The control of inventories and the management of supplies have, in common with the other major branches of commercial and industrial work, become specialist activities.

The supply function has the responsibility for the receipt, custody and distribution of very large sums of money in the form of goods, and for the determination of appropriate quantities of material to be held in order that operational needs may be met in as economic a manner as possible. The supply function must be managed and operated in a highly efficient way. The contribution that a good supply function can make to the success of an organisation is today almost universally recognised, in terms of the contribution to the bottom line profit.

The stores should be considered as a temporary location for materials needed for operational purposes, and should be planned, organised and operated in such a way that the period of residence of each item is as short as possible consistent with economic operation. The only reasons for carrying operating stocks are that the material is needed and that supply cannot be exactly matched with demand. Figure 1.1 shows that a single transaction in direct supply replaces the three operations, receive – store – issue. One activity replaces three. Obsolete, redundant or surplus material is simply money sitting on a shelf, requiring more money to be spent on its custody. It should be pointed

![Diagram of Direct and Indirect Transactions](image)
out that as short a time as possible may range from the hour or two that deliveries of bulk milk may remain in the receiving tanks at a processing plant, through to the several years that emergency equipment, for example, a blowout preventer in an oilfield store, can justifiably be kept. In general, if demand is steady or highly predictable, then we should store for very short periods if at all. The rapid adoption of just-in-time (JIT), lean supply and agile supply approaches in recent years reflects the general awareness that stocks are expensive to hold, and that opportunities should be sought to make better use of the money they represent. When demand is highly unpredictable then storage for longer periods may be necessitated.

There is no standard system of management and control which can be universally recommended or applied but, later in the text, we examine warehouse management systems (WMS) which over time have been introduced into warehouses. This book examines at length these principles and other practices but it must always be borne in mind that the conditions of operation are very diverse.

In a mass production unit, such as a car plant, vast quantities of materials and component parts have to be provided every day. Large sums of money are involved and it is essential to organise the materials function so that the investment is kept to the minimum. From the supplies point of view the most important thing is to keep the quantities of incoming goods as near as possible to the amounts the assembly lines will use daily. Shortages must be avoided or production lines will have to stop. At the same time, too much must not be delivered or it will clog up the marshalling and production areas, apart from the fact that excess deliveries will tie up more capital. So the emphasis is on the manufacturing schedule and everything is governed by that. For bulky or expensive materials or components, the flow will have to be managed hour by hour and this demands a very high degree of cooperation and efficiency.

The Armed Services are different. They need to have enough equipment, ammunition and stores on hand to be able to go into action at short notice. The requirement here is not to keep the amount of stock down as far as possible, but to keep it up to the minimum operational requirement. The obvious example is a warship about to set off on a long spell of sea duty. It must be stocked up with fuel, ammunition, food, clothing and everything else that may be wanted during the voyage.

Between these two extremes there is a great variety of different organisations – wholesale and retail concerns, airlines, petroleum refineries, mining, process industries, sea, air, rail and road transport, electricity, gas and water supply undertakings, hospitals, schools, agricultural enterprises and many others.

It therefore follows that before a system for the provision of materials can sensibly be designed, account must be taken of the nature and needs of the organisation it is intended to serve.
Stores

Purpose

Taking manufacturing as an example, the primary objective of the stores function is to provide a service to the operating departments. All other stores activities, although they have their own relative importance, are subordinate to this main responsibility.

The service given can be analysed into five parts, as follows:

1. To make available a balanced flow of raw materials, components, tools, equipment and any other commodities necessary to meet operational requirements
2. To provide maintenance materials, spare parts and general stores as required
3. To receive and issue work in progress and finished products
4. To accept and store scrap and other discarded material as it arises
5. To account for all receipts, issues and goods in stock.

