

Well positioned

Boeing cuts jobs to shrink overheads

Michael Meeham

Boeing expects to shed 4,500 jobs in its Commercial Airplanes unit this year as it trims overhead 'to ensure competitiveness.'

The cuts were expected; Boeing Chairman and CEO Jim McNerney has previously indicated jobs would be shed. This will bring total BCA employment to about 63,500 workers – the level it had at the start of 2008.

The lost jobs are to be concentrated in administrative positions as BCA strives to reduce overhead costs and discretionary spending, rather than in airplane production. Boeing has been boosting production rates to keep up with demand for the past three years.

'We are taking prudent actions to make sure Boeing remains well posi-

tioned in today's difficult economic environment,' BCA President and CEO Scott Carson said.

In a statement, Boeing said normal attrition and cuts in contract labour 'will account for some of the job reductions, layoffs of Boeing employees also are necessary.' Most of the jobs will be lost in Washington, Boeing's biggest jobs base and the state where it's seen the largest increase in recent employment.

After the mass layoffs sparked by the 9/11 airline downturn, Boeing began adding jobs in 2004 and has steadily increased employment since then.

White orders declined to 662 last year from a high of 1,422 in 2007,

the company has built up an order backlog of more than 3,700 aircraft over the past three years – so it doesn't lack production demand.

Total company employment stood at 160,738 on 31 January 2008, and climbed to 164,202 by 30 September, largely on the strength of hiring at BCA. Employment levels there were at 63,200 at the end of 2007. They rose as high as 68,010 by 31 October and then declined to 67,659 on 31 December. At their high point they were still about 30,000 below the pre 9/11 levels. Lean manufacturing techniques are credited with allowing the company to boost production despite much lower employment levels.

Aviation Week, 9 January 2009.

Source: Reproduced with permission from McGraw-Hill Education.

Questions relating to this news story can be found on page 320 ➔

About this chapter

This is the second of two chapters in Part 4 that deal with *cost accounting*. We have split our study of cost accounting into two parts because the subject is too big to deal with in one. Chapter 13 dealt with direct costs while this one covers indirect costs. By the end of the chapter you will have been shown how accountants have traditionally gone about calculating product costs. In recent years the traditional method has been severely criticized, so we will also outline a relatively new technique for dealing with indirect costs (or overheads). This technique is called *activity-based costing* (ABC) and its proponents make great claims for it.

Learning objectives

By the end of this chapter, you should be able to:

- outline the nature of overheads, i.e. indirect production and non-production costs;
- calculate unit costs using absorption costing;
- assess its usefulness;
- explain what is meant by activity-based costing;
- summarize its advantages and disadvantages.

! Why this chapter is important

In the previous chapter we suggested that you needed to know something about cost accounting for three main reasons:

- to achieve greater control over what you manage;
- to make better decisions;
- to get involved in the material pricing decision.

The first two reasons hold good for this chapter but there is another reason that relates directly to the contents of this chapter.

The treatment of indirect costs in product costing is fairly questionable and there is much controversy in accounting circles about its usefulness and reliability. So you should not leave it entirely to the accountants to decide what to do. As a non-accountant and as a manager you have to get stuck right into the debate but you cannot do that if you don't know what the accountants are talking about.

This chapter will help you to talk to accountants at their level and enable *you* to decide what is best for *your* department when it comes to dealing with the 'overheads'.

Production overhead

News clip

Overhead control

According to the Japanese sales manager of Karmann, the German contract car manufacturer, Japanese car manufacturers have become more sophisticated in their cost accounting. As their supplier networks have grown they now look very carefully at the additional overheads that may be incurred such as training and translation costs. It may be 10% cheaper but in the sales manager's view 'localization' is not worth it if it costs 30% more to look after local suppliers.

Source: Adapted from www.ft.com/cms, 17 March 2009.

In the previous chapter we suggested that if management accounting is going to be used as part of a control system, it is necessary for all costs within an entity to become the direct responsibility of a designated cost centre manager. In this section we will examine how the *production* overhead gets charged to specific units. ‘Production’ relates to the output of any type of entity although it is more usually associated with those types of entities that manufacture a physical or a tangible product. ‘Overheads’ is a substitute term for indirect costs. An indirect cost is one that cannot easily be identified with a specific unit of output, a cost centre, a profit centre or an investment centre.

The charging of production overhead to specific units is rather a complicated procedure. It is known as *absorption costing*. In order to make it easier for you to follow we will take you through it slowly in three stages. As shown in Figure 14.1 the three stages are: (1) allocation; (2) apportionment; and (3) absorption. The figure shows the terms associated with the technique and also how costs are absorbed into one unit.

Activity 14.1 Insert the name of three factory departments whose running costs are likely to be treated as a production overhead.

(1) (2) (3)

