

# Week 1: Management Accounting

(TEXTBOOK: Chapter 1 - Introduction to Management Accounting)

There are two main strands of accounting: **management accounting** and financial accounting. the difference between them is explained below.

## What is Management Accounting?

### Management accounting:

- providing/analysing financial info for internal use **by managers** for planning, control, cost management and better decision-making

managers are the ones responsible for running the business, thus their decisions/actions play a vital role in determining its success, hence the need for accounting information to analyse the financial consequences of their decision-making and to justify making these informed decisions.

Management accounting seeks to meet the needs of managers (more specific/detailed), whereas...

### Financial accounting (not covered in this module):

- Recording transactions, preparing financial statements for financial reporting (for external users - users other than managers)

Financial accounting seeks to meet the accounting needs of the other users (more general/broad).

## Succeeding in a competitive environment

Businesses follow the mantra: "Customer is king" due to rise of competition -> customers want higher quality/lower prices/faster delivery/customised products, hence companies adopt a customer-focused approach to succeed in competitive environments today and satisfy their customers.

## Strategic management

Over past years, the environment that business operates in is more and more competitive, thus the adoption of **strategic management** (series of steps to achieve a business' purpose while developing their competitive edge)

## **five steps of strategic management:**

1. establish mission, vision and objectives
2. carry out a position analysis (e.g. SWOT - strengths, weaknesses, opportunities, threats)
3. identify and assess the strategic options
4. select strategic options and formulate plans
5. perform, review and control

you'll need to meet the needs of the business' stakeholders (e.g. customers, shareholders, suppliers, community, etc) to thrive in the environment

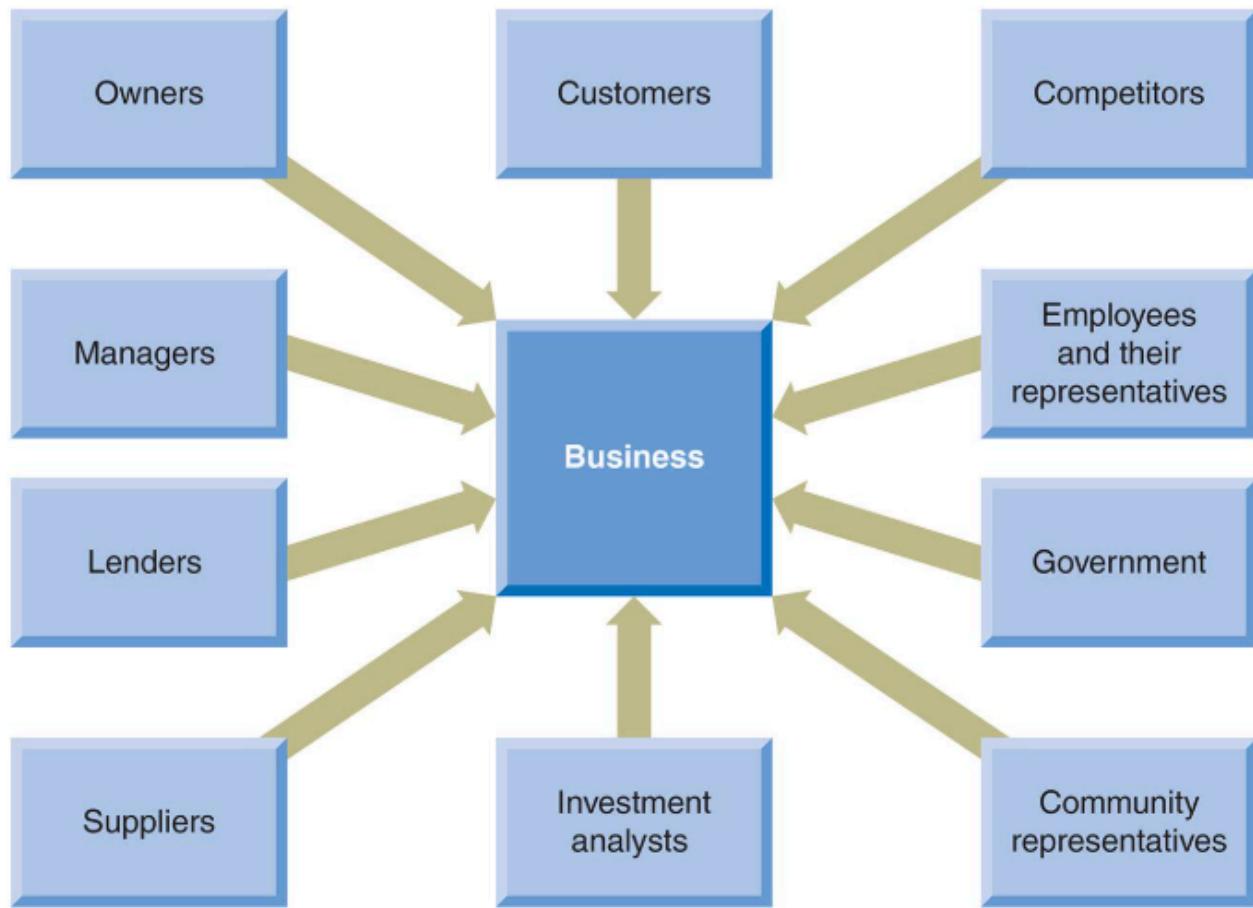
## **Usefulness of management accounting information**

For management accounting to be useful, it must be clear for whom and for what purpose the information will be used.

Managers are important users of financial information concerning the business, but there are several others including owners, employees, lenders and government.

