7) basis, Evesham is a critical link in the fresh food temperature-controlled supply chain and allows the quickest possible route from field to plate, thus preserving both product quality and maximum shelf life. The depot has an operating revenue budget of £7.6m from which it generates a return on investment (ROI) of 21% and a profit margin of 10%.

The depot is subject to seasonality due to the nature of its core volume product but continues to develop its year-round chill business.

The majority of its profits, however, are derived during the summer months of the produce season. Volumes peak during August at a throughput of 7600 pallets per week, with a peak day activity of 1600 (21%) pallets.

Regular daily collections are made from suppliers/packers during the day and returned to the depot during the afternoon/evening. Product is off-loaded into a cross-dock/straight through chilled warehouse facility where it is sorted for onward delivery destination and despatched anytime from 16.00 hours until 01.30 that night.

Orders from the major retailers would have been received into Evesham between the hours of 11.00 and 17.00 that day. A typical example of the complexity of the physical operation is for suppliers such as Flamingo/Wealmore, which are based in the northwest of London.

10.00: Vehicle leaves Evesham to collect clean empty trays from Corby for delivery to Flamingo.

16.00: Arrives at Flamingo, off-loads trays and reloads half the vehicle with product for that day's retail orders.
17.00: Arrives at Wealmore to collect the balance of load for that day's retail orders.
20.30: Arrives back at Evesham to off-load product into the chill warehouse where it is sorted into delivery destinations for Ireland and Scotland.

Tesco – Dublin/Belfast/Livingston
Safeway – Bellshill
Asda – Grangemouth
Somerfield – Pitreavie
(Irish product would leave asap.)

23.00: Vehicle leaves for Salvesen depot at Ormskirk in Lancashire.
01.30: Arrives at Ormsmirk where further product is put on.
(Ormskirk is a produce-growing area) and the trailer is then taken to Scotland by an Ormskirk driver, with the Evesham driver returning with another trailer (may be loaded) to Evesham.
07.30: Arrives at first of Scottish delivery points.

On completion of deliveries, the vehicle would go into the Salvesen operation at Camerons Wood (Livingston, Scotland) to confirm all activities onto the Salvesen 'Track and Trace' Sharp system (confirms visibility of delivery to the customer). The vehicle may then reload with produce or soft fruits collected earlier by Camerons Wood from Scottish growers, returning via the Ormskirk changeover link into Evesham for consolidation and onward delivery to the retail redistribution centres (RDCs).

The transport fleet at Evesham comprises 34 owned tractors supported by 53 temperature-controlled trailers including 40 hired trailers. In addition to ten tractor/trailers based at Ormskirk, the operation has the flexibility to 'buy in' extra resources from other depots in the Salvesen temperature-controlled network. The hired tractors are made up of both long-term rental contracts and short-term casual hire to meet the variable demand and seasonality in a changing market.

Currently, Salvesen covers the following retailer RDC profiles for fresh foods:

Tesco	11
Safeway	8
Somerfield	7
Asda	8
CWS	2
M&S	3

The service level agreements with retailers include that delivery should be made within the limit of the delivery window. Any significant variation in delivery time is subject to penalty. There is no buffer stock because a short shelf life of such a perishable product group does not allow for it. There are also other challenges, such as forecasting the effect of weather or promotions. The supply chain cannot afford any shortage of refrigerated trucks of appropriate capacity when needed. Even if we achieve 100% availability on all products, it may count for nothing if the absenteeism of drivers is out of control.

Exercise

1. What are the customer service and resource utilisation objectives at Evesham?
2. What are the demand planning and supply planning problems at Evesham? Outline a strategy to deal with these problems.

Sample solution

The customer service objective at Evesham is to provide fresh food products on time in full to RDCs according to their delivery windows. The most important criterion is timing. The compromise is cost. However, the reefer supply is now moving from a specialist business to a commodity business and thus the cost should be competitive. Thus, cost is of medium importance. The specification is also of medium importance. Students may argue that as the customer expects all deliveries in the right quantity at a controlled temperature, the specification should be of high importance, but the quality of product is the primary responsibility of the farmer.