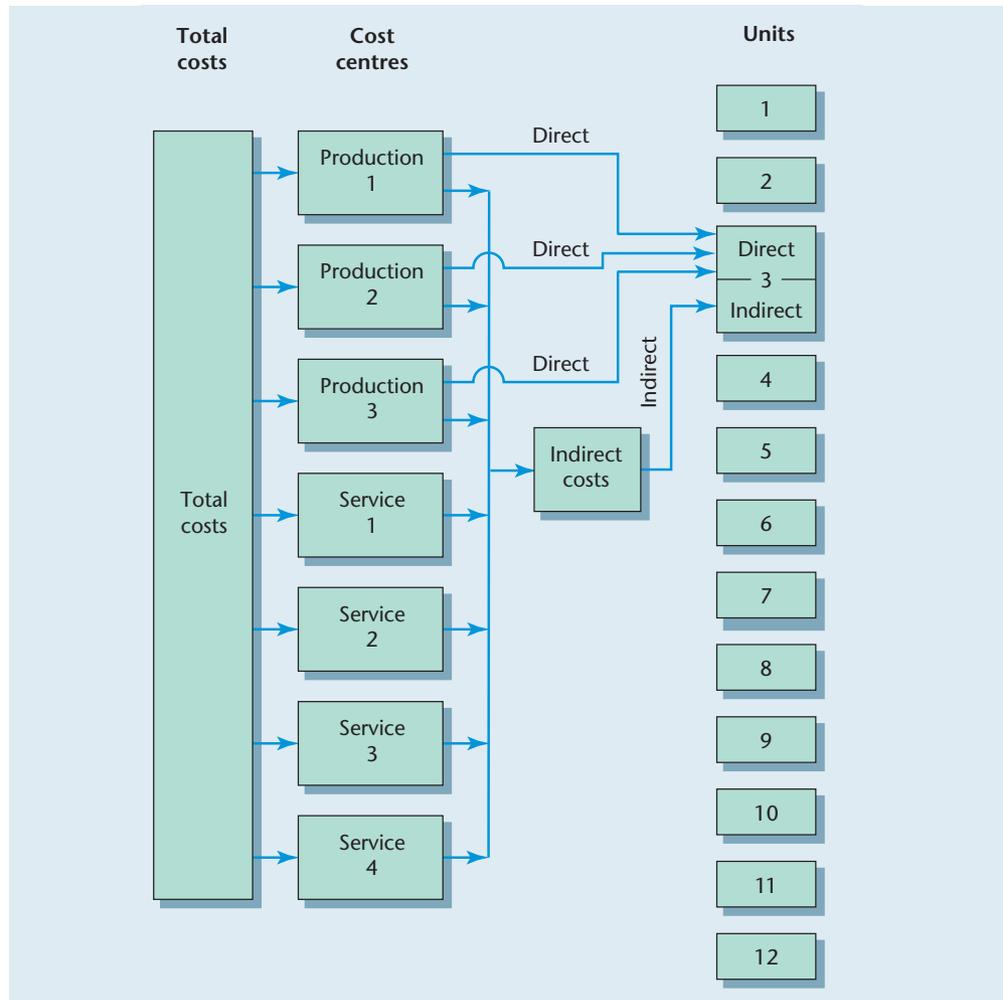


Figure 14.1 Absorption costing system: flow of costs

Stage 1: Allocate all costs to specific cost centres

Allocation is the process of charging the entire cost of an item to a cost centre (or a cost unit) without needing to apportion it or share it out in any way. It is essential that all costs are first allocated to a cost centre because they then become the responsibility of the manager of that centre. Some costs may be difficult to identify with a particular cost centre because they can be associated with a number of cost centres, e.g. factory rent or business rates. Nevertheless, such costs should be charged to a specific cost centre and not a 'general' or a 'sundry' one (even though the relationship may be largely nominal). This requirement is very important because if it is not strictly applied some costs will not be monitored and they will then just spiral out of control.

After the costs have been allocated to a cost centre, the next step is to divide them into two broad categories: *production* cost centres and *service* cost centres. Production cost centres are those departments or sections where the product is manufactured or partly manufactured. *Service* cost centres are those sections or departments that provide a service to other cost centres (including other service cost centres).

Once we have classified the cost centres into 'production' and 'service' we move on to Stage 2.

Stage 2: Share out the production service cost centre costs

There are two ways of sharing out the production service cost centre costs.

- Take *each* cost in each cost centre and charge the cost individually to all the other production and production service cost centres that have benefited from the service provided, e.g. the canteen and the personal department.
- Charge out the *total* of each production service cost centre's costs to all the other production and production service cost centres that have benefited from the service provided.

In practice a combination of both methods is usually adopted, i.e. some costs are charged out individually while the remainder are charged out in total.

Irrespective of which method is adopted the costs are usually shared out using some quantitative factor. A few of the more common methods are described below.

- *Numbers of employees.* This method would be used for those service cost centres that provide a service to individual employees, e.g. the canteen, the works manager's office, and the wages office. Costs will then be apportioned on the basis of the number of employees working in a particular production department as a proportion of the total number of employees working in all production cost centres.
- *Floor area.* This method would be used for such cost centres as cleaning and building maintenance.
- *Activity.* Examples of where this method might be used include the drawings office (on the basis of drawings made), materials handling (based on the number of requisitions processed) and the transport department (on the basis of vehicle operating hours).

A problem arises in dealing with the apportionment of service cost-centre costs when service cost centres provide a service for each other. The wages office, for example, will probably provide a service for the canteen staff, and in turn the canteen staff may provide a service for the wages staff. Before the service cost-centre costs can be apportioned among the production cost centres, therefore, the service cost-centre costs have to be charged out to each other.

Unfortunately, the problem becomes circular because it is not possible to charge some of the canteen costs to the wages office until the canteen has been charged with some of the costs of the wages office. Similarly, it is not possible to charge out the wages office costs until part of the canteen costs have been charged to the wages office. The problem is shown in diagrammatic form in Figure 14.2. The treatment of *reciprocal service costs* (as they are called) can become an involved and time-consuming process unless a clear policy decision is taken about their treatment. There are three main ways of dealing with this problem.

- 1 *Ignore interdepartmental service costs.* If this method is adopted, the respective service cost-centre costs are only apportioned among the production cost centres. Any servicing that the service cost centres provide for each other is ignored.
- 2 *Specified order of closure.* This method requires the service cost-centre costs to be closed off in some specified order and apportioned among the production cost centres and the remaining service cost centres. As the service cost centres are gradually closed off, there will eventually be only one service cost centre left. Its costs will then be apportioned among the production cost centres. Some order of closure has to be specified, and this may be quite arbitrary. It may be based, for example, on those centres that provide a service for the largest number of other service cost centres, or it could be based on the cost centres with the highest or the lowest cost in them prior to any interdepartmental servicing. It could also be based on an estimate of the benefit received by the other centres.
- 3 *Mathematical apportionment.* Each service cost centre's total cost is apportioned among production cost centres and other service cost centres on the basis of the estimated benefit provided. The effect is that additional amounts keep being charged back to a particular service cost centre as further apportionment takes place. It can take a very long time before there is no more cost to charge out to any of the service cost centres. But when that point is reached, all the service cost-centre costs will then have been charged to the production cost centres. This method involves a great deal of exhaustive arithmetical apportionment. It is also very time-consuming, especially when there are a great many service cost centres. Although it is possible to carry out the calculations manually, it is only practical if done by computer.

In choosing one of the above methods it should be remembered that they all depend on an *estimate* of how much benefit one department receives from another. Such an estimate amounts to no more than an informed guess. It appears pedantic therefore, to build an involved arithmetical exercise on the basis of some highly questionable assumptions. So we suggest that interdepartmental servicing charging should be ignored.

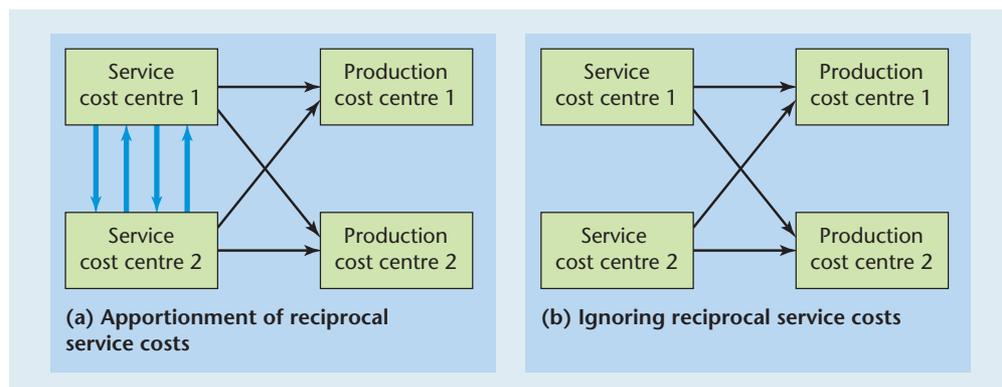


Figure 14.2 Service cost centre reciprocal costs

We have covered some fairly complicated procedures in dealing with Stages 1 and 2. So, before moving on to Stage 3, we use Example 14.1 to illustrate the procedure.