In the general business context the storehouse or warehouse function performs roles beyond providing simply a subsidiary service to another function. The storehouse or warehouse can add value in a number of ways, including:

- **Breaking bulk.** Where goods are supplied in large quantities, perhaps because of economies of scale of manufacture or transportation, then it may be the case that the storehouse performs the activity of taking delivery of bulk consignments and issuing in smaller lots to customers or users. The storehouse enables the more efficient matching of demand with supply.
- **Creating bulk.** It may be the case that a good is produced in small quantities in a variety of locations, and needs to be brought together into larger lots for economic shipment to the market or users. The accumulation and aggregation of these smaller supply quantities is another way in which a warehouse or stockyard can add value. Milk, vegetables, latex and many other natural products are brought together in this way.
- **Smoothing.** In manufacturing, we can think of the storage as an activity which enables production to be certain of having supplies of materials and components as and when needed, or we can store finished goods until the customer needs them. In both cases we are smoothing; that is to say accommodating the fact that the rate of supply and demand and the associated timings do not exactly match.
- **Combining.** Materials in, say, a retail grocery concern are supplied from a variety of origins, yet we serve our customers best by allowing them to select according to their shopping list from the range of products that we offer. If the store did not provide the value-adding
function of bringing these materials together into a single location then the customer would find it impossible to enjoy any real choice as shopping would take up an impossible amount of time.
Responsibilities

■ Economy

It has been emphasised that service is the principal objective of the stores function, but it is obviously desirable to provide that service economically. Frequently, but not always, the most important consideration here is to keep the inventory value at the lowest practicable level to economise in the use of working capital and to minimise the costs of storage. It will be readily understood that there is some conflict between the need to give a good service and the need to economise in stockholdings. On the one hand, the more stock held, the easier it is to have items available on demand; on the other hand, the more stock held, the greater the cost, though of course ordering very frequently in order that stockholding costs may be kept low can itself lead to high costs. It is necessary to seek, find and operate a satisfactory compromise between the various opposing forces. In addition, the stores organisation itself should be economically operated and cooperate with other functions to achieve savings in material and other costs wherever practicable, especially nowadays as both lean and agile supply operations are continually striving to eliminate non-value-adding activities within these areas.

■ Identification

Identification is the process of systematically defining and describing all items of stock. It includes the preparation of a stores code or vocabulary, the adoption of materials specifications and the introduction of a degree of standardisation. Part of this work may be done by design, planning or standards departments, and the purchasing department also has an interest.

■ Receipt

Receipt is the process of accepting, from all sources, all materials, equipment and parts used in the organisation, including supplies for manufacturing or operating processes, plant maintenance, offices, capital installations and finished products.

■ Inspection

Inspection, in this context, means the examination of incoming consignments for quantity and quality. Very often there is a separate inspection department which does this work, but otherwise goods are inspected by stores personnel. Whatever the system of inspection in force, it is the duty of the stores function to see that the inspection is done before items are accepted into stock.
Quality assurance activities, and ‘co-maker’ relationships between buyers and suppliers, have reduced the extent to which the inspection of incoming goods is undertaken, but it remains an important activity.

**Issue and despatch**

This is the process of receiving demands, selecting the items required and handing them over to users. It also includes, where necessary, the packaging of issues and the loading of vehicles with goods for delivery.

**Stock records**

These are maintained in a warehouse management system (WMS) which records all transactions, receipts, issues, returns and balances of stock (see Chapter 5 for WMS).

**Stores accounting**

Stores accounting is the process of recording stock movements and balances in value.
Stock control is the operation of continuously arranging flows of materials so that stock balances are adequate to support the current rate of consumption, with due regard to economy. It includes the related process of provisioning, which is the means whereby instructions are given for the placing of orders. In some concerns the production control department may take a large share in provisioning, at least as far as production materials are concerned via the materials requirement planning (MRP) systems.

Stocktaking, stock checking and stock audit

Stocktaking is the process of physical verification of the quantities and condition of goods, usually on a periodic basis for the purpose of ensuring that an appropriate figure appears in the organisation’s accounts. Stock checking is similar, but may be done on an ad hoc basis for operational reasons. Stock audit involves an external agency, and the purpose is verification. Perpetual inventory control (PIC), or cycle-counting, will be discussed in detail later in the text.