**Figure 1.6**

Main users of accounting information relating to a business



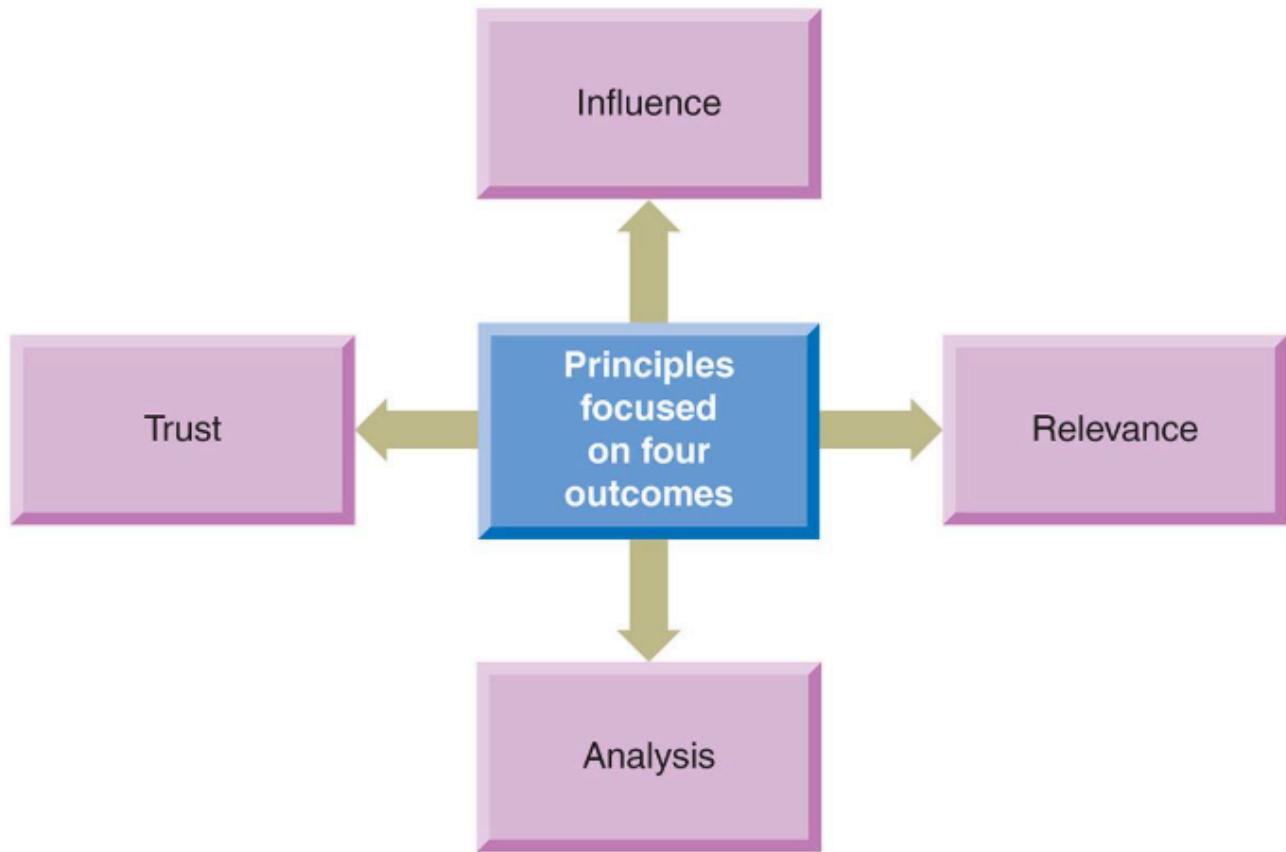
Several user groups have an interest in accounting information relating to a business. The majority of these are outside the business but, nevertheless, have a stake in it. This is not meant to be an exhaustive list of potential users; however, the groups identified are normally the most important.

NOTE: this module concerns the providing of accounting information to **MANAGERS**

## Management Accounting principles

**Figure 1.7**

Four principles focused on four outcomes



**influence** - as management decisions can be influenced by the communication of information

**relevance** - how relevant are the information provided will guide decision-making that affects the future.

**analysis** - management accountants can assess the impact of each options on performance/value of business so managers can understand cause-and-effect relationships and to decide between competing options

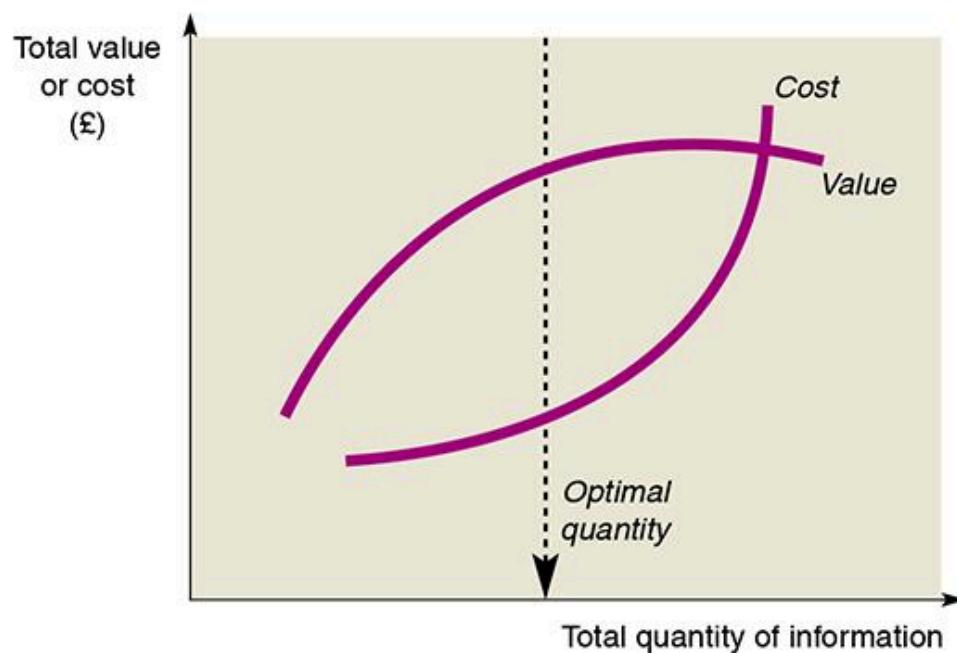
**trust** - accountants need to be trustworthy as trust is basis of all relationships.