Example 14.1

Charging overhead to cost centres

You are provided with the following indirect cost information relating to the New Manufacturing Company Limited for the year to 31 March 2012:

Cost centre:	£
Production 1: indirect expenses (to units)	24 000
Production 2: indirect expenses (to units)	15 000
Service cost centre A: allocated expenses	20 000
Service cost centre B: allocated expenses	8 000
Service cost centre C: allocated expenses	3 000

Additional information:

The estimated benefit provided by the three service cost centres to the other cost centres is as follows:

Service cost centre A: Production 1 50%; Production 2 30%; Service cost centre B 10%; Service cost centre C 10%.

Service cost centre B: Production 1 70%; Production 2 20%; Service cost centre C 10%.

Service cost centre C: Production 1 50%; Production 2 50%.

Required:

Calculate the total amount of overhead to be charged to cost centre units for both Production cost centre 1 and Production cost centre 2 for the year to 31 March 2012.

Answer to Example 14.1

New Manufacturing Co. Ltd Overhead distribution schedule for the year to 31 March 2012

Cost centre	Production		Service		
	1	2	A	B	C
	£	£	£	£	£
Allocated indirect expenses	24 000	15 000	20 000	8 000	3 000
Apportion service cost centre costs:					
A (50 : 30 : 10 : 10)	10 000	6 000	(20 000)	2 000	2 000
B (70 : 20 : 0 : 10)	7 000	2 000	–	(10 000)	1 000
C (50 : 50 : 0 : 0)	3 000	3 000	–	–	(6 000)
Total overhead to be absorbed by specific units	<u>44 000</u>	<u>26 000</u>	<u>–</u>	<u>–</u>	<u>–</u>

Tutorial notes

- Units passing through Production cost centre 1 will have to share total overhead expenditure amounting to £44,000. Units passing through Production cost centre 2 will have to share total overhead expenditure amounting to £26,000. The number of units passing through both departments may be the same. They might be assembled, for example, in cost centre 1 and packed in cost centre 2.
- The total amount of overhead to be shared amongst the units is £70,000 (44,000 + 26,000) or (£24,000 + 15,000 + 20,000 + 8000 + 3000). The total amount of overhead originally collected in each of the five cost centres does not change.



**Tutorial notes
continued**

- 3 This exhibit involves some interdepartmental reapportionment of service cost centre costs. However, no problem arises because of the way in which the question requires the respective service cost centre costs to be apportioned.
- 4 The objective of apportioning service cost-centre costs is to share them out among the production cost centres so that they can be included in the cost of specific units.

Activity 14.2

What accounting term best fits each of the following one-word dictionary definitions?

Dictionary definition	Accounting term
(1) Assign	
(2) Spread	
(3) Engross	

We can now move on to examine stage 3 of the absorption process.

Stage 3: Absorb the production overhead

Once all the indirect costs have been collected in the production cost centres, the next step is to charge the total amount to specific units. This procedure is known as *absorption*.

The method of absorbing overhead into units is normally a simple one. Accountants recommend a single factor, preferably one related as closely as possible to the movement of overhead. In other words, an attempt is made to choose a factor that directly correlates with the amount of overhead expenditure incurred. Needless to say, like so much else in accounting, there is no obvious factor to choose!

There are six main methods that can be used for absorbing production overhead. They are all based on the same equation:

$$\text{Cost centre overhead absorption rate} = \frac{\text{total cost centre overhead}}{\text{total cost centre activity}}$$

The formulae for each of the six methods are as follows.

(1) Specific units

$$\text{Absorption rate} = \frac{\text{total cost centre overhead}}{\text{number of units processed in the cost centre}}$$

This method is the simplest to operate. The same rate is applied to each unit and so it is only suitable if the units are identical.

(2) Direct materials cost

$$\text{Absorption rate} = \frac{\text{total cost centre overhead}}{\text{cost centre total direct material costs}} \times 100$$

The direct material cost of each unit is then multiplied by the absorption rate.

It is unlikely that there will normally be a strong relationship between the direct material cost and the level of overheads. There might be some special cases, but they are probably quite unusual, e.g. where a company uses a high level of precious metals and its overheads strongly reflect the cost of safeguarding those materials.

(3) Direct labour cost

$$\text{Absorption rate} = \frac{\text{total cost centre overhead}}{\text{cost centre total direct labour costs}} \times 100$$

The direct labour cost of each unit is then multiplied by the absorption rate.

Overheads tend to relate to the amount of time that a unit spends in production and so this method may be particularly suitable since the direct labour cost is a combination of hours worked and rates paid. It may not be appropriate, however, where the total direct labour cost consists of a relatively low level of hours worked and of a high labour rate per hour because the cost will not then relate very closely to time spent in production.

(4) Prime cost

$$\text{Absorption rate} = \frac{\text{total cost centre overhead}}{\text{prime cost}} \times 100$$

The prime cost of each unit is then multiplied by the absorption rate. This method assumes that there is a close relationship between prime cost and overheads.

As there is probably no close relationship between either direct materials or direct labour and overheads, it is unlikely that there will be much of a correlation between prime cost and overheads. So the prime cost method tends to combine the disadvantages of both the direct materials cost and the direct labour cost methods without having any real advantages of its own.

(5) Direct labour hours

$$\text{Absorption rate} = \frac{\text{total cost centre overhead}}{\text{cost centre total direct labour hours}}$$

The direct labour hours of each unit are then multiplied by the absorption rate.

This method is highly acceptable, especially in those cost centres that are labour intensive because time spent in production is largely related to the cost of overhead incurred.

(6) Machine hours

$$\text{Absorption rate} = \frac{\text{total cost centre overhead}}{\text{cost centre total machine hours}}$$

The total machine hours used by each unit is then multiplied by the absorption rate.

This is a most appropriate method to use in those departments that are machine intensive. There is probably quite a strong correlation between the amount of machine time that a unit takes to produce and the amount of overhead incurred.

The various absorption methods are illustrated in Example 14.2.

Activity 14.3

Think of all the costs of running a factory. Apart from direct material and direct labour costs, what other costs are likely to be involved? List three of them and then attach to each one the main factor that is likely to cause them either to increase or to decrease.