Storage

Storage comprises the management of warehouses, storehouses and stockyards, the operation of handling and storage of equipment, and the safe custody and protection of stock. Here we are confronted with the conflicting objectives of maximising utilisation while maintaining high levels of accessibility.

Organisation

Policy directive

In any enterprise it is essential that all stores and warehouse staff are fully trained in all the functionalities of the warehouse management system (WMS) and the strategy covering supplies policy, procedures and organisation, ensuring clear definition of the limits within which the function operates, and conveying authority to act within these limits.

Internal organisation

In a small firm the supplies function may be operated from a single office run by one manager but, in a large organisation, it is necessary to apportion the various duties to separate sections, for example:

1. Identification or vocabulary section
2. Standardisation section
Chapter 1 • The supply function

Position of stores within the purchasing and supply organisation

In the industrial field particularly, the specialisation of production and the increasing complexity of modern products and machinery requires a very high standard of organisation and performance in stores work, and the range of materials, components and spares is continually expanding. Stores and purchasing are largely interdependent, and any inefficiency or lack of cooperation on either side is soon reflected in the other. To cope satisfactorily with the whole supply problem in modern conditions, a complete ‘dovetailing’ of these two functions is essential.

There are occasionally special circumstances in an industry which would justify some split in control, but the more progressive concerns show an increasing tendency to set up a completely integrated purchasing and stores
Relationships with other departments

To discharge its responsibilities adequately, the stores department must actively cooperate with other departments, not only to provide a service (to its internal customers) but also to give and receive information (from its internal suppliers) so that the service is efficient and effective (see Figure 1.5). The nature of the other functions involved varies in different organisations, as does the scope and responsibility of the stores function, so that it is difficult to be precise about the relationships unless each case is considered separately. By

Figure 1.5

The purchasing and supply function

**PURCHASING AND SUPPLY FUNCTION**

**PURCHASING**
- Tendering
- Quotations
- Negotiations
- Supplier selection
- Supplier development
- Supplier rating
- Contracts
- Sales of scrap/surplus
- Expediting
- Research
- Invoice clearance etc.

**STOCK CONTROL**
- Determination of order quantities
- Determination of timing of orders
- Forecasting
- Analysis of demand
- Scheduling
- Statistical reports
- Stores accounting
- Stock audit
- Review of slow moving stock
- Vocabulary and coding etc.

**STORES**
- Storehouse design
- Stock location
- Storage equipment
- Mechanical handling equipment
- Checking receipts
- Issuing material
- Maintenance of stock records
- Operation of storehouses
- Operation of stockyards
- Internal distribution etc.

department responsible for all these activities, bringing the work under one responsible departmental manager (see Figure 1.4).

An arrangement of this kind has obvious advantages, the chief of which are outlined as follows:

1. The department head only reports to the line management and his responsibility for the price and availability of materials is clear and unavoidable.
2. A single department control eliminates friction and ensures the maximum cooperation of each section.
3. It is easier to give a more comprehensive training to the staff, and improves promotion prospects.
4. It facilitates the introduction of techniques such as lean supply as internal functions are integrated.
way of example the following notes indicate the position as it is normally found in production companies. Enterprise resource planning (ERP) and warehouse management systems (WMS) facilitate this process of cross-functional working and are discussed later in Chapter 5.

### Production department

This department is the main supplies ‘internal customer’ and it is therefore of the first importance that the services to production are satisfactory in all respects. The closest cooperation is essential not only on the provision of materials but also on the stock levels to be maintained in accordance with the policy for inventory control.

The stores department provides materials, tools and other shop supplies at the required times and in the required quantities to meet the factory programme, advises anticipated difficulties or failure in supply, and notifies any substitute or surplus materials available from stock. The storehouses are ready to accept work in progress and finished goods at any time and to receive scrap, offcuts, rejected items and salvaged or reclaimed materials as they arise, so that the shop floor may be promptly cleared.
The production department sends in to the appropriate storehouses not only the work in progress and finished goods but also any excess materials, tools, fixtures and equipment not currently required, and notifies as soon as possible any impending changes in the production schedule.