## Weighing the costs and benefits

Management accounting information should **only** be produced if the cost of providing it is less than the benefits or value to be derived from its use. The tradeoff should limit the amount of management accounting info provided

**Figure 1.8**

Relationship between the cost and value of providing additional management accounting information



The benefits of management accounting information eventually decline. The cost of providing the information, however, will rise with each additional piece of information. The optimal level of information provision is where the gap between the value of the information and the cost of providing it is at its greatest

TL;DR:

- more info => more cost **BUT**
- too much info => too much cost => not much value if theres too much info (due to irrelevance of these additional info for the managers), hence benefits decline
- theres an optimal amount of info that should be provided to managers (**where the gap between cost and value is greatest**)
- accountants have to decide if its worth having a particular value of information depending on the context (based on the information needed for decision-making by managers)
- its difficult to weigh costs and benefits until the management accounting system is operational

## Management accounting information system

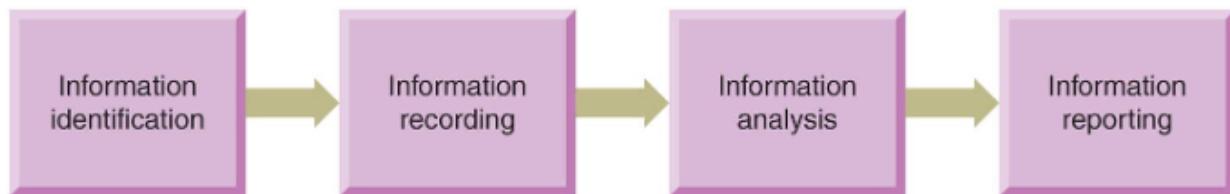
management accounting system provides economic information required by managers to base their decisions to ensure that scarce resources are efficiently allocated. It can be part of a business's total information system. These information is needed

the **features** of a **management accounting information system** involves:

- identifying and capturing relevant information (in this case, economic information);
- recording the information collected in a systematic manner;
- analysing and interpreting the information collected; and
- reporting the information in a manner that suits the needs of individual managers.

**Figure 1.9**

The management accounting information system



There are four sequential stages of a management accounting information system. The first two stages are concerned with preparation, whereas the last two stages are concerned with using the information collected.

The design of a management accounting system should reflect the particular features of the business, so two management accounting systems must not be the same. They should be designed with the 4 principles (influence, relevance, analysis, trust) in mind.

They will continually evolve in response to changes in the external environment and changes in internal business processes.

(basically: a management accounting system is short-term but will change due to change of external factors e.g. business environment/ in business methods)

thus, the changes (e.g., technology, customer needs, product innovation, operational structures, etc.) will all influence the kind of data captured/recorded and how it is analysed and reported.

## What information do managers need?

In the context of management accounting, managers are seen as the "clients"

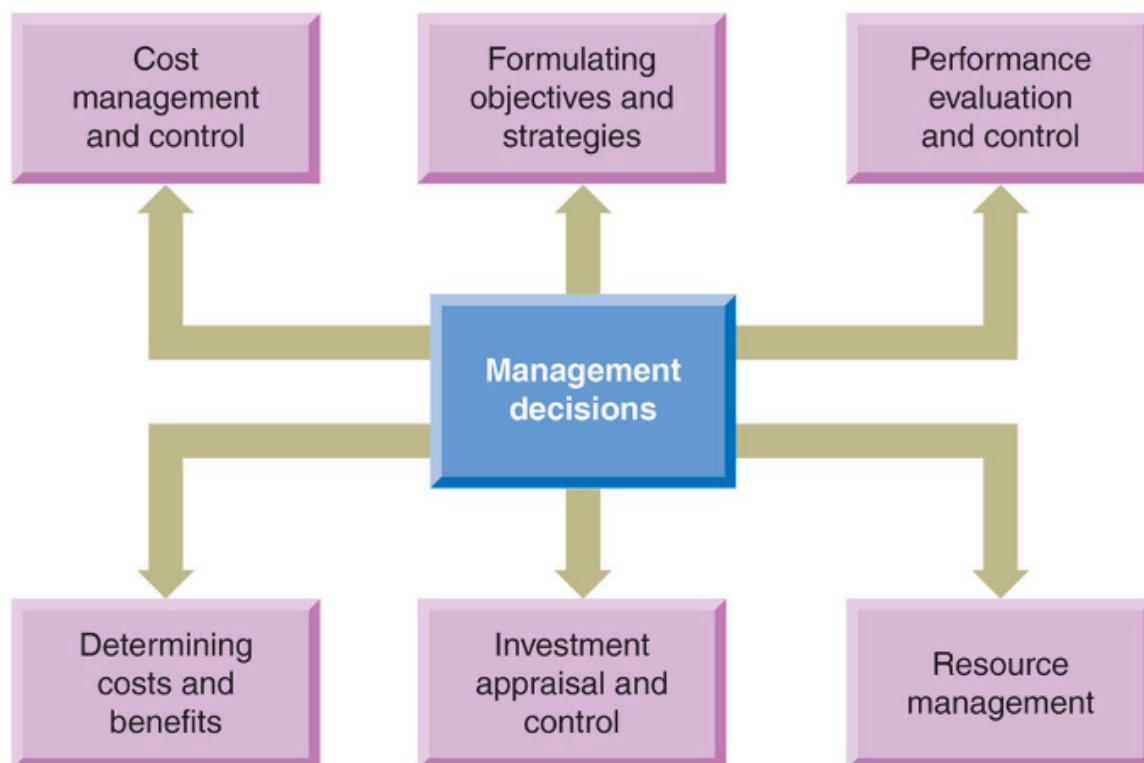
areas of decision-making where **management accounting info** plays an important role:

1. **formulating objectives and strategies** - identify possible objectives/strategies and estimate likely outcomes so managers can use them to evaluate available options and to select the most appropriate.
2. **performance evaluation and control** - help in measuring performance of business against agreed targets (controls should be in place to ensure actual performance aligns with planned performance)
3. **resource management** - as resources are limited so managers need to utilise them as efficiently/effectively as possible

4. **investment appraisal and control** - investments with capital expenditure can affect fortunes of business, hence investment decisions have to be carried out carefully/methodically. information can be used to see profitability/risk of the investment (ROI) and for managers to monitor progress
5. **determining costs and benefits** - management decisions would often require knowledge of costs and benefits of pursuing a particular course of action, where management accounting information is vital for cost-benefit analysis (even approximations can be helpful if they are hard to quantify).
6. **cost management and control** - sustainable management of business costs by identifying activities that drive costs and provide feedback if targets set to drive down costs can be realistically achieved.

