

Chapter 4

Overhead costs

Real world case 4.1

The following advice is offered to businesses that wish to provide coffee as part of their customer service.

The cost of a cup of coffee consists of more than the ingredients and the coffee machine. In order to get a fully integrated picture of the cup costs, one needs to add costs for brewing time, cleaning time, waste of coffee, service and maintenance costs, machine depreciation, machine financing costs, filter papers and other cost elements which might be invisible to the eye. Even, unfortunately, theft is a cost to include. All these 'hidden costs' have to be taken into account!



Coffee should not only be viewed as an additional cost but rather as a way of improving business results and customer satisfaction. Therefore, rather than comparing coffee suppliers and systems just on costs, view them from the standpoint of: 'how can I achieve the best business result with this?' For tips, please look at our recipes and sales tips sections.

The coffee systems made by Douwe Egberts will offer a fully transparent insight into the costs of your coffee service and will be a great help to you in making more money on your coffee sales!

Source: <http://www.douweegbertscoffe systems.com/dg/OutOfHome/CoffeeConsultancy/CupOfCoffee/>, accessed Sept. 2009.

Discussion points

- 1 What are the direct costs of a cup of coffee?
- 2 What are the indirect costs of a cup of coffee?

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Learning outcomes

After reading this chapter you should be able to:

- State the main components of total product cost.
- Explain the traditional approach to allocating and apportioning production overheads to products.
- Explain how cost drivers may be used to allocate overhead costs in activity-based costing.
- Compare and contrast the traditional and activity-based methods of dealing with overhead costs.
- Describe and discuss examples of research into methods of overhead costing.

4.1 Introduction

This chapter begins by outlining traditional procedures for recording the costs of production overheads and indicates some of the problems that are encountered. Many of these procedures remain a cornerstone of present-day management accounting, but some management accountants have looked for new procedures. In particular, **activity-based costing (ABC)** has been developed as a new way of recording overhead costs.

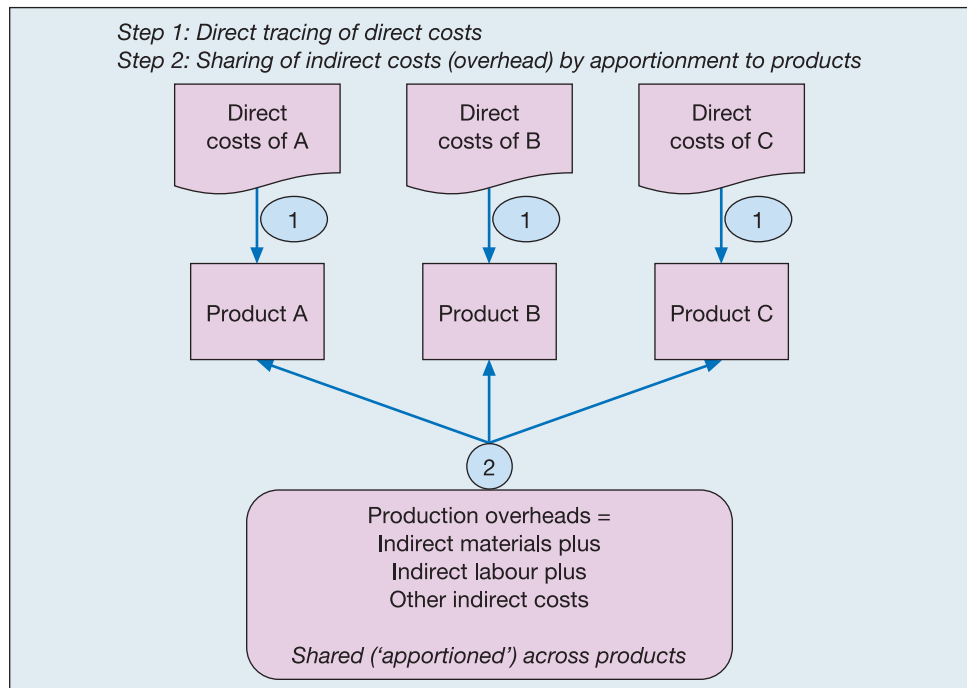
A statement of the cost of a unit of output is shown in Table 4.1. It includes the costs of materials and labour, which have been explained and discussed in Chapter 3. This chapter explains how overhead costs are recorded and traced to the output of the organisation. Figure 4.1 summarises the way in which costs are traced to products. It relates to a cost centre where the output consists of three different products (goods or services).

The direct costs in Figure 4.1 consist of direct materials, direct labour and any other costs that are directly identifiable with a product. We know how much material is

Table 4.1
Statement of cost of a production item

	£	£
Direct materials		xxx
Direct labour		xxx
Other direct costs		<u>xxx</u>
Prime cost		xxx
Indirect materials	xxx	
Indirect labour	xxx	
Other indirect costs	<u>xxx</u>	
Production overhead		<u>xxx</u>
Total product cost		<u>xxx</u>

Figure 4.1
Tracing costs of Products A, B and C in a single cost centre



needed for the product, we know how much labour time is worked on the product and we know about any other costs related only to that product. So the arrows flowing downwards in Figure 4.1 show the direct costs of each product flowing directly to that product.

Some materials, some labour and some other costs are classified as indirect costs because they are spread across a range of products. These have to be shared in some way across the products. Figure 4.1 shows the overhead costs being apportioned ('shared') across products. One debate in management accounting focuses on how to carry out that process of **apportionment**. This chapter presents two approaches in that debate.

Section 4.2 brings together all the indirect costs of production and groups them under the heading production overhead cost. It describes the process of ensuring that overhead costs reach the products, using the **traditional approach**. Section 4.3 sets out an alternative to section 4.2 by sharing out the production overhead costs using an activity-based costing approach. Section 4.4 compares the traditional and the ABC approaches.

Activity 4.1

Think about a journey you have made on public transport. What are the labour costs of operating one journey? What overhead costs are incurred by the organisation providing the transport? How might you find out whether the fares charged to passengers reflect the cost of the transport service?

Real world case 4.2

The following extract is taken from a website on which the UK government explains how activity-based costing can help estimate the costs of providing a police service.

Activity-based costing (ABC) is a widely used costing system that seeks to place an accurate cost on what an organisation produces. In policing, the ABC model has been developed to calculate the costs of policing activities – thus enabling managers to continuously improve policing services.

ABC is essentially a local management tool that focuses on the Basic Command Unit (BCU) and looks at the total cost of policing a given geographical area. It includes all policing services delivered by BCU staff, as well as contributions from headquarters operational or organisational support units. This enables comparisons to be made over time across police forces and between BCUs, and provides managers with a suite of information on Best Value processes.

The benefits of ABC are that it:

- enables BCU Commanders to make better use of their resources;
- enables Police Authorities and forces to identify how resources are being used and to make efficiency improvements, where necessary;
- empowers police forces to justify additional resources by presenting their current resource usage accurately and transparently;
- increases accountability and identifies gaps between resource usage and priorities – thus allowing better comparison between forces.

Source: <http://police.homeoffice.gov.uk/finance-and-business-planning/index>.



Discussion points

- 1 Why is it important to know the overhead costs of different types of police activity?
- 2 What types of overhead might be found in different types of police activity?

4.2 Production overheads: traditional approach

Production overheads were defined in Chapter 2 as comprising indirect materials, indirect labour and other indirect costs of production. Indirect materials and indirect labour are explained in Chapter 3. 'Other indirect costs' will include any item which relates to production and which is not a materials cost or a labour cost. The type of indirect cost depends on the nature of the business and, in particular, on whether it is a *manufacturing* business or a *service* business. Examples are:

- (In a manufacturing business): repair of machinery; rent of factory buildings; safety procedures.
- (In a service business): cost of transport to jobs; replacement of tools; protective clothing.

Whatever their nature, all the production overhead costs have to be **absorbed** ('soaked up') into the products.

Normally the management accountant has to devise a scheme of **allocation** and **apportionment**. There are some essential features for any successful scheme. It must be:

- fair to all parties involved in the process of allocation and apportionment;
- representative of the benefit each party gains from the shared cost;
- relatively quick to apply so that provision of information is not delayed;
- understandable by all concerned.

This chapter will use arithmetically simple models for illustrative purposes, although the mechanism for apportionment ('sharing') does not have to be arithmetically simple provided a computer can be used.

The process described here has three stages:

- 1 allocating and apportioning indirect costs to cost centres;
- 2 apportioning service department costs over production cost centres;
- 3 absorbing costs into products.

Definitions

Allocate means to assign a whole item of cost, or of revenue, to a single cost unit, centre, account or time period.

Apportion means to spread costs over two or more cost units, centres, accounts or time periods. (It is referred to by some textbooks as 'indirect allocation'.)

Absorb means to attach overhead costs to products or services.

