Managing the inventory

- The use of Pareto analysis to save time and give control
- ABC for managing inventory
- Stock cover provides a monitoring tool
- Minimizing effort and inventory value
- A guide to reducing inventory levels

Using Pareto analysis for control

Applying effective control

In the stores there are a wide variety of items, with a stock record for each. Some have high value and others are very cheap. The high-value items are normally controlled tightly, whereas the low-value items are not treated as carefully and are issued in bulk in approximate quantities. Most effort should be put into managing the items which are most important for achieving the inventory targets. In inventory control the best results are gained by organizing effort correctly. There is not sufficient management time to maintain detailed control of all the individual items. If the immediate aim is to reduce stockholding costs then studying the stock of low-value items is unlikely to be the best place to start unless the sales volume is very large. If service is the aim, then attention to a few fast-moving lines often provides the bulk of the improvement required.

This simple principle is embodied in Pareto's Law, which is illustrated by the curve in Figure 3.1. It is also called the 80/20 rule because 80 per cent of the effect is provided by 20 per cent of the cause. In Figure 3.1 80 per cent of stock value is caused by 20 per cent of stock lines. The principle can be applied to many different areas of activity: 80 per cent of the purchased items come from 20 per cent of the suppliers, and 20 per cent of sales lines give 80 per cent of turnover. For a warehouse, 80 per cent of the space is occupied by 20 per cent of the lines. This simple fact makes it obvious which lines should be received little and often.

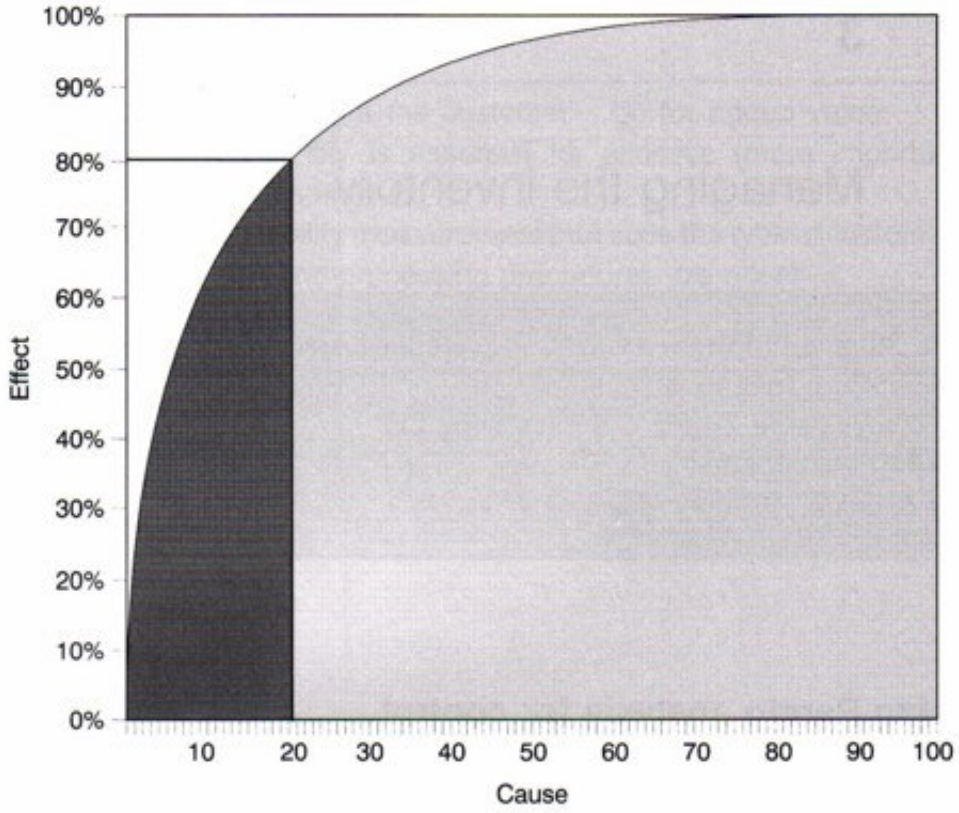

Figure 3.1 Pareto curve

Pareto analysis is the technique which forms the basis of inventory control thinking and is an important management principle which can be applied to minimize effort and to obtain best results. It can also be applied for time management, credit control and many other areas of control. To gain best control, effort has to be directed to the most important areas. The Pareto curve (see Figure 3.1) is often called the '80/20 rule', but the values can be read off at any convenient point. For example, the graph shows that 50 per cent of the product lines account for 97 per cent of the sales (or that the other 50 per cent only provide 3 per cent of the sales – a worrying thought). The shape of the Pareto curve arises from the range of volumes and values combined in a statistical distribution. The shape of the curve does not always give exactly an 80/20 relationship, but this does not affect the principles of applying Pareto analysis to inventory management.