**Figure 1.11**

Decisions requiring management accounting information



Management accounting information helps managers to make decisions in six broad areas: formulating objectives and strategies and strategies, performance evaluation and control, resource management, investment appraisal and control, determining costs and benefits and finally cost management and control.

## Week 2: Full Costing

(TEXTBOOK: Chapter 4: Full Costing)

### What is Cost?

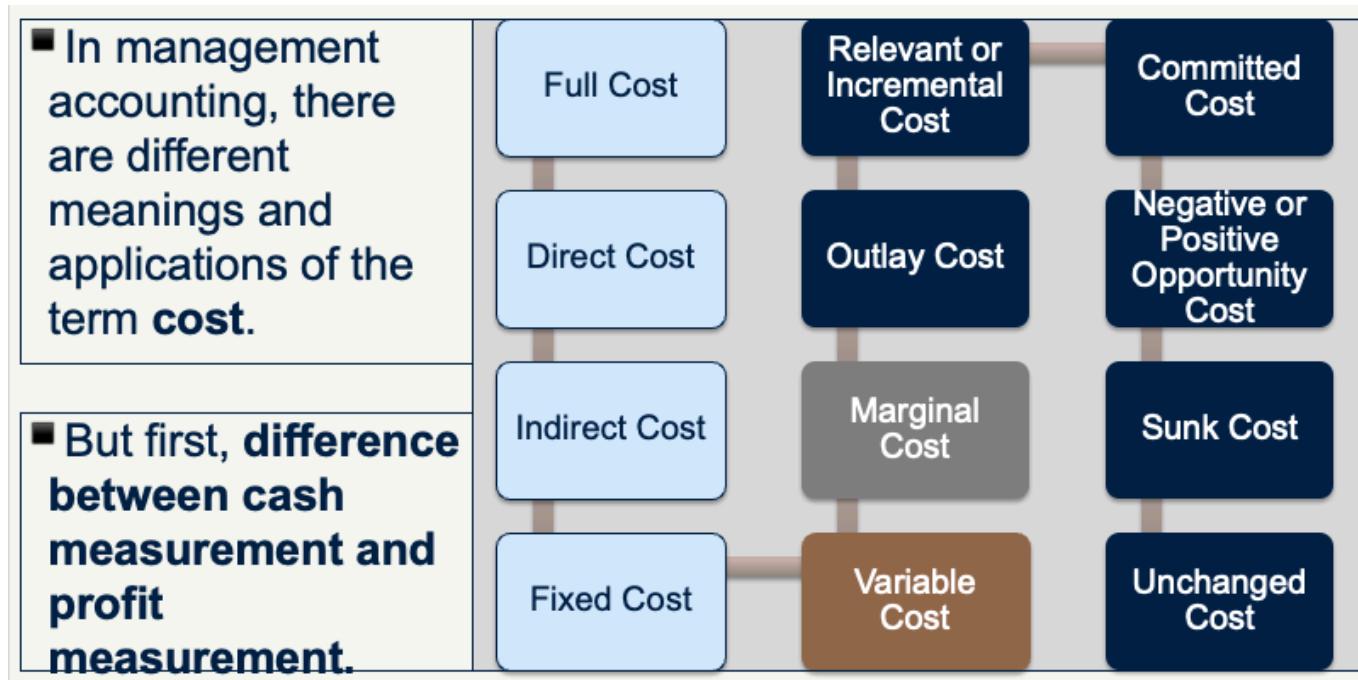
(supposed to be in chapter 2: relevant costs / decision making but knowing what cost is helps in this chapter. it is covered in lecture 1 (week 1))

## Definition of Cost

**Cost:** the amount paid for goods supplied or the service provided

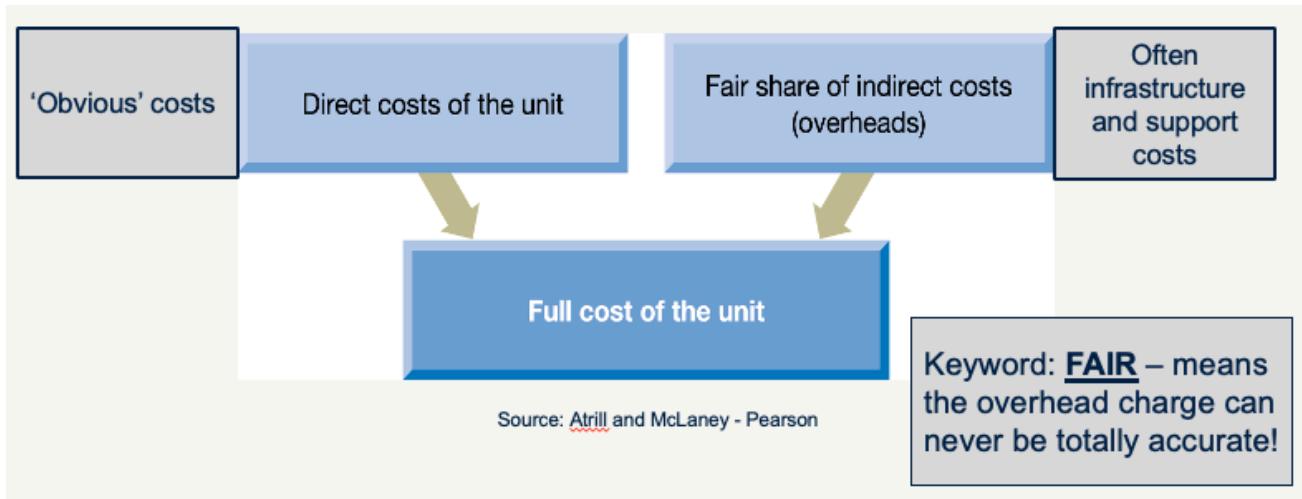
Cost can be defined in different ways, hence managers need to be clear on what it means in the context of decision making.