Allocation, apportionment and absorption in job costing:

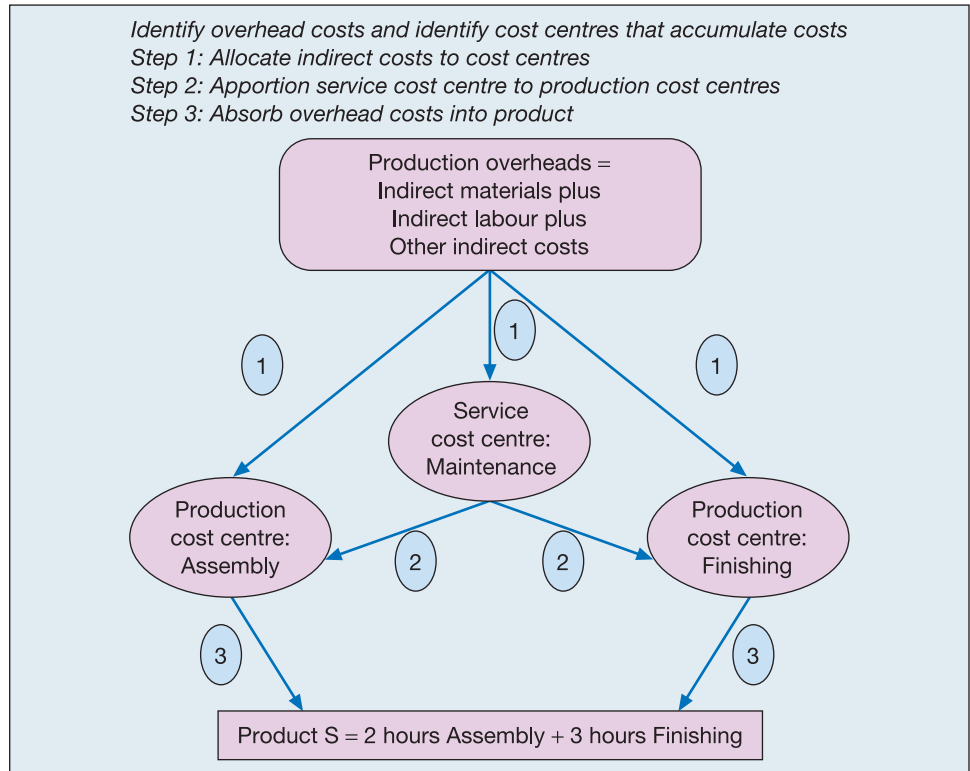
- Direct materials are allocated to products.
- Direct labour costs are allocated to products.
- Indirect materials costs and indirect labour costs are allocated and apportioned to cost centres.
- Total indirect costs of service cost centres are apportioned over production cost centres.
- Total overhead costs of production cost centres are absorbed into products.¹

Figure 4.2 provides a diagram to show the three stages in the flow of indirect costs. The calculations are explained in detail in section 4.2.5.

4.2.1 Allocating and apportioning indirect costs to cost centres

There are two main types of cost centre in any business, namely **service cost centres** and **production cost centres**. The production cost centres are those directly involved

Figure 4.2
Traditional approach to the flow of indirect costs



in the production activity, with the output being either goods or services to customers. The service cost centres are *not* directly involved in the production activity but provide essential backup to the production activity. To sustain long-term profitability, the products of the business must sell at a price which makes a profit after covering the costs of both the service and the production cost centres.

The management accountant will first of all divide the overhead costs into two categories: those which may be allocated as a whole to each cost centre, and those which have to be apportioned (or shared) over a number of cost centres according to how the cost centres benefit from the cost incurred. Table 4.2 sets out some common methods of apportionment where costs are regarded as indirect so far as each cost centre is concerned.

If the records were sufficiently detailed, then most of the costs in Table 4.2 could be turned into items of cost which could be allocated as a whole to each cost centre, avoiding the need for apportionment. For example:

- electricity meters could be installed in each cost centre to measure directly the cost of heating and lighting;
- employees could be given tickets for the canteen which could be collected and recorded for each cost centre;
- the production supervisor could keep a diary of time spent in each cost centre; depreciation could be calculated for each machine;
- the insurance company could be asked to quote a separate premium for each machine.

However, all these procedures would in themselves create a new cost of administration which the business might decide was too high a price to pay for a marginal improvement in the accuracy of allocation of costs.

Table 4.2
Examples of methods of apportionment of costs over cost centres

<i>Cost item</i>	<i>Method of apportionment over cost centres</i>
Rent of building	Floor area of each cost centre
Lighting	Floor area of each cost centre
Power for machines	Number of machines in each cost centre
Production supervisor's salary	Number of employees in each cost centre
Canteen costs	Number of employees in each cost centre
Depreciation and insurance of machinery	Value of machinery in each cost centre

4.2.2 Apportioning service department costs over production cost centres

As explained earlier, service cost centres exist to *support* production but do not make a direct contribution to the product. Once the costs of the organisation have been channelled into the various cost centres, they must be apportioned from service cost centres over production cost centres. The essential features remain the same, namely that the method chosen must be:

- fair to all parties involved in the process of apportionment;
- representative of the benefit each party gains from the shared cost;
- relatively quick to apply so that provision of information is not delayed;
- understandable by all concerned.

Table 4.3 sets out the titles of some service cost centres and gives examples of some methods by which their costs could be apportioned over production cost centres.

Table 4.3
Examples of methods of apportioning total costs of service cost centres across production cost centres

<i>Service cost centre</i>	<i>Method of apportionment over production cost centres</i>
Maintenance department	Number of machines in each cost centre
Employees' restaurant and coffee bar	Number of employees in each cost centre
Stores department	Total value of stores requisitions from each cost centre
Finished goods quality inspection	Value of goods produced by each cost centre
Safety inspectors	Number of employees in each cost centre

Where service departments provide services to each other as well as to the production departments, various methods are possible.

- The **step method** takes the service department with the largest overhead cost first and apportiones it across all departments. The service department with the next largest overhead is then apportioned across all departments other than the one already dealt with.
- The **repeated distribution method** involves continuous reapportionment of service department costs across cost centres until the amount remaining in any service department is so small that it can be ignored.
- An algebraic method involves the use of simultaneous equations.

In many cases these give similar answers. The step method, which is the simplest, is illustrated in the following example.

Step method: example

The hospital manager estimates that the services of the wages department and the services of the computer department should be apportioned on the basis of the number of employees in each department. Information is shown in Table 4.4.

Table 4.4

Data for step apportionment of service department costs

	<i>Surgical</i>	<i>Medical</i>	<i>Wages</i>	<i>Computing</i>	<i>Total</i>
Staff numbers	8	4	3	2	
	£	£	£	£	£
Overheads	50,000	40,000	9,000	30,000	129,000

The information in Table 4.4 looks problematic because the computing department provides a service to the wages department and the wages department provides a service to the computing department. A process for apportioning costs from one to the other could continue indefinitely in the absence of a rule to simplify matters. The step apportionment method provides this simplification by taking each department, one step at a time, and apportioning the costs of that department across the remaining departments. The method is shown in Table 4.5.

- *Step 1.* The department with the highest cost, Computing, is apportioned first in the ratio 8:4:3 across the two 'production' cost centres and the remaining service cost centre.
- *Step 2.* The total overhead cost of the second service department, wages, is then apportioned across the two 'production' departments, surgical and medical, but *no* cost is apportioned back to computing.
- *Step 3.* Check the totals of the overhead costs in the two 'production' departments are the same as the totals of the costs at the start of the process.

Table 4.5

Step apportionment of service cost centres

	Production cost centres		Service cost centres		<i>Total</i>
	<i>Surgical</i>	<i>Medical</i>	<i>Wages</i>	<i>Computing</i>	
Staff numbers	8	4	3	2	
	£	£	£	£	£
Overheads	50,000	40,000	9,000	30,000	129,000
Apportion computing 8:4:3	16,000	8,000	6,000	(30,000)	
Sub-total	66,000	48,000	15,000	–	129,000
Apportion wages 8:4	10,000	5,000	(15,000)		
Total	76,000	53,000	–		129,000

Repeated distribution method

Applying the repeated distribution method requires the costs of computing to be apportioned across surgical, medical and wages. Then the costs of wages are apportioned across surgical, medical and computing. This is repeated until the cost remaining in the service department cost centres is very low. For this example it requires seven apportionment calculations. The result is: Surgical £75,878 and Medical £53,122. This is a more accurate answer than that of the step method but the error level of the step method, as a percentage of the repeated distribution method, is 0.1 per cent for Surgical and 0.2 per cent for Medical. That seems sufficiently low to justify using the step method for practical purposes.

4.2.3 Absorbing overhead costs into products

You have now reached the final stage of the process where all the **overhead costs** are collected in the **production cost centres**, ready to be absorbed into products. The essential features, as before, are that the method must be:

- fair to all parties involved in the process of absorption;
- representative of the benefit each party gains from the shared cost;
- relatively quick to apply so that provision of information is not delayed;
- understandable by all concerned.

To absorb a *fair share* of overhead into each product, the method must make use of the *best measure* of work done on a product. The best measure is usually labour hours or machine hours, depending on whether the production process is labour intensive or machine intensive.

Direct labour hours are frequently used because overhead cost is incurred when people are working. The longer they work, the more overhead is incurred. The overhead cost is expressed as '*£s of overhead cost per direct labour hour*'.

However, sometimes direct labour hours are not the best measure of work performed. In a machinery-intensive environment, machine hours may be preferred to labour hours as a basis for absorbing overhead. The overhead cost is expressed as '*£s of overhead cost per machine hour*'.

There are occasions when the direct labour hours worked on a job are not known because they are not recorded. In such circumstances an overhead cost *per £ of direct labour* could be applied but it has a disadvantage in that a change in the labour rate could affect the amount of labour cost and hence the allocation of overhead.

Where all products are identical, a *cost per unit* would be sufficient. However, in a job-costing system such identical products are unlikely.

In summary, four possible methods of absorbing overhead costs into products are:

- cost per direct labour hour
- cost per machine hour
- cost per £ of labour cost
- cost per unit.

4.2.4 Overhead cost recovery

The overhead costs are absorbed into products so that all costs may be 'recovered' by charging a selling price that covers costs and makes a profit. The process of absorbing overhead costs into products is also described as **overhead cost recovery**. This is another example of the use of different words to describe the same idea in management accounting. You will find that both descriptions are used.

Definition

Overhead cost recovery means absorbing overhead costs into a unit of product so that the overhead costs will eventually be **recovered** in the sale of the product.

4.2.5**Illustration**

This section provides an illustration of the allocation and apportionment of overhead costs and shows how the overhead cost is absorbed into products.

Kitchen Units Company assembles and finishes kitchen units to customers' orders. Assembly involves creating the basic units, while finishing involves adding the laminated surfaces and interior fittings as specified by the customer. The machinery and tools required for the work are kept in working order by a maintenance department. The assembly and finishing departments are production departments because they both do work on the product. The maintenance department is a service department because it helps the work of the production departments but does not deal directly with the product.