Stores carry a wide variety of items, with a stock record for each. Some have high value and others are very cheap. The high-value items are normally controlled tightly, whereas the low-value items are not treated as carefully and are issued in bulk in approximate quantities. Most effort should be put into managing items which are most important for achieving

inventory targets. In inventory control the best results are gained by organizing effort correctly. There is not sufficient management time to maintain detailed control of all individual items. If the immediate aim is to reduce stockholding costs then studying the stock of low-value items is unlikely to be the best place to start unless the sales volume is very large. If service is the aim, then attention to a few fast-moving lines often provides the bulk of the improvement required.

Use Pareto analysis to save time and get results.

Stores contain items ranging from main products to washers and labels, with a stock record for each. High stock value items need to be closely controlled, whereas minor items need not be treated as carefully. To control the resources of the company most effectively our effort and controls should be biased towards high cost areas. Pareto analysis formalizes our efforts to do this. It states that the majority of the effect is produced by a small proportion of the cause. (80 per cent of the effect is due to 20 per cent of the cause.)

The application of this to a stores stock control means that 80 per cent of the total stock value is made up from 20 per cent of the total stock items as stated. The other 80 per cent of stock items contribute only 20 per cent to the total inventory value (shown in Figure 3.1.) In a stock reduction exercise the majority of our cost saving will be gained by decreasing stocks of those few major items.

Eighty per cent of stock is in 20 per cent lines – so reduce the high stock values.

Example

Consider a stock of 12 000 types of items in store. Pareto's Law shows that for a stock value of £800 000 we find that 2400 items account for £640 000 of inventory. The remaining 9600 items are worth only £160 000. Therefore, by concentrating on the 2400, control over the total value will be tight. If 2400 is rather too many to review individually, then the Pareto curve (Figure 3.1) shows that 5 per cent of items account for 55 per cent of cost so 600 items contribute £442 000 to the total stock costs. Again by working on these 600 items carefully the overall stock value can be controlled or decreased.

ABC analysis

Pareto analysis by the current stock level is good for reducing stock levels, but a more consistent classification is required when focusing on the management of inventory. The current stock does not necessarily show which items are important for the business. In fact there may be some important items where the current level of stock is low because Stores are awaiting an impending delivery. On the other hand some items may have a high stock value simply because no one is buying these. It is therefore usual to rank the items according to the annual turnover. The annual turnover is given by

Annual usage × Unit cost

It is not too important whether the unit cost is the standard cost, latest cost or an average as long as it is consistent across all the items. Annual usage has to be adjusted in the case of new or obsolescent items to reflect the future expected demand rate rather than the historical one.

Pareto analysis of this data shows that 80 per cent of the value of demand is for 20 per cent of the moving items. (There is often a number of items in stock for which the demand is zero, and therefore these items are not included in this turnover analysis.) For some businesses the 80/20 rule is not obeyed exactly, but the use of Pareto analysis is important for all inventory.

To use Pareto analysis properly requires the classification of stock by issue value, and the simplest way is to use ABC classes. These can be defined as:

- A = 10 per cent of stock numbers, giving 65 per cent of turnover.
- B = 20 per cent of stock numbers, giving 25 per cent of turnover.
- C = 70 per cent of stock numbers, giving 10 per cent of turnover.

ABC analysis is an excellent technique for achieving objectives.

This is illustrated in Figure 3.2.

It is important to ensure that ABC analysis is based on turnover, but less important that the exact percentages are adhered to. In some instances a further classification (D) is useful to include a large number of very low turnover items. This enables the number of stock lines included in the A, B and C classes to be reduced to manageable numbers.