It is difficult to measure cost for decision-making purposes (it is not as straightforward as it seems)



## How do we look at costs?

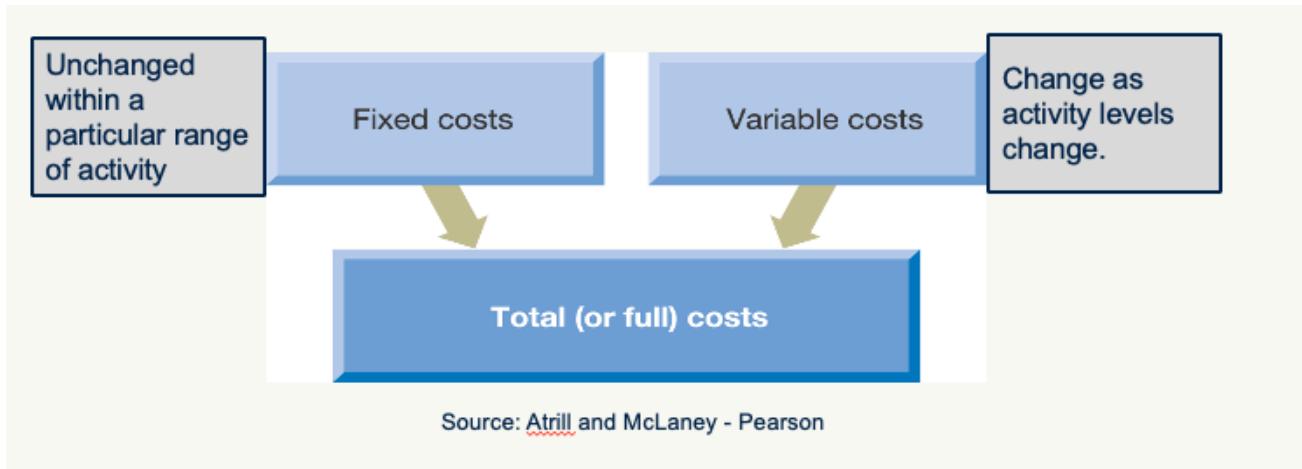
### 1. Cost reporting



**Direct costs:** Costs clearly associated with outputs, and relatively easily financially measured

**Indirect costs (overheads):** Some costs are difficult to associate with outputs and are not easily financially measured

## 2. Decision making



total cost of a job:

- sum of those costs that remain same irrespective of level of activity (**fixed costs**) and those that vary according to level of activity (**variable costs**)

variable cost of making/providing one more unit is called **marginal cost**

## Full Costing

**Full (Absorption) costing** takes account of all the costs of producing a particular product or service, taking in both direct and indirect costs and summing them. For a customer to be supplied with a product or service, all resources sacrificed to make the product, or provide the service are included as part of the full cost.

## What is full cost?

**Full cost** is the **total amount of resources**, usually measured in monetary terms, sacrificed to achieve a given objective.

## Uses of full cost

Managers would want to know the full cost of providing a service/producing a product as it will allow them to:

### 1. Pricing and output decisions

- having full cost info can help managers make decisions on price to charge customers for business's products or services.

## **2. Exercising control**

- determining full cost is useful starting point to exercise cost control

## **3. Assessing relative efficiency**

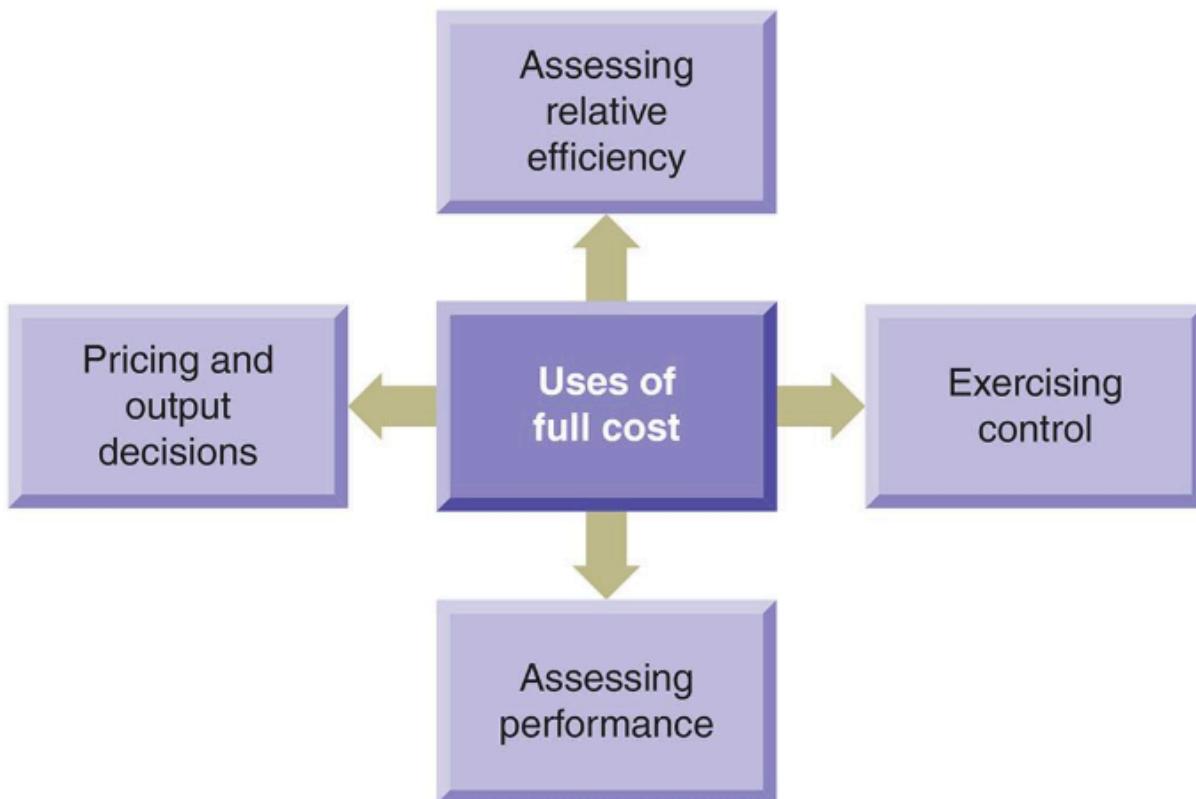
- full cost can help compare efficiency of carrying out an activity in a particular way, or particular place, with some alternative

## **4. Assessing performance**

- profit is important measure of business performance

**Figure 4.1**

Uses of full cost by managers



Managers use full cost information for four main purposes

## **Determining full cost per unit**

### **Single product business (process costing)**

- Where all units of output are identical, the full cost can be calculated as follows:

$$\text{Cost per unit} = \frac{\text{Total cost of output}}{\text{Number of units produced}}$$

- Where there is work in progress at the end of the period, the equivalent units of output it represents must be calculated to derive total output and cost per unit of output.