**Design and engineering departments**

It is most desirable to have close contact with these departments, particularly from the point of view of specifications, standards and obsolescence. Arrangements are made to see that, before any new design, modification or technique is put into production, due note is taken of materials to the old design, so as to avoid obsolescence and, whenever possible, new items and modifications are introduced to coincide with the running down of existing stocks. The design or engineering departments are consulted when obsolescent or obsolete items are being listed for disposal.

In this way the enterprise resource planning (ERP) system and the warehouse management system (WMS) can be continually updated to allow for minimum waste in the form of obsolete stocks.

**Quality department**

Accommodation for inspection personnel may be provided in storehouses, and they are notified of all receipts via electronic advanced shipping notifications (ASN). The stores department is responsible for holding goods received in 'quarantine' and submitting samples to inspection promptly. In return, the inspection department inspects and tests deliveries without delay, and indicates acceptance or rejection. The supplies function must work closely with the quality department if quality is approached from an 'assurance' viewpoint.

This is vitally important in just-in-time and lean-supply environments in which a 'ship-to line' philosophy is employed, ostensibly fast-tracking quality-assured material through to production with minimum stores involvement and inspection. This reduces non-value-added activities (such as inspection and storage) and ensures a smooth continuous flow of material to production in a timely manner.

**Maintenance department**

The supplies service in this case consists in acquiring appropriate materials and machinery spares and being in a position to issue them as and when required. To facilitate this work, the maintenance department advises details of the forward programme on repairs and overhauls as far as possible, particularly where planned maintenance is in operation, and advises on the initial quantities of spares to be provided when any major new plant or machinery is installed.
Chapter 1 • The supply function

**Finance department**

There is a continuous exchange of information covering verification of records and physical stock, clearance of invoices both inwards and outwards, revision of prices, supply of material-cost information, and control of working capital allocated to the financing of stock. Procedures are organised to work together effectively to control the value of inventory and cost of materials. The warehouse management system (WMS) provides detailed valuation of stock in real-time allowing effective stock management to continually reduce stock in line with the varying usages.

**Transport department**

The stores department is itself sometimes responsible for transport but, where there is a separate transport department, it is essential that the two work together harmoniously. The supply function reports details of loads, pick-up locations and discharge points, makes facilities available for the speedy, safe loading or discharge of goods, and provides a weighbridge service. The transport department is responsible for the ready availability of vehicles and for advising any circumstances which may delay deliveries or collections, such as breakdowns, strikes or adverse weather.

**Sales department**

The service provided is normally the acceptance, storage, packing and despatching of finished products. The sales department cooperates by advising, via the ERP and WMS system, of any appreciable fluctuation in the demand for the finished goods which may affect storage accommodation, and is also responsible for giving instruction on the quantities of spare parts or other materials to be held for servicing sales already made.

**Materials management**

Purchasing and supply activities have, in most organisations, long been recognised as warranting departmental status and authority, and the fact that purchasing and supply tasks frequently involve intercourse with other parts of the organisation, as well as with the outside world, is obvious. However, the placing of purchasing and supply in the organisational framework has sometimes led to difficulties in establishing smooth flows of materials and clear channels of communication.

Increasingly, it is being reflected in organisational structures that the involvement of the purchasing and supply function with ‘materials’ does not begin with the receipt of a detailed specification and request to order, neither does it end when materials are delivered. It has always been the
case, for example, that buying activity may involve some contribution to
the ‘what to buy?’ debate, and that the interests of the purchasing executive
in bought materials do not end as soon as the material is placed in store.

Many organisations have adopted a broad concept of procurement that
goes beyond simply ‘buying’, and indeed is usually more than ‘buying + stock
control + stores management’. This concept or approach is known generally
as materials management, though the approach taken varies greatly from com-
pany to company.

M.R. Leenders, H.E. Fearon and W.B. England describe the concept as fol-
lows:

An organisation that has adopted the materials management organisational concept
will have a single manager responsible for planning, organising, motivating and
controlling all those activities principally concerned with the flow of materials into
an organisation. Materials management views material flows as a system.