The illustration in Exhibit 4.1 follows the sequence of Figure 4.2. It shows how the overhead costs of one month are allocated and apportioned, and then absorbs the costs to Product S, a kitchen unit which spends two hours in assembly and three hours in finishing.

Table 1 in Exhibit 4.1 sets out the indirect costs incurred by the business. These costs relate to some or all of the three departments and must be shared among them on a fair basis.

Table 2 sets out information about each department which will be helpful in this fair sharing.

Table 3 apportioned overhead costs across the three departments.

Table 4 apportioned the costs of the service department to the two manufacturing departments.

Table 5 absorbs overhead costs into a job.

Exhibit 4.1**Illustration of the calculation of an overhead cost rate**

Table 1 sets out the indirect costs incurred by the business on behalf of all departments taken together. The costs must be apportioned (shared) over the departments because there is insufficient information to permit allocation of costs as a whole. Table 2 sets out relevant information about each department which will be used in the process of determining an overhead cost rate.

Table 1**Indirect costs incurred by the business**

<i>Cost item</i>	<i>Total cost this month</i>
	£
Indirect materials	36,000
Indirect labour	40,000
Rent	1,000
Insurance	1,600
Depreciation	2,000
Total	80,600

Exhibit 4.1 continued

Table 2
Information about each department

	Assembly	Finishing	Maintenance
Direct materials used for production	£400,000	£500,000	not applicable
Number of employees	10	25	5
Floor area	100 sq m	200 sq m	100 sq m
Value of machinery	£30,000	£50,000	£20,000
Number of direct labour hours worked on production	55,000	64,000	not applicable

There are four steps in calculating the overhead cost to be allocated to each job.

Step 1: Apportioning costs over departments, using a suitable method for each cost

In Table 3, each of the cost items contained in Table 1 is shared across the three departments on an appropriate basis chosen from Table 2.

Table 3
Apportioning (sharing) cost items over the three departments

	Total	Assembly	Finishing	Maintenance
	£	£	£	£
Indirect materials ¹	36,000	16,000	20,000	nil
Indirect labour ²	40,000	10,000	25,000	5,000
Rent ³	1,000	250	500	250
Insurance ⁴	1,600	480	800	320
Depreciation ⁵	2,000	600	1,000	400
<i>Total</i>	<i>80,600</i>	<i>27,330</i>	<i>47,300</i>	<i>5,970</i>

Notes:

¹ The cost of indirect materials is likely to be dependent on direct materials so the proportions applied in sharing out the indirect materials costs are 4:5. The direct materials are used only in Assembly and Finishing, so the indirect materials will relate only to these two departments.

² The cost of indirect labour is likely to be dependent on the total number of employees working in the organisation, so the proportions applied in sharing out the indirect labour costs are 10:25:5.

³ Rent costs may be shared out on the basis of floor space occupied by each department, in the proportions 1:2:1.

^{4,5} Insurance and depreciation may both be shared out by reference to the value of the machinery used in each department, in the proportions 3:5:2.

Step 2: Apportioning service department costs to production departments on the basis of value of machines in each department

The maintenance department provides service in proportion to the machinery used in each department, so it is appropriate to share out the maintenance costs on the basis of value of machinery in Assembly and in Finishing, in the proportions 30,000:50,000:

$$\frac{30,000}{80,000} \times 5,970 = 2,239$$

$$\frac{50,000}{80,000} \times 5,970 = 3,731$$

Exhibit 4.1 continued

Table 4

Apportioning (sharing) maintenance costs between Assembly and Finishing

	Total	Assembly	Finishing	Maintenance
	£	£	£	£
Total cost per department (from Table 3)	80,600	27,330	47,300	5,970
Transfer maintenance costs to Assembly and Finishing		2,239	3,731	(5,970)
Total per department	80,600	29,569	51,031	nil

Step 3: Absorbing total overhead costs of each production department into units produced during the period

Dividing the total cost of each department by the number of direct labour hours, we obtain the following overhead cost rates:

Assembly: £29,569/55,000 hours = 53.76 pence per direct labour hour

Finishing: £51,031/64,000 hours = 79.74 pence per direct labour hour

Step 4: Finding the overhead costs of any job

Now the overhead cost rate may be used to determine how much overhead cost should be charged to each job. The answer will depend on the number of direct labour hours required in each production department, for any job. Take as an example job S, which spends 2 hours in the assembly department and 3 hours in the finishing department. The overhead cost allocated to job S is calculated as follows:

Table 5

Example of the allocation overhead cost to a job

Department	Calculation	£
Assembly	53.76 pence × 2 hours	1.075
Finishing	79.74 pence × 3 hours	2.392
Total overhead cost		3.46

That's all there is to it. The process of allocation, apportionment and absorption of production overheads takes time because every cost has to be traced through to the product, but it is systematic in that all costs eventually find their way through to a product.

Activity 4.2

Return to the start of Exhibit 4.1 and try to work the example for yourself. It is very important for later chapters that you understand the purpose of Exhibit 4.1 and the method of calculation used. There are some features of the tables in Exhibit 4.1 which are worth noting for future reference. First, it is important to keep totals for each column of figures and a total of all the column totals in order to ensure that there are no arithmetic errors that result in costs appearing from nowhere or disappearing to oblivion. Second, it is important to show working notes at all times because there are so many variations of possible method that the person who reads your calculations will need the working notes to understand the method chosen.

4.2.6 Predetermined overhead cost rates

This chapter has explained methods by which *actual* overhead cost for a period may be absorbed into jobs. However, the calculation of overhead cost rates based on the actual overhead costs incurred during the period means that job cost calculations have to be postponed until the end of the period, because the overhead cost cannot be obtained before that time. This creates practical problems where timely information on job costs is essential if it is to be used for estimating the value of work-in-progress or calculating monthly profit. As a result of this demand for information *before* the actual costs are known, many businesses will use predetermined overhead cost rates, estimated *before* the start of a reporting period. This rate will then be applied to all output of the period. At the end of the period, when the actual overhead is known, there will be an adjustment to bring the estimated overhead cost into line with the actual overhead cost.

Estimating the predetermined overhead rate

How does a manager estimate the predetermined overhead cost rate? The estimate could be based on the known overhead costs of previous periods. It could be a 'best guess' of what will happen in the forecast period. The predetermined overhead cost rate is then applied to the output of the period. This is also described as *overhead cost recovery* because the cost will be 'recovered' when the output is completed and sold.

Estimates abound in accounting and part of the reporting process involves explaining why the actual out-turn did, or did not, match up to the estimate. Provided the estimation process is carried out with care, the benefits of using predetermined overhead costs, in terms of having information early rather than late, by far outweigh the possible negative aspects of having to explain differences between estimated and actual overhead costs charged to products. Chapter 15 introduces the techniques of standard costing and variance analysis, which provide a formal means of analysing and investigating differences between estimated and actual amounts.

Table 4.6 gives the information necessary to calculate a predetermined overhead cost rate. The steps of calculation are then described.

Table 4.6
Calculating a predetermined fixed overhead cost rate

Estimated direct labour hours for normal activity	10,000 hours
Estimated fixed overhead cost in total	£50,000
Predetermined overhead cost rate	£5 per direct labour hour

- *Step 1.* The accounting period is one month. Before the start of the month, the manager estimates that there will be 10,000 labour hours worked, under normal activity conditions, and that fixed overhead of £50,000 will be incurred.
- *Step 2.* The manager calculates the predetermined fixed overhead cost rate as £5 per labour hour (= £50,000/10,000).
- *Step 3.* Throughout the reporting period, as work is done, the manager applies £5 of fixed overhead for every labour hour of each item of output from the business. If exactly 10,000 hours of work are carried out then each item of output will carry its fair share of the overhead. The process of overhead cost recovery is complete.

4.2.7 Under-recovery and over-recovery of overheads

The calculations of overhead cost recovery are not always as neat and tidy as in Table 4.6. This section explains how under-recovery and over-recovery can occur.

Under-recovered overhead: underestimating hours worked

Supposing things do not work out as planned in Table 4.6. The manager finds out at the end of the month that only 8,000 hours were actually worked. In Step 3, a fixed overhead of £5 will be charged to jobs for each hour worked, so £40,000 will be charged in total. We can also say that there is recovery of £40,000. At the end of the month the manager confirms that the cash book shows the actual overhead cost incurred is £50,000, corresponding exactly to the estimated amount. The manager has a total fixed overhead cost of £40,000 recovered (charged to jobs) but an actual cost of £50,000 as an expense for the financial profit and loss account. The fixed overhead cost recorded on the job records is said to be *under-recovered*. In the management accounting profit and loss account the fixed overhead element of the cost of goods sold is recorded at £40,000 using the predetermined rate, and a separate cost of £10,000 is recorded as **under-recovered fixed overhead**, so that the total fixed overhead expense of the month equals £50,000.

Under-recovered overhead: underestimating overhead cost

Suppose that the actual hours worked do match the expected hours, so that in Step 3 there is recovery of the full amount of £50,000 (based on 10,000 hours at £5 per hour). However, when the manager checks the cash book, it shows that the actual overhead cost of the month is £55,000 due to an unforeseen rise in fixed service charges. The fixed overhead cost recorded on the job records is again said to be under-recovered. In the management accounting profit and loss account the fixed overhead element of the cost of goods sold is recorded at £50,000 using the predetermined rate, and a separate cost of £5,000 is recorded as under-recovered fixed overhead, so that the total fixed overhead expense of the month equals £55,000.

Definition

Under-recovered fixed overhead occurs when the overhead cost recovered (applied), using a predetermined overhead cost rate, is less than the actual overhead cost of the period. This may be because the actual hours worked are less than the estimate made in advance, or it may be because the actual overhead cost incurred is greater than the estimate of the overhead cost.