To calculate the full cost per unit of output, you average the total manufacturing cost over the number of units produced. You sum all of the elements of cost of production incurred in a particular period (e.g. materials, labour, rent, fuel, power, etc) and dividing this total by the total number of units of output for that period. This is called **process costing**

## Activity 4.1

Fruitjuice Ltd began operations at the beginning of May. It has just one product, a sparkling orange drink that is marketed as 'Orange Fizz'. During May the business produced 7,300 litres of the drink. The manufacturing cost incurred was made up as follows:

	£
Ingredients (oranges, sugar, water and so on)	1,690
Electricity and power	385
Rent of factory accommodation	850
Depreciation of equipment	275
Labour	3,852

What is the full cost per litre of producing 'Orange Fizz' in May?

Answer:

full cost:  $1690 + 385 + 850 + 275 + 3852 = £7052$

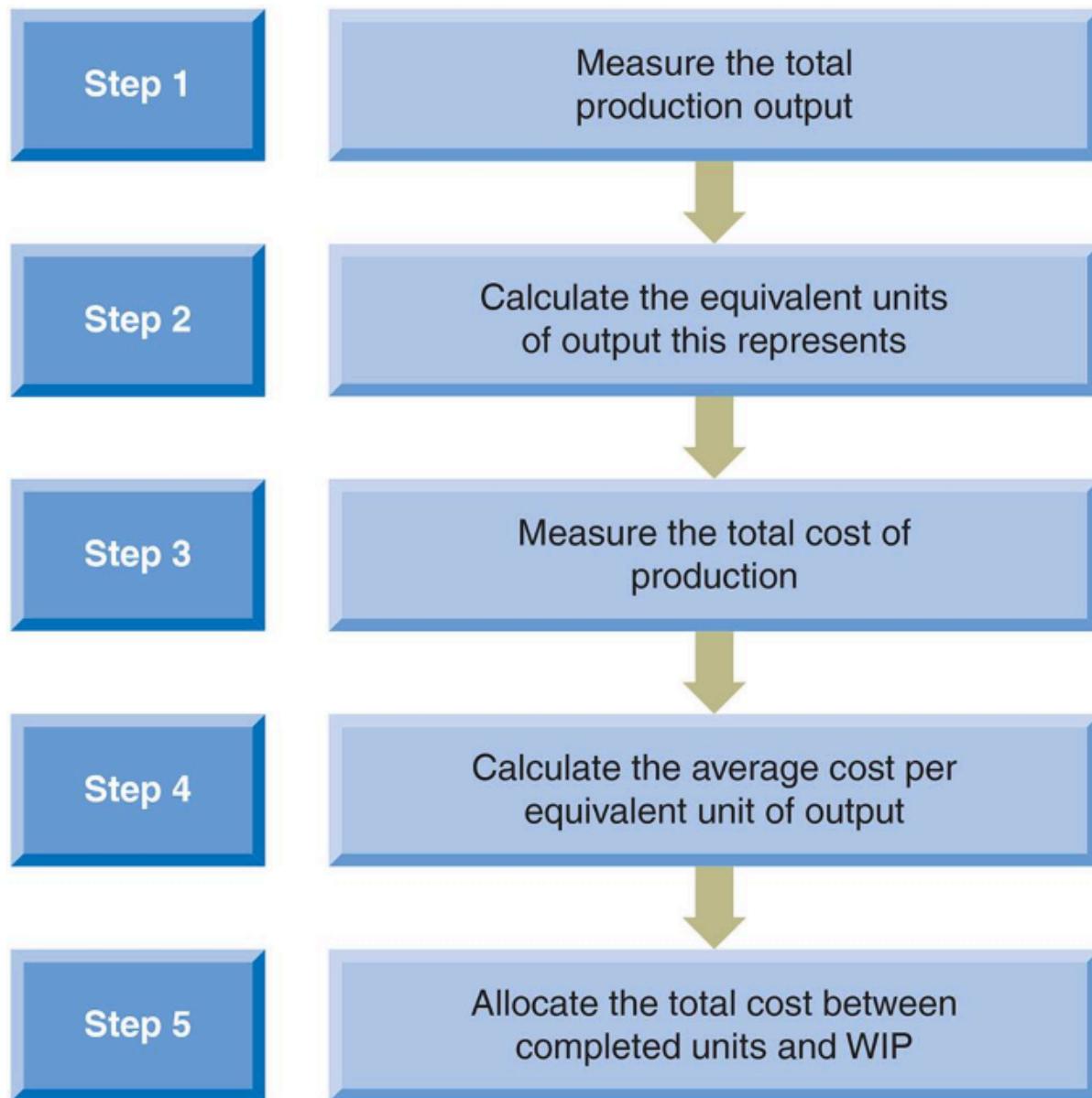
number of litres:  $£7300$

full cost per litre:  $7052/7300 = £0.966\dots \approx £0.97$

There can be problems in calculating how much output was produced (let's say there are partially completed products - they have to be taken into account as well when calculating total units produced and thus cost per unit for that period). You can calculate the equivalent units of output that the work of progress represents (aka number of complete products that could've been produced given material cost / manufacturing costs incurred). you need to have an estimate of degree (as accurate as possible) to which the WIP has been completed e.g. 15 incomplete gnomes at 80% completion would've been equivalent to 12 complete gnomes that is accumulated to total equivalent units of output for that period to be used for calculations

**Figure 4.2**

Key steps in process costing



There are five key steps involved in process costing.

## Multi-product businesses (job costing)

A job-costing approach is used for businesses that offer distinct products or services, which involves accumulating costs for each individual unit of output in order to determine its full cost (process costing cannot be used for multi-product businesses as units of outputs can be quite different).

You use both **direct** and **indirect cost** to determine full cost

**Direct cost** = cost that can be identified with, and measured in respect of, specific cost units (for example, labour of a garage mechanic, in relation to a particular car repair).