Example 14.2**Calculation of overhead absorption rates**

Old Limited is a manufacturing company. The following information relates to the assembling department for the year to 30 June 2012:

	<i>Assembling department</i>
	<i>Total</i>
	<i>£000</i>
Direct material cost incurred	400
Direct labour incurred	200
Total factory overhead incurred	100
Number of units produced	10 000
Direct labour hours worked	50 000
Machine hours used	80 000

Required:

Calculate the overhead absorption rates for the assembling department using each of the following methods:

- (a) specific units
- (b) direct material cost
- (c) direct labour cost
- (d) prime cost
- (e) direct labour hours
- (f) machine hours.

Answer to Example 14.2

- (a) Specific units:

$$\text{OAR} = \frac{\text{TCCO}}{\text{Number of units}} = \frac{\pounds 100\,000}{10\,000} = \underline{\pounds 10.00 \text{ per unit}}$$

- (b) Direct material cost:

$$\text{OAR} = \frac{\text{TCCO}}{\text{Direct material cost}} \times 100 = \frac{\pounds 100\,000}{400\,000} \times 100 = \underline{25\%}$$

- (c) Direct labour cost:

$$\text{OAR} = \frac{\text{TCCO}}{\text{Direct labour cost}} \times 100 = \frac{\pounds 100\,000}{200\,000} \times 100 = \underline{50\%}$$

- (d) Prime cost:

$$\text{OAR} = \frac{\text{TCCO}}{\text{Prime cost}} \times 100 = \frac{\pounds 100\,000}{400\,000 + 200\,000} \times 100 = \underline{16.67\%}$$

- (e) Direct labour hours:

$$\text{OAR} = \frac{\text{TCCO}}{\text{Direct labour hours}} = \frac{\pounds 100\,000}{50\,000} = \underline{\pounds 2.00 \text{ per direct labour hour}}$$

- (f) Machine hours:

$$\text{OAR} = \frac{\text{TCCO}}{\text{Machine hours}} = \frac{\pounds 100\,000}{80\,000} = \underline{\pounds 1.25 \text{ per machine hour}}$$

Example 14.2 illustrates the six absorption methods outlined in the text. In practice, only one absorption method would normally be chosen for each production cost centre, although different production cost centres may adopt different methods, e.g. one may choose a direct labour-hour rate and another may adopt a machine-hour rate.

The most appropriate absorption rate method will depend on individual circumstances. A careful study would have to be made of the correlation between (a) direct materials, direct labour, other direct expenses, direct labour hours and machine hours; and (b) total overhead expenditure. However, it is generally accepted that overhead tends to move with time, so the longer a unit spends in production the more overhead it will incur. So if this is the case, labour-intensive cost centres should use the direct labour hour method while machine-intensive departments should use the machine hour method.

A comprehensive example

At this stage it will be useful to illustrate overhead absorption in the form of a comprehensive example, although that does not mean that we are going to use hundreds of costs centres! The example chosen uses the minimum amount of information for us to bring together all the basic principles of overhead absorption.

Example 14.3

Overhead absorption

Oldham Limited is a small manufacturing company producing a variety of pumps for the oil industry. It operates from one factory that is geographically separated from its head office. The components for the pumps are assembled in the assembling department; they are then passed to the finishing department, where they are painted and packed. There are three service cost centres: administration, stores and work study.

The following information is relevant for the year to 30 June 2012:

<i>Allocated cost-centre overhead costs:</i>	<i>£000</i>
Administration	70
Assembling	25
Finishing	9
Stores	8
Work study	18

Additional information:

- 1 The allocated cost centre overhead costs are all considered to be indirect costs as far as specific units are concerned.
- 2 35,000 machine hours were worked in the assembling department, and 60,000 direct labour hours in the finishing department.
- 3 The average number of employees working in each department was as follows:

Administration	15
Assembling	25
Finishing	40
Stores	2
Work study	3
	<u>85</u>



Example 14.3
continued

- 4 The stores received 15,000 requisitions from the assembling department, and 10,000 requisitions from the finishing department. The stores department did not provide a service for any other department.
- 5 The work study department carried out 2000 chargeable hours for the assembling department and 1000 chargeable hours for the finishing department.
- 6 One special pump (code named MEA 6) was produced. It took 10 machine hours of assembling time, and 15 direct labour hours were worked on it in the finishing department. Its total direct costs (materials and labour) amounted to £100.

Required:

- (a) Calculate an appropriate absorption rate for:
 - (i) the assembling department,
 - (ii) the finishing department.
- (b) Calculate the total factory cost of the special MEA 6 pump.

Answer to
Example
14.3(a)

Oldham Ltd
Overhead distribution schedule for the year to 30 June 2012

Cost centre	Production			Service	
	Assembling	Finishing	Adminis- tration	Stores	Work study
	£000	£000	£000	£000	£000
Allocated overhead costs (1)	25	9	70	8	18
Production					
Apportion administration:					
25 : 40 : 2 : 3 (2)	25	40	(70)	2	3
Apportion stores: 3 : 2 (3)	6	4	–	(10)	–
Apportion work study: 2 : 1 (4)	14	7	–	–	(21)
Total overhead to be absorbed	70	60	–	–	–

Tutorial notes

- 1 The allocated overhead costs were given in the question.
- 2 Administration costs have been apportioned on the basis of employees. Details were given in the question. There were 85 employees in the factory but 15 of them were employed in the administration department. Administration costs have, therefore, been apportioned on a total of 70 employees, or £1000 per employee. The administration department is the only service department to provide a service for the other service departments, so no problem of interdepartmental servicing arises.
- 3 The stores costs have been apportioned on the number of requisitions made by the two production cost centres, that is 15,000 + 10,000 = 25,000, or 3 to 2.
- 4 The work study costs have been apportioned on the basis of chargeable hours, i.e. 2000 + 1000 = 3000, or 2 to 1.

Calculation of chargeable rates:

- 1 Assembling department:

$$\frac{\text{TCCO}}{\text{Total machine hours}} = \frac{£70\,000}{35\,000} = £2.00 \text{ per machine hour}$$

- 2 Finishing department:

$$\frac{\text{TCCO}}{\text{Total direct labour hours}} = \frac{£60\,000}{60\,000} = £1.00 \text{ per direct labour hour}$$

It would seem appropriate to absorb the assembling department's overhead on the basis of machine hours because it appears to be a machine-intensive department. The finishing department appears more labour intensive and so its overhead has been absorbed on that basis.

Answer to
Example
14.3(b)

MEA 6: Calculation of total factory cost

	£	£
Direct costs (as given in note 6)		100
Add: factory overhead:		
Assembling department (10 machine hours × £2.00 per MH)	20	
Finishing department (15 direct labour hours × £1.00 per DLH)	15	35
Total factory cost		<u>135</u>

Non-production overhead

News clip

Tailoring costs and cuts

Dress2Kill, a modern bespoke tailoring service in London, has had to cut its costs owing to a downturn in business following the banking crisis. Sales had been booming but the business had too much stock and high overheads. So two out of the three shops were closed and eight out of twenty staff were made redundant. Within six months overheads had been reduced from £70,000 to £30,000. Oh, and the book-keeper was fired for failing to warn the owner of the risks that had been taken.