Over-recovered overhead: underestimating hours worked

Now suppose an alternative picture. The manager finds out at the end of the month that 11,000 hours were actually worked. In Step 3, a fixed overhead of £5 will be charged to jobs for each hour worked, so £55,000 will be charged in total. We can also say that there is recovery of £55,000. At the end of the month the manager also confirms that the cash book shows the actual overhead cost incurred is £50,000, corresponding exactly to the estimated amount. The manager has a total fixed overhead cost of £55,000 recovered (charged to jobs) but an actual cost of £50,000 as an expense for the financial profit and loss account. The fixed overhead cost recorded on the job records is said to be *over-recovered*. In the management accounting profit and loss account the fixed overhead element of the cost of goods sold is recorded at £55,000 using the predetermined rate, and a separate reduction in cost of £5,000 is recorded as **over-recovered fixed overhead**, so that the total fixed overhead expense of the month equals £50,000.

Over-recovered overhead: overestimating overhead cost

Suppose that the actual hours worked do match the expected hours, so that in Step 3 there is recovery of the full amount of £50,000 (based on 10,000 hours at £5 per hour). However, when the manager checks the cash book, it shows that the actual overhead cost of the month is £48,000 due to an unexpected rebate of charges for heating. The

fixed overhead cost recorded on the job records is again said to be over-recovered. In the management accounting profit and loss account the fixed overhead element of the cost of goods sold is recorded at £50,000 using the predetermined rate, and a separate reduction in cost of £2,000 is recorded as over-recovered fixed overhead, so that the total fixed overhead expense of the month equals £48,000.

Definition

Over-recovered fixed overhead occurs when the overhead cost recovered (applied), using a predetermined overhead cost rate, is greater than the actual overhead cost of the period. This may be because the actual hours worked are greater than the estimate made in advance, or it may be because the actual overhead cost incurred is less than the estimate of the overhead cost.

Effect on profit

If there is over-recovered fixed overhead then too much cost is charged in the management accounts, when compared to the actual cost incurred. The management accounting profit will be too low. To restore the profit to the actual level achieved, the over-recovery must be deducted from the cost charged.

If there is under-recovered fixed overhead, then too little cost is charged in the management accounts, when compared to the actual cost incurred. The management accounting profit will be too high. To restore the profit to the actual level achieved, the under-recovery must be added to the cost charged.

4.2.8

More questions about overhead cost rates

Overhead cost is one of those topics which make you want to ask a new question every time you have an answer to the previous question. Here are some of the questions which might have occurred to you in thinking about overhead cost rates:

- 1 Is it necessary to have an overhead cost rate for each cost centre or could there be one rate to cover all production?
- 2 How is it possible to calculate an overhead cost rate per direct labour hour for fixed overhead costs when these do not vary with direct labour hours?
- 3 What is the best way of ensuring that the process of allocation, apportionment and absorption of costs most closely represents the behaviour of those costs?

The answers to all these questions will be found in thinking about the four conditions for determining a suitable overhead cost rate:

- fair to all parties involved in the process;
- representative of the benefit each party gains from the shared cost;
- relatively quick to apply so that provision of information is not delayed;
- understandable by all concerned.

The answers are therefore as follows.

Is it necessary to have an overhead cost rate for each cost centre or could there be one rate to cover all production?

If there is a wide product range and products spend different amounts of time in different cost centres, it would be undesirable to have one rate to cover all production because that single rate would average out the time spent in the different departments. Thus it is said that blanket overhead cost rates or 'plant-wide rates' should be avoided where possible, or used with great caution. The overhead cost rate to use will be one which can be used with confidence that it meets the four conditions stated earlier.

How is it possible to calculate an overhead cost rate per direct labour hour for fixed overhead costs when, by definition, fixed costs do not vary with direct labour hours?

This question is more difficult to answer and the best starting point is a reminder that accounting is often based on estimates. The fixed overhead costs will have to be absorbed into products eventually. However, this can only be achieved accurately after production is completed. Job cost estimation cannot always wait that long. Therefore, a **predetermined fixed overhead cost rate** is applied to each job on the basis of some measure of work done, such as direct labour hours. If the estimating process is accurate, the estimated hours to be worked will equal the actual hours worked and there will be no problem. If the actual hours are greater than, or less than, the estimate, then there will be a difference, referred to as over-applied or under-applied fixed overhead. (This subject is taken up again in Chapter 5.)

What is the best way of ensuring that the process of absorbing costs into products most closely represents the behaviour of those costs?

This question has aroused considerable excitement in management accounting circles in recent years, as some thinking people realised that too much time had been spent in reading textbooks and theorising. Researchers had omitted to find out whether the actual practice of management accounting was so bad after all. They therefore went out to look and found that some practical management accountants were having some very good ideas, but that those ideas were not finding their way into textbooks.

As a result of those investigations, many articles and books have been written on the importance of **cost drivers**, which are the events that are significant determinants of the cost of an activity. If an oil company has an offshore platform where the supervisor is constantly calling up the helicopter for unplanned visits ashore, the total transport cost for the oil company will rise. The *helicopter flight* is the cost driver and the platform supervisor needs to be aware that the flight cost is part of the cost of running the platform. If a stores department is receiving frequent deliveries of small quantities, the cost driver for the stores department is the *number of deliveries*. Cost drivers are not an earth-shattering discovery in themselves, but they have been built into a description of activity-based costing (ABC) which you will find in section 4.3. Activity-based costing has led many companies to re-examine their approach to allocating overhead costs to products, based on finding a method which most closely models the factors driving the cost.

4.3 Activity-based costing (ABC) for production overheads

Activity-based costing (ABC) is a relatively new approach to allocating overhead costs to products. It focuses on the activities that drive costs (cause costs to occur).

Definition

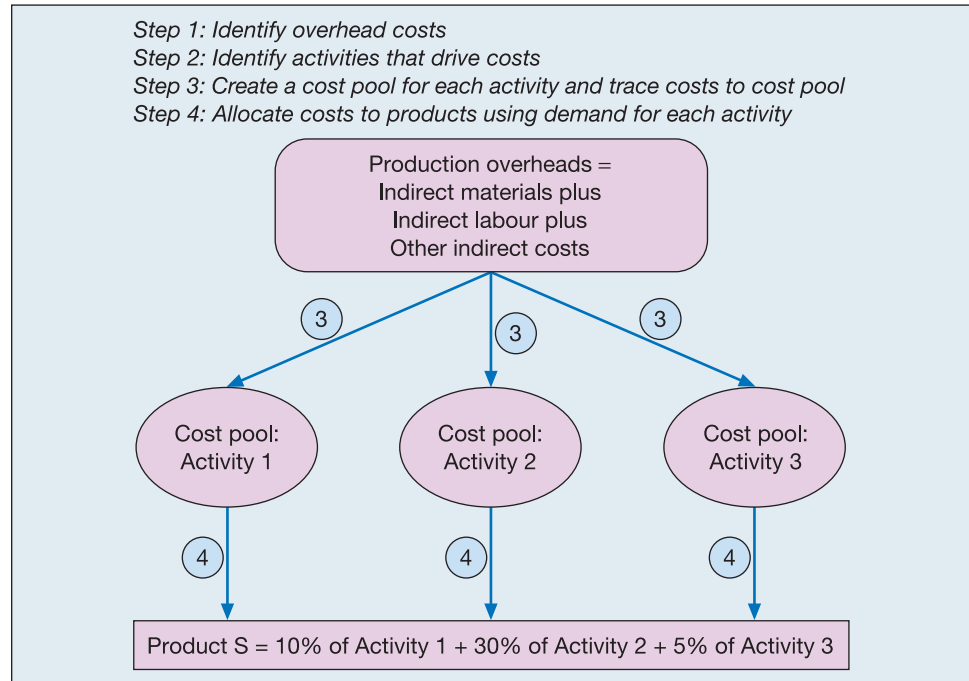
Activity-based costing (ABC) traces overhead costs to products by focusing on the activities that drive costs (cause costs to occur).

The proponents of the subject claim that ABC provides product cost information which is useful for decision making. The claims of ABC will be explored in this chapter by outlining the principles and then examining a case study.

There are five stages to establishing an activity-based costing system. These are:

- 1 Identify the major activities which take place in an organisation.
- 2 Identify the factors which most closely influence the cost of an activity. These factors are called the cost drivers and are a direct indication of how the activity demands cost.
- 3 Create a **cost pool** for each activity and trace costs to cost pools.
- 4 Calculate a **cost driver rate** as the total costs in a cost pool divided by the number of times that the activity occurs.
- 5 Allocate costs to products using the demand for each activity.

Figure 4.3
Activity-based approach to the flow of overhead costs



Compare the ABC steps in Figure 4.3 with those of the traditional approach in Figure 4.2.

4.3.1 Reasons for the development of ABC²

In the 1980s, Professors Cooper and Kaplan in the USA found the focus on activities and cost drivers in some large US manufacturing businesses which had become dissatisfied with the traditional approach to overhead costing. Cooper and Kaplan wrote up their observations as case studies at Harvard University and then published papers on their findings. The cause of change was that business organisations were changing their nature at the time, with an increase in indirect costs related to changes in processes, new ways of dealing with customers, and new investment in more sophisticated operating systems. There was a swing from variable to fixed overhead costs. Labour resources were replaced to some extent by automation. It became apparent that production volumes were no longer the main drivers of overhead costs. Organisations were looking for a costing system that would be more realistic in tracking the consumption of resources that gives rise to cost.

4.3.2 Nature of an activity

An activity, in its broadest sense, is something which happens in the business. An activity could be using materials to make a physical product or using labour to carry out a service operation. In ABC language, that would be an example of a **unit activity**, which is performed each time a product is produced. Other activities are performed to enable output of products but are not so closely dependent on how many units are produced. These are called **product-sustaining activities**. Examples would be product design, product testing and marketing. Some activities are classified as **batch-related activities** which are fixed for a given batch of products. This would include costs of the buying department, costs of moving stores from the warehouse to the factory floor, and costs of planning a production schedule. Where there are expenses such as rent or

insurance which are not driven by making products, they are designated as **facility-sustaining activities** and no attempt is made to allocate these to products. They are charged as a total cost against all products after the separate profit margins on each product are determined.