**Indirect cost (overheads)** = cost that cannot be identified with, and measured in respect of, a particular job (for example, the rent of a garage).

## Direct and Indirect Cost

For full cost to be calculated, you must separate cost into two categories: **direct cost** and **indirect cost**. The full cost is the sum of total direct and total indirect costs.

### Direct Cost

- Cost that is associated with specific cost units that can be measured reliably
- E.g. direct materials / direct labour

### Indirect Cost (Overheads)

- Cost that cannot be identified with each particular cost unit (job)
- E.g. amount paid to rent the garage would be an indirect cost of a particular car repair

### Note about indirect cost (overheads)

- indirect cost and overheads both mean the same thing (they are synonymous terms)
- it can be difficult to find an appropriate way to identify how to use overheads (charging overhead costs -> overhead absorption or overhead recovery rate)
- how can indirect cost be assigned to individual cost units?
- You tend to share the overhead cost equally between each unit (overhead absorption (recovery) rate)
- There are many other ways to charge overheads e.g. machine hour rate / labour hour rate, into the full cost. there is no **correct\*** way to assign overheads to jobs, but you assign a share of total overheads to each job, as overheads cannot be directly identified with individual jobs
- examples: percentage of direct labour cost, percentage of direct materials, direct material usage rate, etc etc
- selecting which overhead approach to take account for is based on your judgement based on nature/context of what is being calculated
- all overheads tend to be related to time
- direct labour hours tend to be regarded as the most common way to sharing overheads between cost units (as they can be measured for each job)
- consider the nature of operations/activities that may be such that 1 area uses 1 overhead absorption/recovery rate and another area uses a different one
- non-manufacturing overheads do not form part of the full cost calculation (just include overheads relating to manufacturing process only)

## **how to select an 'appropriate' method of charging overheads**

- there is no set rule; it is a matter of **judgement**
- where production is capital intensive and overheads are machine-based, its preferable to use machine hours. otherwise, it would be sensible to choose direct labour hours.
- your judgement should be based upon the circumstances/context given
- consider the nature of operations/activities that may be such that 1 area uses 1 overhead absorption/recovery rate and another area uses a different one
- e.g. use direct labour hour if the cost centre/department is labour-intensive or machine hour rate if machine-intensive.

if businesses have more than 1 cost centre, each cost centre will have their own direct/indirect costs for their respective activities. there will also be overhead costs for the entire business as a whole.

cost centres tend to have cost separately identified. charging direct cost to jobs to cost centre is same as where whole business is a single cost centre. record keeping would normally be done cost centre by cost centre.

the total production overheads of entire business must be broken down on cost centre basis; where they are divided between cost centres.

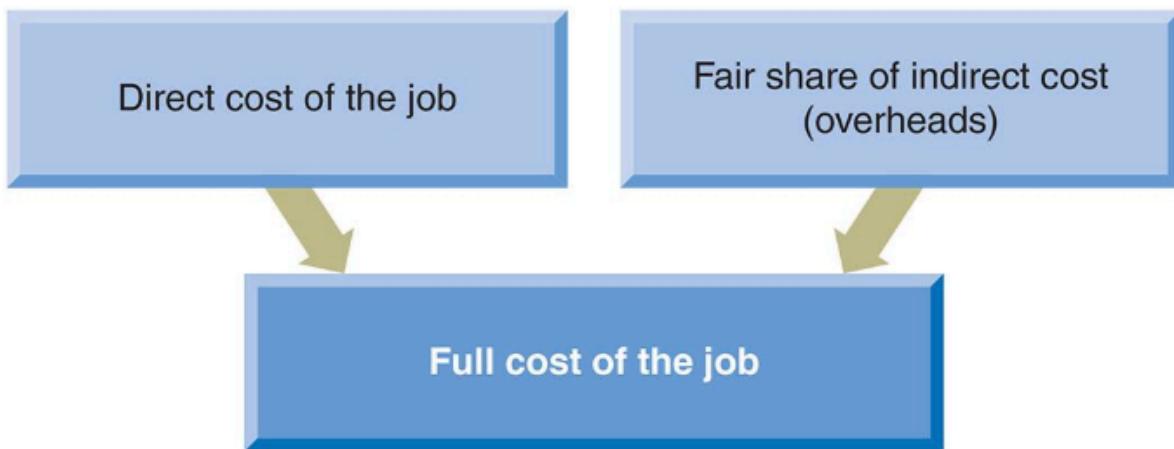
## **Job Costing**

To determine full cost of a particular cost unit, we first identify the direct cost of the cost unit. Next, we will have to charge each cost unit with an appropriate share of indirect cost

(overheads) as cost units will 'absorb' overheads.

**Figure 4.4**

The relationship between direct cost and indirect cost



The full cost of any particular job is the sum of those cost elements that can be measured specifically in respect of the job (direct cost) and a share of the cost of creating the environment in which production (of an object or service) can take place, but which do not relate specifically to any particular job (indirect cost).