The resource utilisation objective is maximising the utilisation of resources owned by the company – people (drivers) and facilities (own vehicles). Facilities refer to those owned by the depot. The materials are not owned by the depot and stock control is not an issue. As the products are handled at controlled temperatures, the importance of materials is medium.

The capacity management strategy should be to provide an efficient adjustment of capacity.

As output stocks are not feasible, an efficient adjustment of reefer vehicle capacity has been provided. The depot provided own and contract vehicles (34 tractors and 53 trailers) to cover the average throughput (e.g. 1100 pallets per day @ 20 pallets per trailer, 55 trailers). In addition, ten tractor/trailers from Ormskirk are available to adjust for variation and seasonality.

Of the 94 staff, nearly half of them are qualified drivers. Therefore, some extra capacity for drivers is planned to cover both variations and absenteeism.

Because of the agreed delivery window, the principle of 'backward scheduling' is applied. A route scheduling optimisation programme is available to provide recommended schedules, based on which final adjustments are made by the route planner.

In order to improve the exchange of information, the company has installed electronic data exchange (EDI) systems with some supermarkets.

Source: Christian Salvesen, UK (2002).

Strategic alliances

In order to achieve an integrated supply chain, the various players need to work together. The four most important types of distribution management strategic alliances are 3PL, RSP, DI and CRM.

Third-party logistics

The use of a third party to take over some or all of a company's logistics responsibilities is becoming more prevalent; 3PL is simply the use of an outside company to perform all or

part of the firm's materials management and product distribution function. The relationships of 3PL are typically more complex than traditional logistics supplier relationships. Modern 3PL arrangements involve long-term commitments and often multiple functions or process management. As organisations focus on their core competencies, they are looking for other specialist organisations to partner with.

Retailer–supplier partnerships

As customer satisfaction becomes more imperative and margins get tighter, it makes sense to create cooperative efforts between suppliers and retailers in order to leverage the knowledge of both parties. The types of retailer–supplier partnerships can be viewed on a continuum. At one end is information sharing. On the other is a consignment scheme of vendor-managed inventory (VMI), where the vendor completely manages and owns the inventory until the retailer sells it.

In a simple quick response strategy, suppliers receive POS data from retailers and use this information to synchronise their production and inventory activities with actual sales at the retailers. In this strategy, the retailer still prepares individual orders, but the POS data is used by the supplier to improve delivery performance and hence reduce supply variability.

In a continuous replenishment strategy, sometimes called rapid replenishment, vendors receive POS data and use this data to prepare shipments at previously agreed intervals to maintain specific levels of inventory.

In a VMI system, the supplier decides on the appropriate inventory levels of each product and the appropriate policies to maintain these levels. The goal of many VMI programmes is to eliminate the need for the retailer to oversee specific orders for replenishment. The ultimate goal is for the supplier to manage the inventory and only receive payment for it once it has been sold by the retailer, in essence, the retailer is providing an outlet for the supplier!

Distributor integration

Modern information technology has enabled this strategy in which distributors are integrated so that expertise and inventory located at one distributor are available to the others. DI can be used to address both inventory-related and service-related issues. In terms of inventory, DI can be used to create a large pool of inventory across the entire distributor network, thus lowering total inventory costs while raising customer service levels. Similarly, DI can be used to meet the customer's specific needs by directing those requests to the distributor best suited to address them.

The influence of the Internet on the economy in general and business practice in particular has been tremendous. The direct business model employed by industry giants such as Dell and Amazon enables customers to order products over the Internet and thus allows these companies to sell their products without relying on third-party distributors apart from those providing the physical delivery service.

Similarly, the Internet and the emerging e-business models have produced expectations that many supply chain problems will be resolved merely by using these new technology and business models. While it has promised so much, in reality, the expectations have not been achieved. In many cases, the downfall of some of the highest-profile internet businesses has been attributed to their logistics strategies.

While the success of the business-to-customer concept has not yet been eventuated, the use of the Internet for business-to-business integration has more likelihood of success. Integration of supply chain players is made possible with the use of the Internet and the associated technologies.