Example 1

A language college teaches English as a Foreign Language. It has two departments: E (European mother tongue) and A (Asian mother tongue). Information about each is shown in Table 4.7. The overhead cost of cleaning classrooms is £32,000 per year.

Table 4.7

Information for Example 1: departments E and A

Department	E	A
Number of teaching staff	12	18
Annual teaching labour cost	£600,000	£1,000,000
Number of rooms	18	16

The traditional method of allocating cleaning overhead cost to departments has been to apply a rate of two per cent of the labour cost of teaching. This is shown in Table 4.8.

Table 4.8

Traditional treatment of cleaning overhead

	E	A
Overhead cost rate	2% of labour cost	2% of labour cost
Apportionment of cost £32,000	£12,000	£20,000

The head tutor of Department A feels this is unfair because it has fewer classrooms than Department E and so requires less cleaning effort.

Assume that cleaning cost may be regarded as a cost pool and show how activity-based costing can be applied where the number of classrooms is the cost driver for cleaning.

The apportionment of cost by the activity-based method is shown in Table 4.9.

Table 4.9

Activity-based costing for cleaning overhead

	E	A
Cost pool: cleaning, £32,000		
Cost driver: fraction of classroom usage	18/34	16/34
Apportionment of cost £32,000	£16,940	£15,060

Comment. The head of Department A will be happier with the use of activity-based costing because it reflects the lower usage of cleaning driven by fewer classrooms. On the other hand, it may be that this is not the best cost driver. For instance, suppose that the head of Department E responds by pointing out that their classrooms are kept tidy and are therefore easier to clean. The debate over cost drivers might take some time to resolve.

Example 2

In the office of a firm of solicitors and estate agents there are overhead costs incurred relating to the cost of office support for the staff preparing legal documentation. There are two departments preparing legal documentation. Department A has dealt with

15 property transactions having an average value of £100,000 each, while Department B has dealt with 5 property transactions having an average value of £1m each.

The total amount of the office overhead costs for the period is £100,000. The traditional approach to overhead cost has been to apportion the amount of £100,000 in proportion to the number of property deals dealt with by each department. They are now asking for an activity-based approach to costing, where the cost driver is the value of transactions in each department, because high value transactions involve more work.

Table 4.10
Traditional treatment of cleaning overhead

	A	B
Cost pool: office overhead, £100,000		
Cost driver: number of transactions	15/20	5/20
Apportionment of cost £100,000	£75,000	£25,000
Cost per transaction	£5,000	£5,000

The traditional approach gives the same unit cost regardless of size of transaction.

Table 4.11
Activity-based costing for office overhead

	A	B
Overhead cost rate	1,500/6,500	5,000/6,500
Apportionment of cost £100,000	$100,000 \times 1.5/6.5$ = £23,000	$100,000 \times 5/6.5$ = £77,000
Cost per transaction	£1,530	£15,400

Comment. The activity-based approach puts much more of the overhead cost on to Department B because that one is driving more of the overheads. When the cost per transaction is calculated, the activity-based approach, based on value, loads the cost towards the high-value transaction and so produces a relatively higher cost per unit for these transactions.

4.3.3 Role of the management accountant

Activity-based costing allows the *attention-directing* functions of the management accountant to come to the fore. The management accountant takes a key role in understanding the operation of the business and translating into cost terms the activities *as perceived by those who carry them out*.

Because activity-based costing requires a very thorough analysis of how products drive the costs of various activities, it is not feasible to work through a full illustration here. Instead, one activity, that of purchasing materials for use in a hotel restaurant, will be explored by a case study in some detail. Hopefully, that will give you a flavour of the complexity and fascination of ABC and encourage you to read further.

4.3.4 Case study: Glen Lyon Hotel

The Glen Lyon Hotel has two main product lines, with quite different characteristics. In the restaurant, meals are provided on a daily basis to the chef's high standards of perfection. In the conference suite, banquets are arranged for special functions such as weddings. There is a restaurant manager, responsible for restaurant meals, and a functions manager, responsible for banquets. The hotel seeks to offer competitive prices subject to meeting all costs and earning an adequate profit.

The hotel has a purchasing department which purchases the food required by the hotel restaurant and all supplies required for special functions, including crockery and cutlery. The purchasing officer is concerned that the restaurant manager insists on buying food in relatively small quantities, because the chef is very particular about monitoring the continued high quality of supplies. The functions manager also creates problems for the purchasing department because she insists on buying crockery and cutlery in bulk, to save cost, which requires time being taken by the purchasing officer to negotiate the best terms with the supplier. Even the suppliers can create a great deal of work because they are constantly changing their prices and this has to be recorded on the computer system of the purchasing department. The purchasing officer would like to show that these activities are all costly because they drive the amount of work undertaken by the purchasing department.

Fiona McTaggart was called in to help, and she now explains how she went about the task of applying activity-based costing in relation to the activities of the purchasing department.



FIONA: *First of all I asked for a list of all the costs incurred by the department in a year (see Table 4.12).*

Table 4.12

List of costs incurred by resources used in the purchasing department

<i>Resource cost</i>	£
Salary of purchasing officer	15,000
Wages of data processing clerk	9,000
Telephone calls	<u>3,000</u>
Total costs to be allocated	<u>27,000</u>

Identifying the cost drivers

Then I sat down with the purchasing officer for a long meeting during which we talked about how the purchasing process worked. From those discussions I found that a number of activities were driving the work of purchasing and I listed all those (see Exhibit 4.2).

Exhibit 4.2

List of activities in the purchasing department

- Agreeing terms with supplier
- Processing an order
- Updating the price lists
- Updating the supplier records
- Processing queries about invoices

I explained to the purchasing officer that, although the purchasing department was an identifiable unit of the organisation for staff management purposes, it would no longer be treated as a cost centre under activity-based costing. The purchasing process would be regarded as a set of activities consuming 'resources' such as salaries, wages and telephone calls. Each activity would collect a 'pool' of cost as the resources were used up. The pool of costs would be passed on to those other departments drawing on the services of the purchasing department and from those departments the costs would find their way into products.

Creating the cost pools

The next stage was to decide how much of each resource cost was attributable to the activity driving that cost. This part was quite tricky because the purchasing officer only had a 'feel' for the relative impact in some cases. Take as an example the processing of an order. When the restaurant manager asks for food to be ordered, the purchasing officer

first has to phone the supplier to check availability and likely delivery time. Then she checks that someone will be available to open the cold store when the delivery arrives. She is then able to fax the order to the supplier who will phone back to confirm that the goods are available and that delivery will be as requested. Once the goods arrive, the purchasing officer has to check that the delivery note agrees with what was ordered. That whole process takes about 20 minutes for each order.

We carried on talking and I was able to identify, for each resource cost, some measure of how the activity was being driven. The starting point was salaries. We estimated that the purchasing officer spent the equivalent of two days per week agreeing terms with suppliers. The remaining three days were divided equally over the other activities listed. For wages cost, the data processing clerk spent three days per week in processing orders, half a day each week on updating price lists and updating suppliers' records, and one day per week on checking and processing questions from the accounts department about invoices received for payment. The final cost heading was telephone calls. The destination and duration of each call is logged by the telephone system so we took a sample of one week's calls and decided that 60 per cent of telephone calls were routine calls to place an order, 20 per cent were dealing with queries over price changes and the remainder were spread equally over agreeing terms, updating the supplier records and dealing with invoice queries. Following these discussions I sketched a diagram of the ABC approach (see Figure 4.4) and then drew up a table showing how each cost item could be allocated to the various activities so that a cost pool is created for each activity (see Table 4.13).

Figure 4.4

Sketch of the ABC approach applied to the activity of purchasing

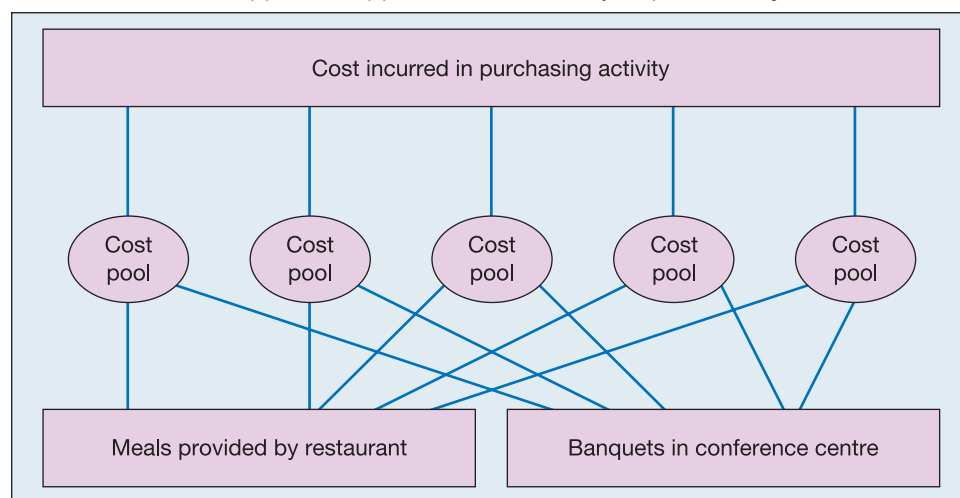


Table 4.13

Creating a cost pool: allocation of resource costs to activities

Resource	Resource cost	Activity cost pools				
		Agreeing terms with supplier	Processing an order	Updating the price list	Updating the supplier records	Processing invoice queries
	£	£	£	£	£	£
Salary	15,000	6,000	2,250	2,250	2,250	2,250
Wages	9,000		5,400	900	900	1,800
Telephone	3,000	200	1,800	600	200	200
	<u>27,000</u>	<u>6,200</u>	<u>9,450</u>	<u>3,750</u>	<u>3,350</u>	<u>4,250</u>

Demand for each activity

The next stage was to determine how many times each activity driver was put into action. This involved measuring the volume of each activity, as a measure of the demand for that activity. Agreeing terms with the supplier is not easy to quantify, but we were aware that there are discussions with each supplier at some time during the year, so we took the number of suppliers as the measure of volume driving that activity. It was relatively easy to establish the number of orders processed at the request of the restaurant manager. The price list has to be updated every time the supplier changes the price of any items, and they all change at least twice per month, so we decided that the number of items on the order list was a reasonable measure. Updating supplier records involves changing minor details for existing suppliers but takes more time to record a new supplier. So we used the number of new suppliers as the measure of the volume of that activity. Processing invoice queries depends on the number of such queries.