The specific functions that might be included under the materials manager are
material planning and control, production scheduling, material and purchas-
ing research, purchasing, incoming traffic, inventory control, receiving, incoming
quality control, stores, in-plant materials movement, and scrap and surplus
disposal. Not all functions are necessarily included: the ones often excluded are
production scheduling, in-plant materials movements, and incoming quality
control.

(Purchasing and Materials Management, 9th edn, Irwin, Illinois, 1989, p. 4)

The main benefit which seems to arise from the adoption of the materials
management approach is an improvement in communication and coordi-
nation between departments. There is less sub-optimisation, and centralised
responsibility and control enables smoother and faster flow of materials.
Comprehensive and linked approaches to the acquisition, storage and move-
ment of materials can be devised and employed, thereby reducing the risk of
errors at the interface between independent departments.

Materials management is not just a matter of managerial organisation. It
is rather a matter of philosophy. It may not matter too much how the com-
ponents of the materials function in an organisation are organised, provided
that a single executive, probably called the materials manager, holds all the
appropriate reins.

It is generally agreed and recognised that the term logistics has its origins in
military usage, where it is used to cover the movement and accommodation
of materials and personnel involved in operations. Recent years have seen a
wider use of the expression logistics in the business context. However, since
business usage of the term is relatively new, there is, as yet, no complete or
universal agreement as to the exact meaning of the term.
Definitions of logistics abound; the following are given by way of example:

Logistics is the process of planning, implementing and controlling the efficient, cost-effective flow and storage of raw materials, in-process inventory, finished goods and related information from point of origin to point of consumption for the purpose of conforming to customer requirements.

(Council of Logistics Management (CLM), USA)

The area of support management used throughout the life of the product or system to efficiently utilize resources assuring the adequate consideration of logistics elements during all phases of the life cycle so that timely influence on the system assures an effective approach to resource expenditures.

(Society of Logistics Engineers (SOLE), USA)

The process of managing the movement and storage of goods and materials from their source to the point of ultimate consumption.

(Institute of Logistics (IL), UK)

It is interesting to note that the CLM and IL definitions, along with many others, which lack of space precludes, are concerned with movement and storage of goods in a general sense. The CLM imply a manufacturing context and the IL definition seems to be more widely applicable. The SOLE definition differs markedly, in that it suggests that the focus of logistics is on the long-term, life cycle support of products or systems, for example, capital plant and equipment.

The various definitions of logistics often betray their origins by their content. There is a view that logistics is mainly about distribution, held, of course, by those bodies mainly concerned with marketing and distribution. It is a way of linking physical distribution management with earlier events in the supply chain.

Another view is that logistics is primarily concerned with acquisition and storage, and the other aspects follow on. It may be suggested that the Chartered Institute of Purchasing and Supply, in including logistics as a final professional level examination subject, views logistics in this way. Their syllabus seems to indicate this view.

The third main school of thought is that logistics is mainly concerned with support operations, and that it is very much a service activity, undertaken to ensure that expensive systems or equipment is maintained continuously through its life cycle.

Figure 1.6 gives a simple interpretation of the general view of ‘Logistics’.

The supply chain concept

The Chartered Institute of Purchasing and Supply, in the professional syllabus document, define the supply chain as:

1. Specification of requirements.
2. Sourcing and acquisition of materials and services.
3 Negotiation and management of contracts and projects.
4 Control and movement of materials into and through production and other operational processes.
5 Inspection, quality assurance, handling, storage and distribution to the point of need.
6 Control and disposal of waste and redundant materials.

It may be difficult to view all of the above activities as part of a continuous process, but most of them can be seen as sequential, and dependent on each other, hence ‘chain’.

The purely purchasing task is rather easier to depict as a chain, along the following lines:

1 Recognition of need
2 Requisition prepared
3 Requisition reviewed by buyer
4 Specifications developed
5 Sources located
6 Source selected
7 Order placed
8 Contract formed
9 Expediting and liaison activities
10 Receiving and inspection
11 Approval and payment of invoice
12 Contract completion.