Reviewing the impact of the new technologies on the supply chain provides an interesting development. The Internet and the evolving supply chain strategies have seen a shift in transportation and order fulfilment strategies away from case and bulk shipments to single-item and smaller-size shipments and from shipping to a small number of stores to serving highly geographically dispersed customers. This shift has seen the importance of partnerships with parcel and LTL (less than truckload) industries. It has also increased the importance and complexity of reverse logistics, that of handling the significant numbers of product returns. Thus, one of the big winners in the new developments is the parcel industry. Indeed, one of the important advantages of the parcel industry is the existence of an excellent information infrastructure that enables real-time tracking. Those players in this industry who work to modify their own systems in order to integrate them with their customers' supply chains are likely to be successful.

As businesses come to understand the role of the Internet, we will see new models of business evolving. As yet, what those models will be is unsure, but one thing is for certain, the Internet will have an impact on how supply chains of the future will be managed.

Customer relationship management

The recent growth in the availability of CRM systems has led to the access of data that can be used to improve overall supply chain performance. The objective of CRM is to develop a customer-centred organisation that ensures every opportunity is used to delight customers, foster customer loyalty and build long-term relationships that are mutually beneficial. The ultimate goal is to ensure that each individual customer's current and future wants and needs can be satisfied. What this involves is the capture of individual customer transaction details, and from this historical data, developing a picture of what that customer needs and purchasing habits are.

CRM's relevance to overall supply chain management lies in the need to integrate such systems with the management of the supply side. The information gathered by CRM systems can be used to improve the overall performance of the complete supply chain. As the need for supply chain transparency increases, businesses are looking for ways to improve the efficiency of supply. This has led to the development of the concept of total demand chain management

The partnership with customers is the mirror of working with suppliers with the role reversed. Ideally, the relationship will be that the customer involves the manufacturer in the market research phase so that together the best product can be designed to meet the end consumers' needs. Likewise, the customer through EDI or Extranet can input directly into the ERP system. Improved internal relationships within the business between manufacturing and logistics staff interfacing directly with customers should achieve a more precise specification of customer needs and sharing data (e.g. EDI or business-to-customer (B2C) web).

Thus, it is useful to carry out an ABC analysis (Pareto chart) to identify the top customers as shown in Figure 10.4. The Pareto theory is that 20% of the customers will account for roughly 80% of the business. ABC analysis takes this a step further by dividing customers into three groupings as shown in Figure 10.4. Normally, the division will be

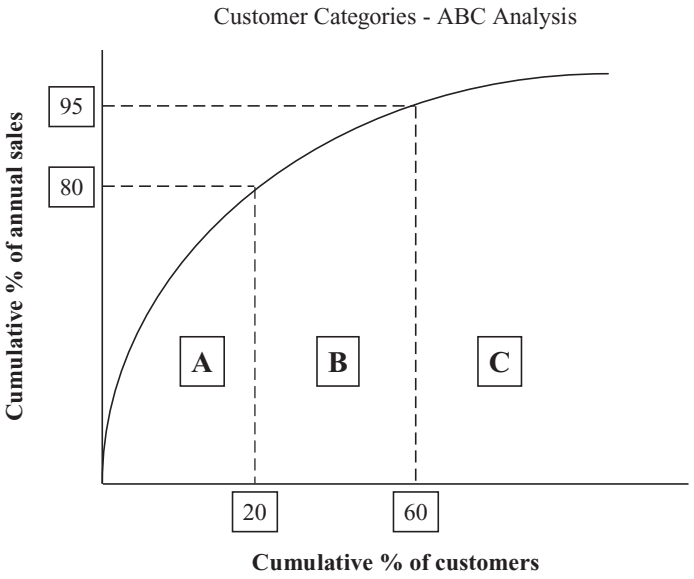

Figure 10.4 ABC analysis of customers

the top 5%, the next 15% and the balance of customers –80%. In this example, the analysis has been further broken down so that it can be seen that the top five customers account for 84% of the sales, and overall just 3% of the customers account for 80% of the sales.

Another challenge of working with customers is to identify the true profitability of all customers and then improve the profitability of key customers. Figure 10.5 illustrates that a 'tail' of unprofitable customers actually reduces the total profit contributions.