Cost driver rates

My final accounting statement was a calculation of the cost per activity unit for each activity (see Table 4.14). This was determined by dividing the cost in the pool by the measure of how that activity was being driven by products.

Table 4.14

Calculation of cost per activity unit for each activity

	Activity cost pools				
	Agreeing terms with supplier	Processing an order	Updating the price list	Updating the supplier records	Processing invoice queries
Cost per Table 4.13	£6,200	£9,450	£3,750	£3,350	£4,250
Activity driver	Number of suppliers	Number of orders	Number of items listed	Number of suppliers updated	Number of queries
Activity volume	60	1,600	7,000	60	150
Cost per activity unit	£103.333	£5.906	£0.536	£55.833	£28.333

Using the calculation of cost per activity unit for each activity I was able to explain the benefits of activity-based costing. The purchasing department is providing a service to the rest of the organisation, but at a cost. That cost could be made more visible using activity-based costing because the factors driving the cost could be quantified in their effect. Looking at Table 4.14, it is not difficult to see that the most significant cost drivers are the activities of agreeing terms with suppliers and of updating the suppliers' records. Each new supplier causes a further £159.166 (£103.333 + £55.833) to be incurred at an early stage. The restaurant manager needs to be aware that placing large numbers of low-volume orders causes cost to be incurred on each order. The total cost incurred could be reduced by moving to a lower number of orders, each being of higher volume. (Someone would need to check that that did not create larger new costs in storage of the goods.) The next most costly activity, in terms of cost per unit, is that of answering queries about invoices. The accounts department should be made aware that each enquiry costs £28.333.

I also looked back to the old way of allocating the cost of the purchasing department (see Table 4.15). Before activity-based costing was considered, the organisation charged the purchasing costs to products as a percentage of the value of materials ordered. Looking back to Table 4.12, the total purchasing department costs are shown as £27,000. The purchasing department handles goods to the value of £800,000 in a year. The purchasing department costs were therefore charged to products at 3.375 per cent of cost.

Table 4.15

Previous methods of allocation, based on percentage of value of items requested

	<i>Restaurant manager</i>	<i>Functions manager</i>	<i>Accounts department</i>
	£	£	£
Goods purchased through purchasing department	300,000	500,000	–
3.375% of goods purchased	10,125	16,875	nil

Why was this not the best approach? The answer is that there were two main product lines, having quite different characteristics. One was restaurant meals provided on a routine basis and the other was special banquets for functions such as weddings. My further enquiries revealed that the high-price purchases required for special functions caused relatively few problems in agreeing terms with suppliers and relatively few queries arose over the invoices. Where problems of negotiation and invoicing did arise was in the low-price, high-volume ingredients used routinely in the dining room meals. The information on cost per unit of each activity allowed a much more precise allocation of cost, although I was now in for even more work in tracing the costs from the various activity pools through to the products.

Tracing costs through to products

To trace costs through to products I obtained estimates of the quantity of each activity demanded by the restaurant manager and the functions manager (see Table 4.16) and multiplied each quantity by the cost per activity unit calculated in Table 4.14. The result is shown in Table 4.17.

Compare this with the cost allocation under the traditional system which is shown in Table 4.15.

Table 4.16

Quantity of activity demanded by each function

<i>Activity</i>	<i>Demanded by restaurant manager</i>	<i>Demanded by functions manager</i>
Agreeing terms with supplier	10 new suppliers	50 new suppliers
Processing an order	1,200 orders	400 orders
Updating the price list	4,000 items	3,000 items
Updating the supplier records	10 new suppliers	50 new suppliers
Processing invoice queries	All 150 demanded by accounts department	

Table 4.17

Allocation of purchasing cost to restaurant manager, functions manager and accounts department

Activity	Restaurant manager	Functions manager	Accounts department	Total
	£	£	£	£
Agreeing terms with supplier	1,033	5,167		6,200
Processing an order	7,088	2,362		9,450
Updating the price list	2,143	1,607		3,750
Updating the supplier records	558	2,792		3,350
Processing invoice queries			4,250	4,250
Total cost allocated	10,822	11,928	4,250	27,000

My conclusions were that the accounts department had previously been unaware of the costs it was causing the purchasing manager whenever an invoice query was raised. Using activity-based costing would allow the allocation of cost to the accounts department each time a question was raised. Some care might need to be taken to examine the size and significance of the invoice query in relation to the cost allocation. It would not be a good idea for the accounts department to allow a £50,000 error to go unchecked because they feared a charge of £28.33. The implementation of activity-based costing might need to be accompanied by the use of performance measures which show how the benefits of an activity exceed the costs incurred.

The functions manager would incur less overhead cost under the activity-based system than under the previous approach. The recorded cost of functions would therefore decrease. As I explained earlier, the high-priced purchases of food for special functions cause relatively few problems in processing a smaller number of orders. The functions manager seems to have a relatively high number of new suppliers. Cost could be controlled further if fewer suppliers were used for functions. Less purchasing effort would be required.

The restaurant manager experiences little difference in cost under either approach. To improve overhead costs there would need to be a quantum leap in practice, such as reducing the order frequency to the stage where one less person was employed in the purchasing department, or else where a part-time employee could do the work presently undertaken full-time. Merely reducing the order frequency would not be enough if the purchasing staff are still present full-time and the same cost is being spread over a lower volume of activity. Although there is little impact, these figures give the restaurant manager food for thought.

Product costs

In the full application of ABC, the costs would be taken into the final product cost. I have not done that here because the purchasing department's costs are only one small corner of the total business. Activity-based costing creates a lot of work, but a well-coded computerised accounting system can handle that. I spent the best part of one day dealing only with the analysis of the purchasing department costs, so it would take a few weeks of consultancy to cover the entire range of activities which contribute to the cost of the products. My consultancy fees would be another overhead to be allocated, but I believe the hotel would find the effort well worth it in terms of more effective management over a period of years.

Activity 4.3

Imagine you are the owner of a business which rents ice-cream stalls from the local council. You employ persons to run each stall. Write down a list of the costs you would expect to incur. Write another list of the drivers of cost. How could activity-based costing help you understand and control the costs of your business?

4.4 Comparing traditional approach and ABC**4.4.1 Contrasting treatments**

Allocating direct costs to products is not a problem. The particular need for activity-based costing lies in the area of absorbing overhead costs into products. The traditional approach to absorbing overhead costs to products was explained in section 4.2. In that section it was shown that, traditionally, costs are first allocated and apportioned to cost centres and then absorbed into products which pass through those cost centres. Activity-based costing follows a different approach to channelling costs towards products. Table 4.18 sets out the contrasting treatments.

Table 4.18
Contrasting activity-based costing and traditional overhead cost allocation

<i>Traditional overhead cost allocation</i>	<i>Activity-based costing</i>
Identify <i>cost centres</i> in which costs may be accumulated. Cost centres are determined by the nature of their function (e.g. production or service department cost centres).	Identify the way in which products drive the activity of the business and define suitable <i>cost pools</i> for collecting the costs relating to each activity. Activity cost pools are determined by the activities which drive the costs (e.g. obtaining new customers, negotiating customer contracts).
↓	↓
Collect costs in cost centres.	Collect costs in activity cost pools.
↓	↓
Determine an <i>overhead cost rate</i> for each production cost centre (e.g. cost per direct labour hour).	Determine a <i>cost driver rate</i> for each activity cost pool (e.g. a cost per customer contract, cost per customer order received).
↓	↓
Allocate cost to products using the calculated cost rate and the measure of the <i>product's consumption of that department's cost</i> (e.g. number of labour hours required).	Allocate cost to products according to the <i>product's demand for the activity</i> which drives cost.

4.4.2 Benefits claimed for activity-based costing

Activity-based costing (ABC) appeared first in the academic literature during the late 1980s. It had reached the professional accountancy journals by the early 1990s and by that time was already being used (or tested) by companies with progressive attitudes.

It has not been applied in all cases, but the idea of asking 'what drives cost' is found in many situations. The main benefits claimed are that ABC provides product cost information which, although it includes an allocation of overheads, is nevertheless useful for decision-making purposes. It is useful because the overhead costs are allocated to the products in a way that reflects the *factor driving the cost*. If a product cost is thought to be too high, then it can be controlled by controlling the factors driving the most significant elements of its cost. Attention is directed towards problem areas. Activity-based costing is seen as a valuable management tool because it collects and reports on the significant activities of the business. It is also attractive for service-based organisations which have found that the traditional, manufacturing-based costing methods are not suited to the different nature of the service sector.

Real world case 4.3

The following extract continues the law and order' theme of Real world case 4.2. It explains the use of activity based costing in the Crown Prosecution Service, where decisions are taken on whether a case should be taken to court for trial.

The broad concept of activity costs within CPS is that the number of files handled, multiplied by staff time, is equal to the total cost of staff time spent on the CPS prosecution process. The system is built purely on staff time and excludes accommodation and other ancillary costs, e.g. Capital.