Clearly, the supply chain does not contain all of the links depicted above in every case; for example, specifications will in many cases pre-exist, but the list does show a progression of dependent activities. For stock items it is possible to think of the chain as an endless one, with replenishment enabling issues to
take place, and issues eventually triggering the reorder process which in time leads back to replenishment.

The term ‘supply chain’ is today more widely employed to describe the various organisations and processes through which a product may pass on its way from its origin as raw material(s) to its point of ultimate consumption. This flow of materials or products is sometimes referred to as a downstream flow, and is accompanied in the supply chain by the upstream flow of information from customers to suppliers.

Organisations are investing heavily in concepts, techniques and practices which will increase efficiency by removing waste in the supply chain. The term ‘waste’ is widely interpreted, and includes delay (of materials or information), inefficient movement (again of materials or information), or indeed any activity which does not enhance or add value to the product supplied.

The term ‘supply chain management’ is emerging as yet another expression to compete with ‘purchasing and supply’, ‘materials management’ and ‘logistics’. The probability is that the expression will pass into widespread usage, as it encompasses the whole spectrum of materials-related activities without the manufacturing connotation of materials management or the transport and distribution emphasis that some place on logistics.

The supply chain is, as has been suggested, also a demand chain, the supply of goods being accompanied by the flow of information in the opposite direction.

Figure 1.7 is a simplified representation of a supply chain.
BS5729 provides a valuable summary of the basics of stock control and storekeeping and is published in five parts, as follows:

■ Part 1 (1982): Introduction to management of stock control

This part introduces the concepts and objectives of stock control as a part of management strategy and outlines methods of setting target stock levels and their achievement. It summarises the objectives of stock control as the establishment and maintenance of the total investment in stock at the minimum consistent with:

1 adequate customer service;
2 operating efficiency;
3 physical limitations

taking into account the operating policies of the organisation. Part 1 includes sections on financial considerations, costs of holding stock, how stocks move, stock planning, setting the stock control rules and systems, action to achieve targets and measuring progress.

■ Part 2 (1981): Demand assessment

Part 2 outlines some basic forecasting procedures suitable for stock control. It is not a complete guide and examines simple methods only. This part is divided into three sections dealing respectively with:

1 Independent demand, where future requirements are uncertain and likely to be irregular, and the demand for one item is largely independent of the demand for any other item.
2 Dependent demand, where future requirements for individual items can be translated from planned production of major items or assemblies. This is basically the materials requirement planning approach (MRP).
3 Other methods, where a selection of special problems and methods are described in brief.

■ Part 3 (1983): Replenishment of stock

This part of BS5729 provides guidance on the determination of a stock replenishment policy using three broad groups of reorder systems. Information is given on which parameters to adopt, both generally and on an item-by-item basis, to take account of the nature of demand, order quantities, safety stocks, replenishment lead times and related costs. Additionally, procedures are provided for selected stock control and the related concept of master scheduling. Sections are included on order quantities, reorder systems, order timing
Chapter 1 • The supply function

(including safety stocks and lead times), selective stock control and master scheduling. Appendices are included which explain the derivation and use of economic order quantity formulae.

■ Part 4 (1981): Data processing

Part 4 provides guidance on the application of data processing for use by personnel concerned with stock control. The guide draws attention to both general and initial considerations that need to be taken account of in planning a computer application. This is followed by consideration of system design and development, choice of hardware, implementation and running and evaluating a system.

■ Part 5 (1980): Storekeeping

This final part of the standard defines storekeeping as: ‘Those procedures and means whereby goods are received, identified, stored, issued, accounted for,
and replenished in accordance with defined levels of service and with due regard for the statutory requirements for health and safety.’ Within this definition six major functions of storekeeping are identified (see Figure 1.8). Each function is represented as a number of key tasks, and comments are made against each as an aid to those who are setting up a store or who are concerned with storekeeping in an organisation.

At the time of writing the possibility of BS5729 being absorbed and replaced by a more comprehensive standard covering production management is under consideration. Whether this will happen remains to be seen, though a fundamental problem is, of course, the fact that most inventories are nothing to do with production.