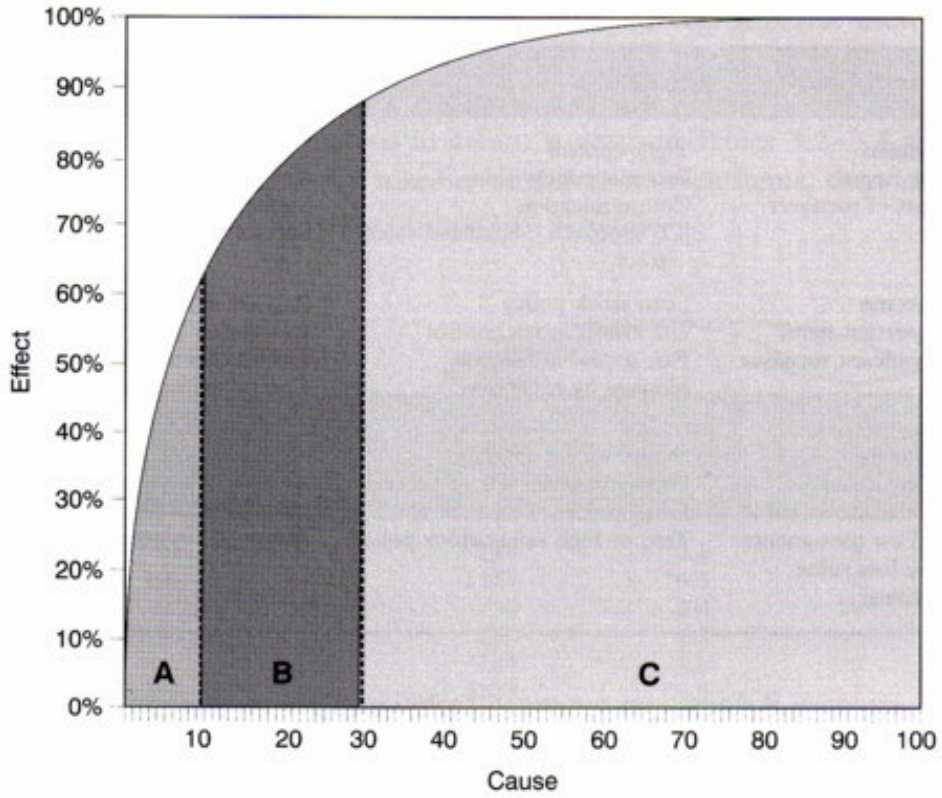

Figure 3.2 ABC analysis

The purpose of ABC analysis is not to provide different types of service but to provide service with the least amount of cost and effort. Different systems of control are used for the three categories of stock. As the A items carry the most value, accurate systems are required to control them. On the other hand, the C items are low turnover value but form the bulk of the inventory. For these the main requirement is to ensure that stock is available to meet demand.

A class – there aren't many, so control tightly.

The control requirements for each category are shown in Table 3.1. Category A items have a disproportionate amount of time and effort used on them and have to be controlled tightly using systems in conjunction with market expertise and product knowledge to maintain stock at the lowest appropriate level.

B class – let the system manage these.

Management inventory

Table 3.1 ABC inventory control

Characteristics	Policy	Method
A items Few items Most of turnover	Tight control Personal supervision Communication JIT approach – balanced safety stock	Frequent monitoring Accurate records Sophisticated forecasting Service-level policy
B items Important items Significant turnover	Lean stock policy Use classic stock control Fast appraisal method Manage by exception	Rely on sophisticated method Calculated safety stocks Limit order value Computerized management and exception reporting
C items Many items Low turnover value (Few movements or low value items)	Minimum supervision Supply to order where possible Large orders Zero or high safety stock policy	Simple system Avoid stockouts and excess Infrequent ordering Automatic system

For category B items computerized techniques are most appropriate. The number of items involved and the lower values make it a waste of time to use specialist skill which could be working on category A. The computer can maintain control through statistics and deal with the complex calculations using the computer forecasting models which are most important for B items. The use of management by exception is also important for B class.

The minor sales items, category C, should be controlled by a simple system which enables supply to be obtained with a minimum of administration. However, the control system for C items must be reliable and not result in stockouts or large excesses. An investment in extra stock of C class items is inexpensive but can greatly simplify the problems of controlling large numbers of stock lines. This is an appropriate policy for the faster moving C class items. For the very slow moving, higher value C class items a purchase to order policy should be adopted where possible, or if there is only one customer, they can hold the stock themselves and be responsible for reordering as required.

C class – don't take risks, be lazy.
High but not excessive inventory.