ABC does not replace performance indicators but illuminates them to make their messages more meaningful. Indicators on their own are rather like the controls in a car which tell you how many revs and what speed you are doing, but not if you are a good driver or are respecting the speed limit.



After all, the simple cost of a case can always be determined by dividing expenditure by caseload but this tells you nothing about the efficiency or quality of the product or how the organisation is running, only how much the case costs on average.

Source: http://www.cps.gov.uk/publications/finance/abc_intro.html.

Discussion points

- 1 What is the benefit of ABC in the situation described here?
- 2 Do you agree with excluding costs such as accommodation and the cost of capital as explained in the article?

You may ask at this point, 'If activity-based costing is the best approach, why has it not replaced the traditional approach to overhead cost apportionment?' The answer to that question is, first, that the technique is still relatively rare in practical application, despite the amount written about it. Second, no allocating mechanism can produce accurate results unless the cost item which is being processed is of high reliability and its behaviour is well understood. The successful application of activity-based costing depends on a thorough understanding of basic principles of cost behaviour and the ability to record and process costs accurately.

Activity-based costing will not solve all problems of forward planning. The analytical method relies on historical data and therefore shares with many other aspects of accounting the disadvantage of being a backward-looking measure which must be used with caution in forward-looking decisions.

Finally, activity-based costing requires detailed accounting records and a well-structured system for **cost coding** so that costs are allocated correctly to cost pools and from there to products. There may need to be a considerable investment in discovering and installing the best information system for the job.

4.5 What the researchers have found

This section describes four research papers. Drury and Tayles (2005) used a postal questionnaire study to show that businesses use a range of practices in overhead absorption, which should be seen as a continuous spectrum of change from traditional to ABC. Soin *et al.* (2002) observed the change to ABC in one organisation. Greasley (2001) presents a simulation study of the costing of police custody operations using an ABC framework. Liu (2005) studies the use of ABC in the Crown Prosecution Service.

4.5.1 Range of methods of overhead absorption

Drury and Tayles (2005) reported the results of a postal questionnaire study that examined the range of methods used for overhead absorption. They realised that if a researcher asks a simple question 'Do you use traditional methods or do you use ABC?' then the respondent is forced to make a choice which may not reflect the diversity of what is happening in practice. So Drury and Tayles asked a broader range of questions about the allocation of costs and the identification of cost drivers. From this information they calculated a measure of 'cost system complexity'. The lowest complexity consisted of one cost pool and one cost driver. The highest complexity consisted of more than 50 cost pools and more than 10 cost drivers. The results of the analysis showed that the highest complexity of cost system was associated with, in order of importance, size of sales, finance sector, product diversity, service sector and customisation of products.

The conclusion from this paper is that a range of absorption procedures may be found. Some lie in the 'traditional' area, some are strongly 'ABC-based', but many show a mixture of both approaches, with the use of cost drivers or cost pools.

4.5.2 Research into ABC

Research into the application of ABC usually involves case study work where the researcher observes and analyses the use of ABC. An example of such research may be seen in Soin *et al.* (2002). They describe a two-year observation of the implementation of ABC in a clearing bank. This is a service business that does not hold stocks, so the importance of costs lies in decision making and control. The ABC system was introduced by a team of consultants working with the staff of the bank. Introducing ABC requires careful identification of activities which in turn requires observing and talking to employees. This can raise considerable suspicion in the minds of employees, especially if cost savings (meaning loss of jobs) are also part of the plan. The case study brings out some of the complex behavioural problems that arise in a major management accounting change.

The authors concluded that non-accountants in the bank began to appreciate cost data more because the data came from operational knowledge. The ABC accountants also developed a better understanding of the banking operations. The ABC system

allowed the financial control department to provide information on various processes and this enhanced the credibility of the financial control process because users started to believe the cost figures. One of the negative aspects, from a management perspective, was that they now knew the 'true' cost of activities and this affected their prices when bidding for new contracts. Competitors were tendering lower prices, perhaps because they did not know the 'true' cost. That raised the question of whether the cost information was useful, if its effect was to lose all contracts.

The authors concluded that the introduction of ABC processes had been a revolutionary activity, but that there remained some reluctance to use the ABC information in strategic management.

4.5.3 Using an ABC framework

Greasley (2001) created a model for the cost of operating a custody system in a police station. The model was built by recording historical data relating to arrests over a twelve-month period. The actual costs were not known, but there were records of custody cell utilisation, interview room utilisation, arrest process duration and number of court appearances. The research produced a cost per arrest for different types of offences. Costs were driven by processes (such as booking-in to custody, searching, interview and court appearances) and by resources (such as the number and rank of police staff required to deal with different types offence).

Liu (2005) described a case study to explore the use of ABC in the Crown Prosecution Service, a government agency that decides on prosecuting criminal cases in the courts of law in England and Wales. The system put in place was described as activity-based resource planning (ABRP), building on ABC that had been in place since 1995. The ABRP model reflected the importance of staff as the main cost of the work done and related staff resources and overhead costs to the activities driving work in each area.

4.6 Summary

Key themes in this chapter are:

- **Total product cost** is defined as consisting of direct materials, direct labour and production overhead cost.
- **Production overhead costs** comprise indirect materials, indirect labour and other indirect costs of production.
- **Allocation** of indirect costs to cost centres means that the entire cost item is identified with one cost centre.
- **Apportionment** of indirect costs across cost centres means that the cost item is shared across those cost centres on some basis which is a fair representation of how the cost item is used by each cost centre.
- **Absorption** is the process by which overhead costs are absorbed into units of output, or 'jobs'.
- The processes of **apportionment** and **absorption** are said to be *arbitrary* (meaning 'a matter of choice rather than of strict rules'). To ensure that the best result is obtained, the scheme of apportionment and absorption must be:
 - fair to all parties involved in the process;
 - representative of the benefit each party gains from the shared cost;
 - relatively quick to apply so that the provision of information is not delayed;
 - understandable by all concerned.

- The sequence of **allocate**, **apportion** and **absorb** is called the **traditional** approach to product costing.
- **Activity-based costing** (ABC) traces overhead costs to products by focusing on the **activities** that **drive** costs (cause costs to occur).
- It also provides a method of spreading overhead costs by asking: what drives each cost?
- Costs are collected in **cost pools** and then spread over products based on cost per unit of activity for the activity in question.
- Costs are then allocated to products on the basis of a cost per unit of activity.
- **Cost drivers** have taken on an increasingly important role in apportioning indirect costs to cost centres.
- Contemporary management accounting practice focuses on the accountant becoming part of the operational team so as to ensure that the job costs derived are understood and reflect the factors that drive the costs to be incurred.

References and further reading

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QUESTIONS

The Questions section of each chapter has three types of question. '**Test your understanding**' questions to help you review your reading are in the 'A' series of questions. You will find the answer to these by reading and thinking about the material in the textbook. '**Application**' questions to test your ability to apply technical skills are in the 'B' series of questions. Questions requiring you to show skills in '**Problem solving and evaluation**' are in the 'C' series of questions. A symbol [S] means that there is a solution available at the end of the book.

A Test your understanding

- A4.1** Give three examples of production overheads in each of the following:
 (a) a manufacturing business (section 4.2); and
 (b) a service business (section 4.2).
- A4.2** For each of your answers to the previous question, say whether the cost is a fixed cost or a variable cost (section 4.2 and chapter 2, sections 2.4.1 and 2.4.2).

- A4.3** What are the important features of any successful scheme of allocating, apportioning and absorbing indirect costs to products (section 4.2)?
- A4.4** [S] For each of the following overhead costs, suggest one method of apportioning cost to cost centres:
- (a) employees' holiday pay;
 - (b) agency fee for nurse at first-aid centre;
 - (c) depreciation of floor-polishing machines used in all production areas;
 - (d) production manager's salary;
 - (e) lighting;
 - (f) power for desktop workstations in a financial services business;
 - (g) cost of servicing the elevator;
 - (h) fee paid to professional consultant for advice on fire regulation procedures.
- A4.5** [S] Explain how each of the following service department costs could be apportioned over production centres:
- (a) Cleaning of machines in a food-processing business.
 - (b) Vehicle maintenance for a fleet of vans used by service engineers.
 - (c) Canteen services for a company operating a large bus fleet.
 - (d) Quality control department of an engineering business.
 - (e) Planning department of a bridge-building company.
 - (f) Research department of a chemical company.
- A4.6** State the principles to be applied in absorbing costs into products (section 4.2.3).
- A4.7** Compare the relative merits of calculating overhead costs per unit of products using each of the following methods (section 4.2.3):
- (a) Cost per direct labour hour.
 - (b) Cost per unit of output.
 - (c) Cost per direct machine hour.
 - (d) Cost per £ of direct labour.
- A4.8** Explain the meaning of overhead cost recovery (section 4.2.4).
- A4.9** What are the benefits and what are the possible problems of using predetermined overhead cost rates (section 4.2.6)?
- A4.10** Explain what is meant by under-recovery and over-recovery of overhead cost (section 4.2.7).
- A4.11** What are the problems of using blanket overhead cost rates (section 4.2.8)?
- A4.12** What is meant by 'cost driver' (section 4.3)?
- A4.13** What are the four stages in establishing an activity-based costing system (section 4.3)?
- A4.14** What is the nature of an activity (section 4.3.2)?
- A4.15** What are the main points of difference between traditional overhead cost allocation and activity-based costing (section 4.4.1)?
- A4.16** What are the benefits claimed for activity-based costing (section 4.4.2)?
- A4.17** What have researchers found about the range of methods of overhead absorption used in practice (section 4.5.1)?
- A4.18** How have researchers used a case study in long-term observation of a change to ABC (section 4.5.2)?
- A4.19** How can an ABC framework help in modelling the costs of a public service (section 4.5.3)?