Source: Adapted from www.ft.com/cms, 11 May 2009.

In the previous section we concentrated on the apportionment and absorption of *production* overheads. Most companies will, however, incur expenditure on activities that are not directly connected with production activities. For example, there could be selling and distribution costs, research and development costs, and head office administrative expenses. How should these types of cost be absorbed into unit cost?

Before this question can be answered, it is necessary to find out *why* we would want to apportion them. There are three possible reasons:

- *Control.* The more that an entity's costs are broken down, the easier it is to monitor them. It follows that just as there is an argument for having a detailed system of responsibility accounting at cost centre level, so there is an argument for having a similar system at unit cost level. However, in the case of non-production expenses this argument is not a very strong one. The relationship between units produced and non-production overhead is usually so remote that no meaningful estimate of the benefit received can be made. So the apportionment of non-production overhead is merely an arithmetical exercise, and no manager could be expected to take responsibility for costs charged to their cost centre in this way. From a control point of view, therefore, the exercise is not very helpful.
- *Selling price.* In some cases, it might be necessary to add to the production cost of a specific unit a proportion of non-production overhead in order to determine a selling price that covers all costs and allows a margin for profit. This system of fixing selling prices may apply in some industries, e.g. in tendering for long-term contracts or in estimating decorating costs. In most cases, however, selling prices are determined by the market and companies are not usually in a position to fix their selling prices based on cost with a percentage added on for profit (known as cost-plus pricing).

- *Stock valuation.* You might think that we need to include non-production overheads in valuing stocks but as SSAP 9 does not permit them to be included they are usually ignored, even in management accounting. This is largely because much more work will be involved if the management accounts had to be altered to suit the requirements of the financial accounts.

It is obvious from the above summary that there are few benefits to be gained by charging a proportion of non-production overhead to specific cost units. In theory, the exercise is attractive because it would be both interesting and useful to know the *actual* cost of each unit produced. In practice, however, it is impossible to arrive at any such cost, and so it seems pointless becoming engaged in a purely spurious arithmetical exercise.

The only real case for apportioning non-production overhead applies where selling prices can be based on cost. What can be done in those situations? There is still no magic formula and an arbitrary estimate has still to be made. The easiest method is simply to add a percentage to the total production cost, perhaps based on this relationship between non-production overhead and total cost. This is bound to be a somewhat questionable method, since there can be no close relationship between production and non-production activities. It follows that the company's tendering or selling-price policy should not be too rigid if it is based on this type of cost-plus pricing.

Activity 14.4

You are a manager in a company that manufactures consumer products. Market prices are competitive and you need to keep down your costs. Do you think that charging non-production overhead to unit costs serves any purpose in this context? Tick the box below as appropriate and then give your reasons.

Yes No

Why? _____

Predetermined absorption rates

An absorption rate can be calculated on a historical basis (i.e. after the event), or it can be predetermined (i.e. calculated in advance).

As we have argued, there is no close correlation between fixed overhead and any particular measure of activity: it can only be apportioned on what seems to be a reasonable basis. However, if we know the total actual overhead incurred, we can make sure that it is all charged to specific units, even if we are not sure of the relationship that it has with any particular unit.

In order to do so we need to know the *actual cost of overheads* and the *actual activity level* (whether measured in machine hours, direct labour hours or on some other basis). In other words, we can only make the calculation when we know *what* has happened.

The adoption of *historical* absorption rates is not usually very practicable. We have to wait until the actual period is over before an absorption rate can be calculated, the products costed and the customers invoiced. It is therefore, preferable to use what is known as a *pre-determined absorption rate*. This involves estimating the overhead likely to be incurred and the direct labour hours (or machine hours) that are expected to be worked. If one or other of these estimates turns out to be inaccurate then we would have either undercharged our customers (if the rate was too low), or overcharged them (if the rate was too high).

This situation could be very serious for a company. Low selling prices caused by using a low absorption rate could have made the company's products very competitive, but there is not much point in selling a lot of units if they are being sold at a loss. Similarly, a high absorption rate may result in a high selling price. Each unit may then make a large profit but not enough units may be sold to enable the company to make an overall profit.

The difference between the actual overhead incurred and the total overhead charged to production (calculated on a predetermined basis) gives rise to what is known as a *variance*. If the actual overhead incurred is in excess of the amount charged out, the variance will be *adverse*, i.e. the profit will be less than expected. However, if the total overhead charged to production is less than was estimated then the variance will be *favourable*. The effect of this procedure is shown in diagrammatic form in Figure 14.3. Other things being equal, a favourable variance gives rise to a higher profit, and an adverse variance results in a lower profit.

It is a cardinal rule in costing that variances should be written off to the profit and loss account at the end of the costing period in which they were incurred. It is not considered fair to burden the next period's accounts with the previous period's mistakes. In other words, we should start off the new accounting period with a clean sheet.

Throughout the preceding sections we have clearly expressed many reservations about the way in which accountants have traditionally dealt with overheads. In recent years, dissatisfaction about overhead absorption has become widespread, and now a different technique called *activity-based costing* is being advocated. We review it briefly in the next section.

Activity 14.5

Fill in the missing words.

- _____ means to estimate beforehand an appropriate absorption rate.
- The difference between the actual overhead incurred and the total overhead charged is known as a _____.