The most effective stock control systems are based upon ABC analysis combined in a common-sense manner with the other techniques we shall be discussing later.

ABC analysis is the basis for the total control of stock. It is also used as the basis for perpetual inventory stores control where annual stocktaking is avoided by routine counting of a few stock parts each week.

An example of Pareto analysis in action is given in Tables 3.2–3.4 and Figure 3.3. Table 3.2 shows a number of different stock items, their unit cost and annual usage in terms of quantity of value.

Table 3.2 Example of Pareto analysis

Item	Annual usage (units)	Unit cost (£)	Annual turnover (£)	Annual turnover (%)	Rank
A12	21	7	147	2.1	5
B23	105	11	1155	16.3	2
C34	2	15	30	0.4	10
D45	50	5	250	3.5	4
E56	9	14	126	1.8	6
F67	394	12	4728	66.6	1
G78	5	8	40	0.6	9
H89	500	1	500	7.0	3
I90	11	4	44	0.6	8
J01	3	25	75	1.1	7
Total			7095	100	

Re-arrange

Table 3.3 Classification by usage value

Item	Annual usage (units)	Unit cost (£)	Annual turnover (£)	Annual turnover (%)	Rank	Class	Cumulative percentage
F67	394	12	4728	66.6	1	A	66.6
B23	105	11	1155	16.3	2	B	82.9
H89	500	1	500	7.0	3	B	89.9
D45	50	5	250	3.5	4	C	93.4
A12	21	7	147	2.1	5	C	95.5
E56	9	14	126	1.8	6	C	97.3
J01	3	25	75	1.1	7	C	98.4
I90	11	4	44	0.6	8	C	99.0
G78	5	8	40	0.6	9	C	99.6
C34	2	15	30	0.4	10	C	100
Total			7095	100			

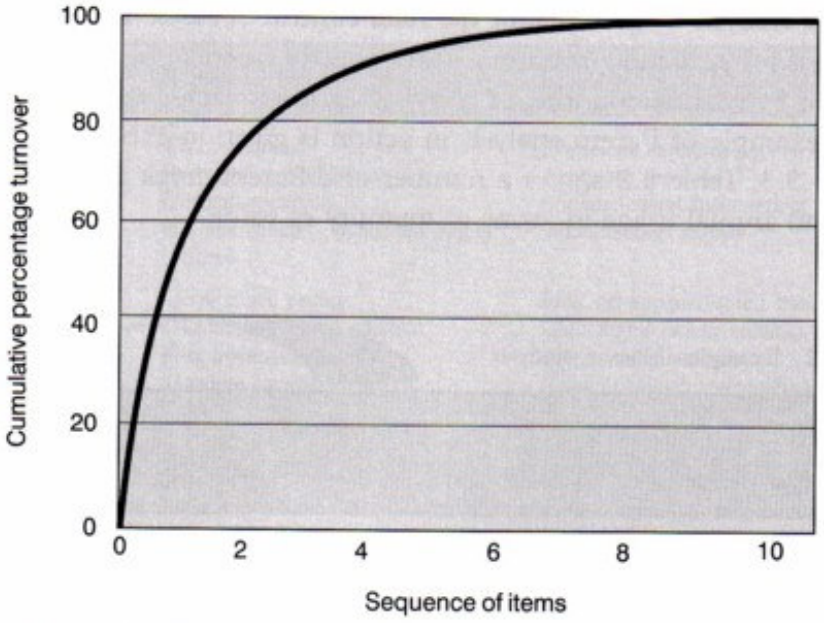

Figure 3.3 The cumulative Pareto curve

Items are then ranked in order of size of annual turnover value. This is displayed in Table 3.3 with the items in descending order. The cumulative annual usage value and percentage of turnover are also calculated. Items are then classified into A, B and C by assessing the number of items in each category and their percentage of total turnover value.

In the Table 3.4, classes A, B and C are compared as percentages of number of items and total value. The table shows that the seven items in class C have a turnover of £712, whereas the only item in class A has a turnover of £4764.

Table 3.4 Summary of ABC analysis

Classification	Percentage of items[1]	Percentage of value	Value per class
A	10.0	66.6	4728
B	20.0	23.3	1655
C	70.0	10.1	712
Total	100.0	100.0	7095

Note: [1]ABC analysis is carried out only for items with usage.