B Application

B4.1 [S]

A factory manufactures garden huts. The production process is classified into two production departments, Assembly and Joinery. There is one service department, the canteen. The relevant forecast information for the year ahead is as follows:

Indirect costs for all three departments in total:

	<i>Total</i> £
Indirect labour	90,000
Indirect material	81,000
Heating and lighting	25,000
Rent and rates	30,000
Depreciation	56,000
Supervision	45,000
Power	<u>36,000</u>
Total	<u>363,000</u>

The following information is available about each department:

	<i>Total</i>	<i>Assembly</i>	<i>Joinery</i>	<i>Canteen</i>
Floor space (sq metres)	50,000	20,000	24,000	6,000
Book value of machinery (£)	560,000	300,000	240,000	20,000
Number of employees	150	80	60	10
Kilowatt hours of power	18,000	9,000	8,000	1,000
Direct materials (£)		100,000	50,000	
Direct labour (£)		50,000	42,000	
Maintenance hours		8,000	6,000	
Labour hours		12,640	8,400	

The canteen is used by both production cost centres.

Required

- (1) Apportion production overhead costs over the assembly, joinery and canteen departments using a suitable method for each department.
- (2) Apportion service department costs over production departments.
- (3) For each production department, calculate an overhead cost rate, based on labour hours, which may be used to absorb production overhead cost into jobs.
- (4) Find the overhead cost of a job which spends three labour hours in the assembly department and four labour hours in the joinery department.

B4.2 [S]

A company manufactures golf bags. Golf bags have the following manufacturing costs:

	<i>£ per bag</i>
Labour (5 hours at £5.00/hour)	25
Materials	40
Variable production overheads	10

In addition, the company has monthly fixed production overhead costs of £100,000. 5,000 golf bags are manufactured every month.

Required

Prepare a statement of total product cost for a batch of 5,000 golf bags which shows prime cost and production overhead cost as subtotals.

B4.3 [S]

Budgeted information relating to two departments of Rydons Tables Ltd for the next period is as follows:

<i>Department</i>	<i>Production overhead</i>	<i>Direct material cost</i>	<i>Direct labour cost</i>	<i>Direct labour hours</i>	<i>Machine hours</i>
	£	£	£		
1	270,000	67,500	13,500	2,700	45,000
2	18,000	36,000	100,000	25,000	300

Individual direct labour employees within each department earn differing rates of pay according to their skills, grade and experience.

Required

- Rydons Tables intends to use a production overhead cost rate of £6 per machine hour for absorbing production overhead cost into jobs, based on the budget. Write a short note to the managers of the business commenting on this proposal.
- During the past year, Rydons Tables has been using a production overhead cost rate of £5.60 per machine hour. During the year overheads of £275,000 were incurred and 48,000 machine hours worked. Were overheads under-absorbed or over-absorbed, and by how much?

B4.4 [S]

A private college has two teaching departments: languages and science. The college also has a library and a staff refectory, both of which provide services to the teaching departments. The library staff also eat in the refectory. The college administrator feels that the benefits of the staff refectory are best measured in proportion to the number of staff in each department. The benefits of the library are best measured in proportion to the number of students in each department. The overhead costs of each department, and other relevant details, are as follows:

	<i>Languages</i>	<i>Science</i>	<i>Library</i>	<i>Refectory</i>	<i>Total</i>
Overhead costs allocated (£)	20,000	15,000	12,000	10,000	57,000
Number of staff	4	4	2	2	
Number of students	400	300	–	–	

Required

- Prepare a cost apportionment of overhead costs using the step method.
- Use a computer-based spreadsheet to calculate the apportionment of overheads using the repeated distribution method.

B4.5 [S] [CIMA question]

A company operates a standard absorption costing system and absorbs fixed production overheads based on machine hours. The budgeted fixed production overheads for the company for the previous year were £660,000 and budgeted output was 220,000 units using 44,000 machine hours. During that year, the total of the fixed production overheads debited to the Fixed Production Overhead Control Account was £590,000, and the actual output of 200,000 units used 38,000 machine hours.

Fixed production overheads for that year were:

- £90,000 under absorbed
- £60,000 under absorbed
- £20,000 under absorbed
- £10,000 over absorbed

B4.6 [S] [CIMA question]

(a) The following information relates to the budget for the year ahead.

Production overhead cost budget		£
Machinery costs		285,000
Set-up costs		235,000
Purchasing costs		<u>300,000</u>
Total production overheads		<u>820,000</u>

The following table shows the total budgeted activities of the company (it manufactures many different types of products) and the details relating to the manufacture of two product lines: S and T.

<i>Data</i>	<i>Total</i>	<i>Product S</i>	<i>Product T</i>
Machine hours	95,000	2 per unit	1 per unit
Number of production runs	235	20	5
Purchase orders	5,000	100	100
Production quantities of S & T		5,000 units	20,000 units

Calculate, using activity based costing, the production overhead costs that would be attributed to one unit of Product S and one unit of Product T. (5 marks)

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C Problem solving and evaluation

C4.1

In a general engineering works the following routine has been followed for several years to arrive at an estimate of the price for a contract.

The process of estimating is started by referring to a job cost card for some previous similar job and evaluating the actual material and direct labour hours used on that job at current prices and rates. Production overheads are calculated and applied as a percentage of direct wages. The percentage is derived from figures appearing in the accounts of the previous year, using the total production overhead cost divided by the total direct wages cost.

One-third is added to the total production overhead cost to cover administrative charges and profit. You have been asked to draft a short report to management outlining, with reasons, the changes which you consider desirable in order to improve the process of estimating a price for a contract.

C4.2

You have been asked for advice by the owner of a small business who has previously estimated overhead costs as a percentage of direct labour cost. This method has produced quite reasonable results because the products have all been of similar sales value and have required similar labour inputs. The business has now changed and will in future concentrate on two products. Product X is a high-volume item of relatively low sales value and requires relatively little labour input per item. It is largely produced by automatic processes. Product Y is a low-volume item of relatively high sales value and requires considerably more labour input by specially skilled workers. It is largely produced by manual craft processes.

What advice would you give to the owner of the business about allocation of overhead costs comprising:

- the owner's salary for administrative work?
- rent paid on the production facilities?
- depreciation of production machinery?

Compare the effect of having one overhead recovery rate for all three costs in aggregate, and the effect of identifying the factors which 'drive' each cost in relation to the production process.

Case studies

Real world cases

Prepare short answers to case studies 4.1, 4.2 and 4.3.

Case 4.4 (group case)

As a group you are the senior teaching staff of a school where each subject department is regarded as a cost centre. The direct costs of each cost centre are teachers' salaries, textbooks and worksheets for pupils. The overhead costs of the school administration are charged to each cost centre as a fixed percentage of teachers' salaries in the cost centre. The languages department argues that this is unfair to them as they have a higher ratio of teachers to pupils due to the need for developing spoken language skills. The art department objects to the percentage charge because it includes accommodation costs without recognising that they are housed in portacabins where the roof leaks. The maths department says that they should not have to share the costs of expensive technical equipment when all they need for effective teaching is a piece of chalk. One member of staff has read about 'cost drivers' and the teachers have decided that they would like to meet the school accountant to put forward some ideas about using them. So far they have made a list of the main overhead costs as:

- heating and lighting
- head teacher, deputy heads and office staff salaries
- cleaning
- maintenance
- library
- computing services for staff
- computing labs for pupils
- insurance of buildings and contents.

Allocate among your group the roles of staff in the languages department, art department and maths department. Discuss cost drivers for each of the overhead costs listed and attempt to arrive at an agreement on cost drivers to be presented to the school accountant. What are the problems of agreeing the drivers? What are the benefits?

Case 4.5 (group case)

Two bus companies are competing for passengers on the most popular routes in a major city. The long-established company has strong customer loyalty, provides weekend and evening services as well as frequent day-time services and covers the cost of unprofitable routes from the profits on popular routes. The incoming company has larger resources from which to support a price war and can be selective in running only at peak times on the most popular routes. There are fears that if the incomer wins the bus war, the quality of service provision will diminish in the evenings and at weekends and on unprofitable routes.

As a group allocate the roles of: (1) passenger representatives, (2) the financial controller's department of the long-established company, (3) members of the city council's transport committee, (4) representatives of the police force. In the separate roles discuss the areas where cost savings might be achieved by the long-established company to make it competitive on price. Then come together and negotiate a support package for the company which focuses on improving the financial performance of the company.

Case 4.6

This textbook follows the common practice of describing indirect costs as overhead costs. The following extract from the NHS costing manual gives separate definitions to indirect costs and overhead costs. It is an example of costing terminology being adapted to suit the particular circumstances of the organisation.

Key Concepts

2.2.1 Direct, Indirect and Overhead Costs

2.2.1.1 Direct costs are those which can be directly attributed to the particular cost centre.

For example, the cost of drugs incurred by a doctor or paediatrics may be directly attributed by the pharmacy system. Hence, drugs could be a direct cost of paediatrics.

2.2.1.2 Indirect costs are those costs which cannot be directly allocated to a particular cost centre but can usually be shared over a number of them. Indirect costs need to be allocated to the relevant cost centres. For example, there may be no method of directly allocating laundry costs to a particular cost centre and therefore laundry costs are an indirect cost to a number of cost centres.

2.2.1.3 Overhead costs are the costs of support services that contribute to the effective running of a health care provider. Overhead costs may include the costs of business planning, personnel, finance and the general maintenance of grounds and buildings. They need to be apportioned on a consistent and logical basis. Where such services are shared with other parts of the NHS, care should be taken to ensure the relevant proportions are identified to the relevant services. These proportions should be reviewed annually as utilisation of these services will vary.

Source: NHS costing manual www.dh.gov.uk, 2005.

Questions for discussion

- 1 How does the NHS costing manual distinguish between indirect costs and overhead costs?
- 2 What warnings are given about the problems of apportioning overhead costs?

Notes

1. CIMA (2005).
2. Innes and Mitchell (1995).