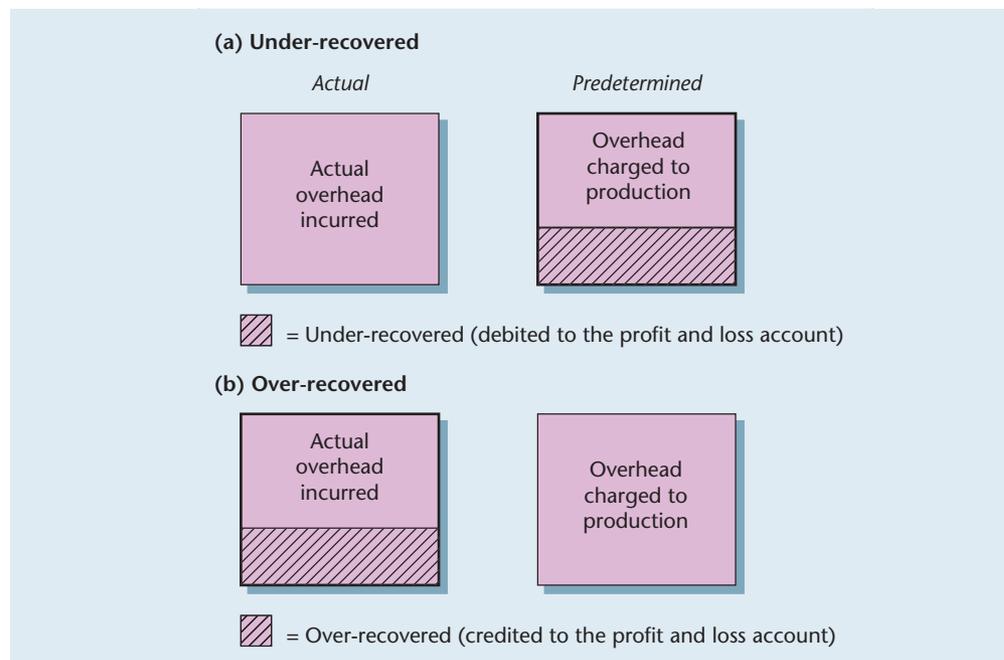


Figure 14.3 Predetermined rates under- and over-recovery of overhead

Activity-based costing

As we have seen, the calculation of product costs involves identifying the *direct costs* of a product and then adding (or absorbing) a proportion of the *indirect costs* (i.e. the overheads) to the total of the direct costs.

This was the method used for most of the twentieth century. It was only in the 1980s that it began to be apparent that the traditional method of absorbing overhead was inappropriate in an advanced manufacturing environment. As the traditional method involves calculating the total cost of overheads in a particular cost centre and charging them out to particular units on a time basis, the total cost is *averaged* among those units that flow through that particular cost centre. The assumption behind this procedure is that the more time that a unit spends in production, the more overhead it will incur. Such an assumption means, of course, that no distinction is made between fixed and variable overhead. It also means that irrespective of whether a particular unit causes a certain cost to arise in a cost centre, it is still charged with a proportion of that cost.

We will use an example to illustrate this point. The details are contained in Example 14.4.

Example 14.4

Overhead absorption: the unfairness of the traditional approach

In Jasmine Ltd's production cost centre 1, two units are produced: Unit A and Unit B, the total overhead cost being £1000. This is made up of two costs: (1) machine set-up costs of £800; and (2) inspection costs of £200. Overhead is absorbed on the basis of direct labour hours. The total direct labour hours (DLH) amount to 200. Unit A requires 150 DLH and Unit B 50 DLH.

The machinery for Unit A only needs to be set up once whereas Unit B requires nine set-ups. Unit A and Unit B both require two inspections each.

Required:

- (a) Calculate the total overhead to be charged to Unit A and to Unit B using:
 - (i) the traditional method of absorbing overhead
 - (ii) a fairer method based on set-up and inspection costs
- (b) Prepare a table comparing the two methods.

Answer to Example 14.4

(a) (i) The traditional method

The absorption rate is £5 per direct labour hour (£1000 total overhead ÷ 200 direct labour hours). As Unit A has 150 direct labour hours spent on it, it will absorb £750 (150 DLH × £5) of overhead. Unit B has 50 direct labour hours spent on it; it will, therefore, absorb £250 of overhead (50 DLH × £5).

(a) (ii) A fairer method

Each set-up costs £80 [£800 ÷ 10 (1 set-up for A + 9 set-ups for B)].

Each inspection costs £50 [£200 ÷ 4 (2 inspections for A + 2 inspections for B)].

The total overhead charged to Unit A, therefore, would be £180: £80 for set-up costs (1 set-up × £80) plus £100 inspection costs (2 inspections × £50).

Unit B would be charged a total of £820: £720 of set-up costs (9 set-ups × £80) and £100 inspection costs (2 inspections × £50).

The fairer method illustrated here is known as *activity-based costing*.

(b) Comparing the two methods

The table below compares the two approaches to overhead absorption:

Jasmine Limited		
<i>Product</i>	<i>Overhead absorbed on a traditional basis</i>	<i>Overhead absorbed on an activity basis</i>
	£	£
A	750	180
B	250	820
Total	<u>1 000</u>	<u>1 000</u>

Example 14.4 illustrates the potential unfairness of the traditional method of absorbing overhead. As the method *averages* the total cost among particular units, those units that do not benefit from a particular activity bear a disproportionate amount of the total cost. In the above example, Unit A should only be charged £180 of overhead (compared with £750 under the traditional method), whereas Unit B should be charged £820 (compared with £250 under the traditional method).

It follows that if the eventual selling price is based on cost, the traditional method would grossly inflate Unit A's selling price and deflate Unit B's selling price. Unit A's selling price would probably be highly uncompetitive and only a few units might be sold. Unit B's selling price would probably be highly competitive. So a great many units of Unit B might be sold but the total sales revenue may not be sufficient to recover all the overhead costs.

The fairer method that we have described is called activity-based costing (ABC). In order to illustrate the principles behind ABC, we have made reference to just one cost centre. However, in practice overheads for the whole of the entity (including both manufacturing and non-manufacturing overheads) would be dealt with collectively. They would then be allocated to *cost pools*, i.e. similar areas of activity. It is estimated that even in the largest entities a total of about 30 cost pools is the maximum number that it is practicable to handle. This means that some costs may be allocated to a cost pool where there is only a distant relationship between some of the costs. In other words, like the traditional method of absorbing overheads, ABC also involves some averaging of costs.

Once the overheads have all been allocated to an appropriate cost pool, a *cost driver* for each pool is selected. A cost driver is the main cause of the costs attached to that pool. Once again some approximation is necessary because some costs collected in that pool may only have a loose connection with the selected driver. By dividing the total cost in a particular cost pool by the cost driver, an overhead cost per driver can be calculated. For example, suppose the total overhead cost collected in a particular cost pool totalled £1000 and the costs in that pool were driven by the number of material requisitions (say 200), the cost driver rate would be £5 per material requisition (£1000 cost ÷ 200 material requisitions).

The final stage is to charge an appropriate amount of overhead to each unit benefiting from the service provided by the various cost pools. So if a particular unit required 10 material requisitions and the cost driver rate was £5 per material requisition, it would be charged £50 (£5 per material requisition × 10 requisitions). Of course, it may benefit from the services provided by a number of other cost pools, so it would collect a share of overhead from each of them as well.

The above procedures are illustrated in Example 14.5.

**Example
14.5****Activity-based costing (ABC)**

Shish Limited has recently introduced an ABC system. The following details relate to the month of March 2012.

- Four cost pools have been identified: parts, maintenance, stores and administration.
- The cost drivers that were identified with each cost pool are: total number of parts, maintenance hours, number of material requisitions and number of employees.
- Costs and activities during the month were:

Cost pool	Total overhead £000	Activity	Quantity
Parts	10 000	Number of parts	500
Maintenance	18 000	Number of maintenance hours	600
Stores	10 000	Number of material requisitions	20
Administration	2 000	Number of employees	40

- 500 units of Product X3 were produced. This production run required 100 parts and 200 maintenance hours; 6 material requisitions were made and 10 employees worked on the units.