Management inventory

Saving time

Applying the Pareto principle is a way of balancing inventory, stock availability and critical resource spent on each item. How the law can be applied depends on what the critical resource is considered to be. The critical resource for all inventory controllers is time, because of the large amount of information required for tight control and the wide variety and quantity of stock held. The Pareto principle shows that 80 per cent of the time is spent doing 20 per cent of the jobs and a significant time saving can be made if a small reduction can be achieved in these jobs. They may be very frequent short jobs (such as keying stores issues into a computer) or more infrequent, long-winded jobs (such as writing a major management report).

Practical considerations in using ABC analysis

The ABC classification is a simple tool to enable the stock manager to control a large number of items in a limited amount of time. This simple approach is one of the most powerful tools employed to reduce stock value and to decrease the workload of busy inventory managers and purchasers. Experience with this technique over a large number of companies has suggested that there are some pitfalls and some practical ways to circumvent them. The situations which arise are typically:

1 Too many A class items.
2 Large numbers of lines (D class).
3 Non-moving lines (O class).
4 Fixed stock level items (F class).
5 Non-stock items.

Use ABC to save time.

Number of A class items

A class items are supposed to be reviewed on a daily basis, or a weekly basis at least. To be practical, there has to be an upper limit of, say, 300 A class items per inventory planner. Even where the planner manages many thousands of items, the number of A class has to be kept small.

D class items

For normal inventories of 3000 lines, the ABC classification works well. Where there are over 10 000 part numbers there should be a modifica-

tion to the classification system so that the vast bulk of low-value turnover items are dumped into a further class, D. The D class contain the lowest turnover lines, say 50 per cent of the active item numbers which contribute only 2–3 per cent of the total turnover. The ABCD classification now is as follows:

- A class: 5 per cent of moving lines (300 per planner maximum).
- B class: 10 per cent of moving lines.
- C class: 35 per cent of moving lines.
- D class: 50 per cent of moving lines.

The classification can alternatively be carried out by turnover value, for example:

- A class: 45 per cent of turnover.
- B class: 30 per cent of turnover.
- C class: 22 per cent of turnover.
- D class: 3 per cent of turnover.

These classifications can be varied to suit the exact shape of the Pareto distribution for the inventory to be managed. The principles of use of the technique do not change even if the distribution is not 80/20.

Non-movers

So far in the discussion the moving inventory has been classified, and the non-movers have been ignored. Companies do sometimes have a need to keep non-moving items, or items where the movement is so slow that they appear as non-movers in the recording systems. These items will probably be subject to the stock cleansing discussed in the section on turnover of stock. In the interim they should be provided with a separate classification. Normally they are given class 'O' or 'X' which signifies that they should not be ordered again.

Use ABCOFZ as a practical control method.

Fixed classification

As Pareto analysis is to be used for ordering, there are a few items where the stock level should not respond to usage rate. (Unfortunately in many older stock management systems, the stock control parameters are all like that!)

For example, the employment of two new maintenance fitters in a factory requires them to be kitted out with protective clothing, tools, tool boxes and a variety of items. The use of these items is likely to fall rather than rise as a result of that action since there is less likelihood of further recruitment. By putting these items in a separate classification (say F), they can be segregated and identified. The system can then identify that the stock level parameters from classification F are not updated.

Non-stock items

The decision as to which items are in the stock range is an arbitrary one and depends on the particular inventory policy and market conditions. Customers do not usually consider their requirements as 'stock' or 'non-stock' items and the difference to them is only in the lead time provided by the supplier. In fact, non-stock items are continuously being taken into the stock range and stock items being deleted. For this reason it is useful to include non-stock items in the ABC analysis. This can either be done by including them within the ABC classes or, more commonly, to have a separate classification (say, Z) for non-stock items. This separate classification then has the feature that no stock is ordered from suppliers unless the stock cover is negative (i.e. there is a customer requirement but no stock). It is very useful to include all goods in the inventory management system as it provides unified records identification and control over all goods, and makes management and analysis easy.

Stock cover

Turnover of stock

The current stock levels in the various stores throughout the company may not all be at the ideal levels, as we have seen. The purpose of controlling the inventory is to drive the stocks toward their proper level which is determined by the characteristics of supply and demand patterns. The major factors are:

- supply lead time
- average demand rate
- variability of demand
- supply frequency
- customer delivery time allowed.