In one organisation we encountered, the top 5% of the customers accounted for 40% of the sales, and because of their importance to the company, they had been able to negotiate volume discounts and special delivery arrangements. When these benefits were examined and costed out, it was found that whereas the balance of the customers was providing the company with a true 40% gross profit margin on sales, these top 5% were only providing the company with a margin of 10%. Thus, overall, the gross margin on all

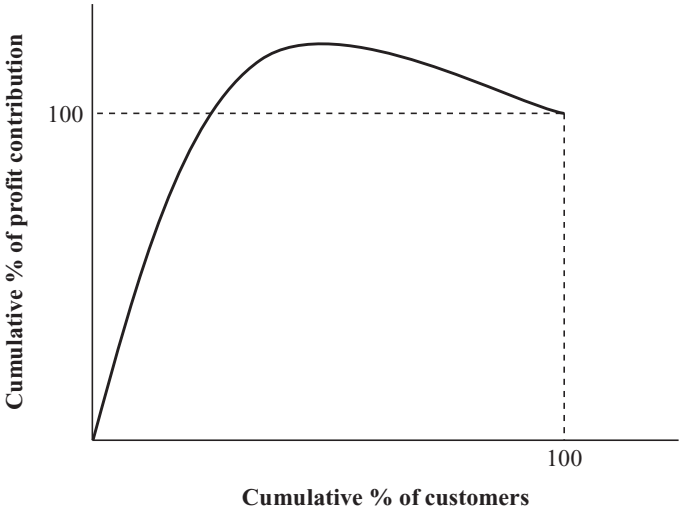

Figure 10.5 Customer profitability

sales for the company was reduced to 28% whereas the budget had allowed for 40%. This had not been apparent as the discounts had been shown in the accounts as an overhead expense and the extra transport costs had also been included as an overhead cost. There were also other reasons why the drop in true margin was not obvious.

In order to assess the true profitability of customers it is necessary to move away from the average allocation of cost (e.g. cost per tonne) and conventional cost accounting. Logistics managers are now working towards what is known as 'activity-based costing' (ABC) where cost is allocated according to the level of activity that consumes the resources. For example, the order picking cost of an order will vary according to its work content depending on whether the order is in full pallets or small units, the number of lines or SKUs or whether it requires additional packaging.

Summary

It is generally accepted that unless you are in the distribution business, you should seriously consider outsourcing your distribution to a third-party specialist. It is reasonable to expect that a specialist distribution company is likely to provide a more cost-effective service for a supplier. However, being cost-effective is not the same as being service-effective and it is arguable if a third-party company is likely to have full customer satisfaction. When a distribution company is delivering goods on behalf of a group of suppliers, it is fair to assume that the distributor will not offer any extra service beyond what is specified in service level agreements. Therefore, order fulfilment and customer relationship management will be affected by outsourced distribution policy.

In this chapter, we have described the fundamentals of distribution strategy, warehouse operations, stock management, transport planning and customer relationships management to encourage a better understanding of distribution management. With this backdrop, a manager will hopefully be better equipped to manage their own distribution operations or monitor the distribution activities of third-party distributors. The knowledge of distribution management principles as a building block of total supply chain management also highlights its key role in delivering goods and services to the customer.

Discussion questions

1. What are the three ways distribution assets can be managed? Discuss the advantages and disadvantages of each option.
2. In the case example of Walmart, describe how Walmart both achieved savings and improved customer service by owning both warehousing and transport networks.
3. Explain with examples how the total safety stock in a multi-site warehousing network can be reduced by reducing the number of warehouses.
4. What are the key factors to be considered in designing a warehouse? Discuss the seven steps to be considered in a warehouse design project.
5. Which of the following would be your key consideration for scheduling vehicles for local delivery:
   - Minimise mileage.
   - Maximise volume utilisation of the vehicle.
   - Maximise vehicle time utilisation.

   Explain the rationale of your answer.
6. Discuss the advantages and disadvantages of 3PL.

7. A distributor learnt that a major supplier of its products is considering going direct to consumers. What advantages of channel management can it offer to the supplier that the supplier cannot offer?

Exercise

Given the following data for an ambient storage warehouse:

- Annual demand: 12,000 tonnes
- Load per pallet: 400 kg
- Stock turn: 13
- Weekly maximum peak: 1.4 × average
- SKUs: 4 (same load per pallet)

Calculate the pallet positions required allowing 20% average peak and 85% utilisation of pallets.