Required:

Using ABC, calculate the total amount of overhead absorbed by each unit of Product X3 in March 2012.

**Answer to
Example 14.5**

Shish Ltd					
Cost pool	Overhead	Cost driver	Cost driver rate	Usage by Product X3	Overhead cost charged to Product X3
(1)	(2) £000	(3)	(4) £	(5)	(6) £
Parts	10 000	500 parts	20	100 parts	2 000
Maintenance	18 000	600 hours	30	200 hours	6 000
Stores	10 000	20 requisitions	500	6 requisitions	3 000
Administration	2 000	40 employees	50	10 employees	500
Total overhead to be absorbed by Product X3					11 500

- Column (4) has been obtained by dividing the data in column (2) by the data in column (3).
- The data in column (6) has been obtained by multiplying the data in column (4) by the data in column (5).
- The total amount of £11,500 shown in column (6) is the total amount of overhead to be absorbed by Product X3.

Solution

The total amount of overhead to be absorbed by each unit of Product X3 would be £23 (£11,500 ÷ 500 units).

ABC is an attempt to absorb overhead on the demands that a particular unit in production makes of the various resources that it uses before it is completed and becomes part of the 'finished stock'. In traditional overhead absorption costing, a unit is charged with the *average* charge for overheads irrespective of what proportion relates to that specific

unit. This means that some units are charged with more than their fair share of overheads while others are perhaps charged with much less.

There is no difference in principle between ABC and traditional overhead absorption costing. ABC simply looks for a closer relationship between individual activities and the relationship that they have with specific units of production, while the traditional method adopts a more general approach. However, ABC does not require any distinction to be made between production overhead and non-production overhead – an issue that is largely ignored in traditional overhead absorption.

Activity 14.6

Tick the box in the relevant column.

	True	False
Activity-based costing (ABC) has been practised for over 100 years.		
ABC is simply a more complicated way of absorbing overheads.		
The main problem with ABC is in selecting appropriate cost drivers		



Questions you should ask

The topic covered in this chapter is one that should encourage non-accountants to ask some very searching questions. We suggest that you use the following as a starting point.

- Have you had any problems in identifying some costs with particular cost centres?
- If so, which?
- How did you decide which cost centre to charge them to?
- What methods have you used to charge service cost centre costs to production cost centres?
- Have you ignored any interservice cost centre charging?
- If not, how have you dealt with the problem?
- What activity bases have you used to absorb overheads into product costs?
- Have you worked out absorption rates on a historical or a predetermined basis?
- What have you done about non-production overheads?
- Is there a case for switching to activity-based costing?

Conclusion

In this chapter we have continued our study of cost accounting that began in Chapter 13. In it we have explained how production overheads are absorbed into product costs. In summary, the procedure is as follows.

- 1 Allocate all costs to appropriate cost centres.
- 2 Distinguish between production and service cost centres.
- 3 Examine the individual costs in each production service cost centre and, where possible, apportion them on some equitable basis to other cost centres.
- 4 Apportion the total of any remaining service cost centre costs either (1) to production cost centres or (2) to production cost centres as well as other service cost centres. If (2), continue to reapportion the service cost centre costs until they have all been charged to production cost centres.
- 5 Select an absorption method based on either the number of units flowing through a particular cost centre or on the time a unit spends in the cost centre based on direct labour cost, direct labour hours or machine hours.
- 6 Divide the total overhead in each production cost centre by the selected absorption factor.
- 7 Charge each unit with its share of overhead (e.g. direct labour hours or machine hours \times the absorption rate).
- 8 Add the amount calculated to the total direct cost of that unit.

It is also necessary to determine whether the above procedure should be done on a historical or a predetermined basis and whether non-production overheads should also be absorbed into product cost.

The above method has been in use for well over 100 years. Some academics and practitioners do not believe that it is suitable for modern manufacturing methods. In recent years a new method called *activity-based costing* has been adopted by some large companies. ABC is similar to traditional overhead absorption costing except that both production and non-production overheads are assigned to one of a number of identifiable cost pools. The main factor that causes those overheads to be incurred (known as a *cost driver*) is identified and a cost driver rate calculated (the pool overhead divided by the cost driver). Products are then charged with their share of each of the cost pool overheads.

Key points

- 1 In order to charge unit costs with a share of production overheads, *all* costs should first be identified with a specific cost centre.
- 2 Some cost centres provide a service to other cost centres. These are known as *service cost centres*. The various costs collected in the service cost centres should be shared out on an apportionment basis among the other cost centres. Some costs collected in the service cost centres may be apportioned separately; otherwise, the *total service cost centre cost* will be apportioned. An element of cross-charging arises when the service centres provide services for each other. This can be resolved either by ignoring any cross-charging, apportioning the total of the service centre costs in some specified order, or by mathematical apportionment.
- 3 Once the production cost centres have received their share of the service centre costs, an absorption rate for each production cost centre should be calculated. The traditional method is to take the total of each production cost centre's indirect cost (i.e. its overhead) and divide it either by the actual (or planned) direct labour hours, or by the machine hours actually worked (or planned to be worked) in that particular cost centre.

- 4 The absorption rate calculated for each production cost centre is used to charge each unit passing through that cost centre with a share of the production overhead.
- 5 The total production cost of a particular unit can then be calculated as follows:

$$\text{direct materials cost} + \text{direct labour cost} + \text{direct expenses} + \text{share of production overhead} = \text{total production cost}.$$
- 6 The absorption of non-production overhead (head office administration expenses, selling and distribution costs, and research development costs) is not recommended, except when it may be required for pricing purposes.
- 7 Absorption rates will normally be predetermined, i.e. they will be based on planned costs and anticipated activity levels.
- 8 The under-absorption or over-absorption of overhead should be written off to the profit and loss account in the period when it was spent.
- 9 In recent years a new way of dealing with the absorption of overheads called *activity-based costing* has been suggested. ABC involves charging overheads to common cost pools, identifying what main factor drives the costs in each of the respective pools, and then calculating a cost driver rate. Units are then charged with their share of each of the pool costs.

Check your learning

The answers to these questions can be found within the text.

- 1 What is (a) a production cost centre, (b) a service cost centre?
- 2 What do the terms 'allocate', 'apportion' and 'absorb' mean?
- 3 Suggest three ways that service cost centre costs may be charged to other cost centres.
- 4 What is meant by 'reciprocal service costs'?
- 5 Indicate three ways to deal with them.
- 6 What is the basic formula for absorbing production overheads into product costs?
- 7 List six methods of how this may be done.
- 8 What is non-production overhead?
- 9 How should it be absorbed into product costs?
- 10 What is a predetermined absorption rate?
- 11 What is meant by under- and over-recovery of overhead?
- 12 What do the initials 'ABC' mean?
- 13 What is a cost pool and a cost driver?
- 14 How does ABC differ from traditional absorption costing?

News story quiz

Remember the news story at the beginning of this chapter? Go back to that story and reread it before answering the following questions.

In 2009 Boeing was one of many companies throughout the world that announced a cut in overheads in an attempt to avoid making a loss. But what is really meant by 'overheads'?

Questions

- 1 To what extent do you think that making 4500 employees redundant is related to cutting overheads?
- 2 If most of the job losses are to come from administrative positions what impact is this likely to have on the main business of the company?
- 3 What do you think the President and CEO of Boeing means when he states that this action is being taken to make sure that the company is 'well positioned'?

Tutorial questions

The answers to questions marked with an asterisk may be found in Appendix 4.

- 14.1 'Arithmetical precision for precision's sake.' How far is this statement true of the traditional methods used in absorbing overheads into product costs?
- 14.2 Has total absorption costing any relevance in a service industry?
- 14.3 Some non-accountants believe that the technique of overhead absorption was devised simply to provide jobs for accountants. How far do you agree?
- 14.4 How should reciprocal service costs be dealt with when calculating product costs?
- 14.5 Assess the usefulness of activity-based costing in managerial decision making.
- 14.6* Scar Limited has two production departments and one service department. The following information relates to January 2012:

	£
Allocated expenses:	
Production department: A	65 000
B	35 000
Service department	50 000

The allocated expenses shown above are all indirect expenses as far as individual units are concerned.

The benefit provided by the service department is shared among the production departments A and B in the proportion 60 : 40.

Required:

Calculate the amount of overhead to be charged to specific units for both production department A and production department B.

- 14.7*** Bank Limited has several production departments. In the assembly department it has been estimated that £250,000 of overhead should be charged to that particular department. It now wants to charge a customer for a specific order. The relevant data are:

	<i>Assembly department</i>	<i>Specific unit</i>
Number of units	50 000	–
Direct material cost (£)	500 000	8.00
Direct labour cost (£)	1 000 000	30.00
Prime cost (£)	1 530 000	40.00
Direct labour hours	100 000	3.5
Machine hours	25 000	0.75

The accountant is not sure which overhead absorption rate to adopt.

Required:

Calculate the overhead to be absorbed by a specific unit passing through the assembly department using each of the following overhead absorption rate methods:

- specific units
- percentage of direct material cost
- percentage of direct labour cost
- percentage of prime cost
- direct labour hours
- machine hours.

- 14.8** The following information relates to the activities of the production department of Clough Limited for the month of March 2012:

	<i>Production department</i>	<i>Order number 123</i>
Direct materials consumed (£)	120 000	20
Direct wages (£)	180 000	25
Overhead chargeable (£)	150 000	
Direct labour hours worked	30 000	5
Machine hours operated	10 000	2

The company adds a margin of 50 per cent to the total production cost of specific units in order to cover administration expenses and to provide a profit.

Required:

- Calculate the total selling price of order number 123 if overhead is absorbed using the following methods of overhead absorption:
direct labour hours;
machine hours.
- State which of the two methods you would recommend for the production department.

- 14.9** Burns Limited has three production departments (processing, assembly and finishing) and two service departments (administration and work study). The following information relates to April 2012:

	£
<i>Direct material</i>	
Processing	100 000
Assembling	30 000
Finishing	20 000

<i>Direct labour</i>	
Processing (£4 × 100 000 hours)	400 000
Assembling (£5 × 30 000 hours)	150 000
Finishing (£7 × 10 000 hours) + (£5 × 10 000 hours)	120 000
Administration	65 000
Work study	33 000
<i>Other allocated costs</i>	
Processing	15 000
Assembling	20 000
Finishing	10 000
Administration	35 000
Work study	12 000

Apportionment of costs:

	<i>Process</i>	<i>Assembling</i>	<i>Finishing</i>	<i>Work study</i>
	%	%	%	%
Administration	50	30	15	5
Work study	70	20	10	–

Total machine hours: Processing 25 000

All units produced in the factory pass through the three production departments before they are put into stock. Overhead is absorbed in the processing department on the basis of machine hours, on the basis of direct labour hours in the assembling department, and on the basis of the direct labour cost in the finishing department.

The following details relate to unit XP6:

	£	£
<i>Direct materials</i>		
Processing	15	
Assembling	6	
Finishing	<u>1</u>	22
<i>Direct labour</i>		
Processing (2 hours)	8	
Assembling (1 hour)	5	
Finishing [(1 hour × £7) + (1 hour × £5)]	<u>12</u>	<u>25</u>
Prime cost		<u><u>47</u></u>

XP6: Number of machine hours in the processing department = 6

Required:

Calculate the total cost of producing unit XP6.

14.10 Outlane Limited's overhead budget for a certain period is as follows:

	£000
Administration	100
Depreciation of machinery	80
Employer's national insurance	10
Heating and lighting	15
Holiday pay	20
Indirect labour cost	10
Insurance: machinery	40
property	<u>11</u>
	<i>c/f</i> <u>286</u>

	£000
	<i>b/f</i> 286
Machine maintenance	42
Power	230
Rent and rates	55
Supervision	50
	<u>663</u>

The company has four production departments: L, M, N and O. The following information relates to each department.

<i>Department</i>	<i>L</i>	<i>M</i>	<i>N</i>	<i>O</i>
Total number of employees	400	300	200	100
Number of indirect workers	20	15	10	5
Floor space (square metres)	2 000	1 500	1 000	1 000
Kilowatt hours' power consumption	30 000	50 000	90 000	60 000
Machine maintenance hours	500	400	300	200
Machine running hours	92 000	38 000	165 000	27 000
Capital cost of machines (£)	110 000	40 000	50 000	200 000
Depreciation rate of machines (on cost)	20%	20%	20%	20%
Cubic capacity	60 000	30 000	10 000	50 000

Previously, the company has absorbed overhead on the basis of 100 per cent of the direct labour cost. It has now decided to change to a separate machine-hour rate for each department.

The company has been involved in two main contracts during the period, the details of which are as follows:

<i>Department</i>	<i>Contract 1:</i>	<i>Contract 2:</i>
	<i>Direct labour hours and machine hours</i>	<i>Direct labour hours and machine hours</i>
L	60	20
M	30	10
N	10	10
O	—	60
	<u>100</u>	<u>100</u>

Direct labour cost per hour in both departments was £3.00.

Required:

- Calculate the overhead to be absorbed by both contract 1 and contract 2 using the direct labour cost method.
- Calculate the overhead to be absorbed using a machine-hour rate for each department.

Further practice questions, study material and links to relevant sites on the World Wide Web can be found on the website that accompanies this book. The site can be found at www.pearsoned.co.uk/dyson