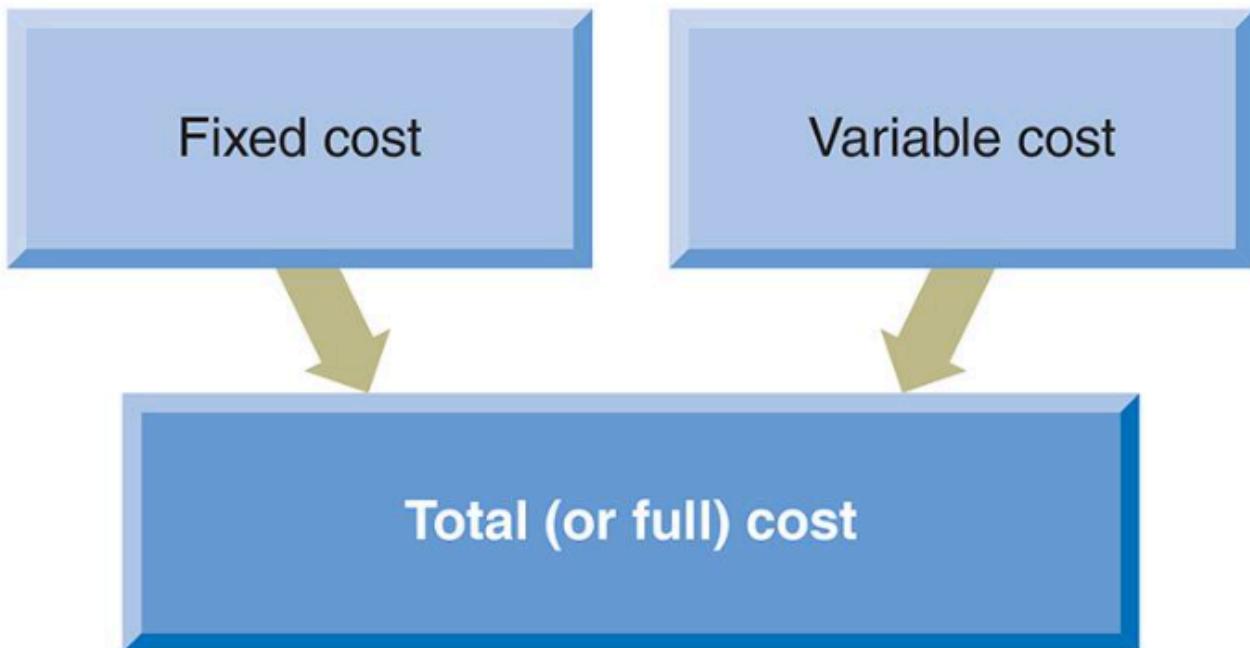
Whether a cost is direct or indirect depends on the item being costed - the cost unit. It is wrong to refer to indirect cost without specifying the cost unit

## **Full Costing (Marginal analysis) - covered in Chp 3**

Full cost (total cost) of doing something, can be analysed between its fixed and variable elements

**Figure 4.5**

The relationship between fixed cost, variable cost and total cost



The total cost of a job is the sum of the cost that remains the same irrespective of the level of activity (fixed cost) and that which varies according to the level of activity (variable cost).

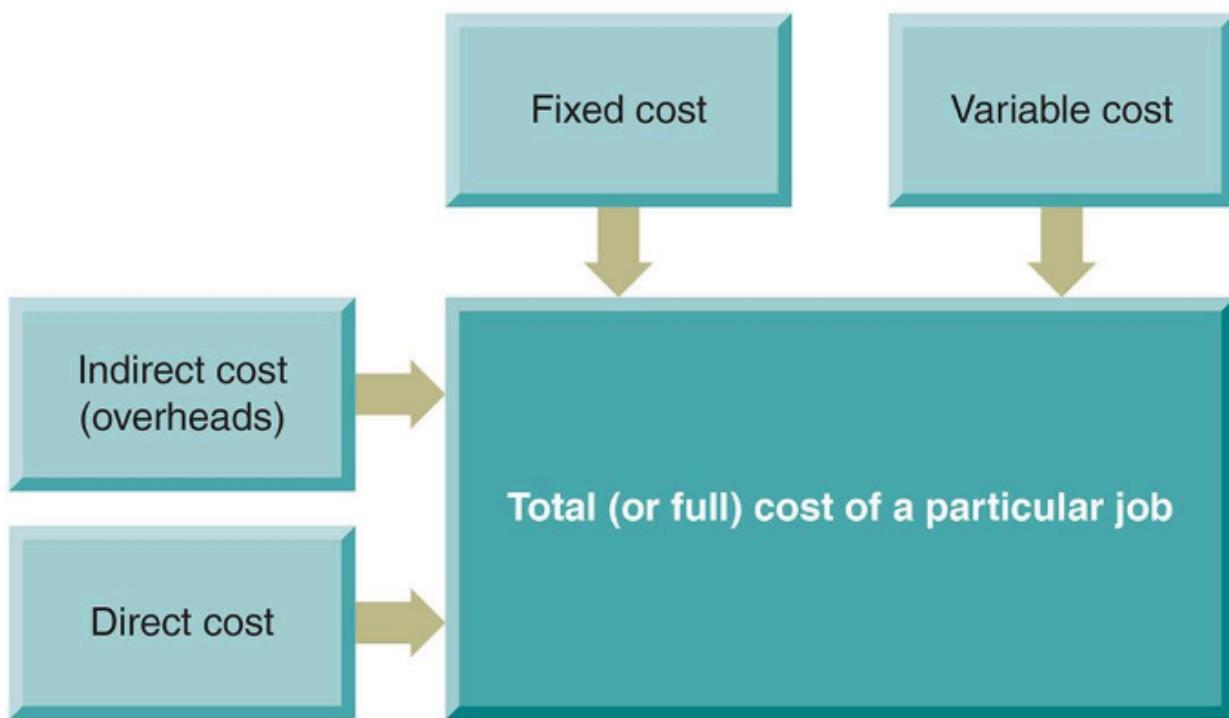
note: variable/direct cost and fixed/indirect costs are NOT the same

fixed and variable costs are defined in terms of cost behaviour in the face of changes in the volume of activity. direct and indirect cost are defined in terms of the extent to which they can be identified with, and measured with respect of, particular cost units (jobs).

example: an indirect cost like power for machinery can be variable, and direct cost like labour can be fixed - identifying a cost as being either direct/indirect doesn't tell us if the cost is fixed or variable.

**Figure 4.6**

The relationship between direct, indirect, variable and fixed costs of a particular job



A particular job's full (or total) cost will be made up of some variable and some fixed cost elements. It will also be made up of some direct and some indirect (overhead) elements.

total cost is **sum of direct and indirect costs**. it is also the **sum of fixed and variable costs**. these two facts are not connected.

## Example of Job Costing

### Example 4.2

Mirocom provides a personal computer maintenance and repair service. It has overheads of €10,000 each month. Each month 1,000 direct labour hours are worked and charged to cost units (jobs carried out by the business). A particular PC repair undertaken by the business used direct materials costing €35. Direct labour worked on the repair was three hours and the wage rate is €22 an hour. Mirocom charges overheads to jobs on a direct labour hour basis.

What is the full (absorption) cost of the repair?

step 1:

find the **overhead absorption (recovery) rate** : rate at which individual reports will be charged with overheads ( $10000/1000 = 10$  per direct labour hour)

step 2:

use the rate to calculate full cost

Thus, the full cost of the repair is:

	$\epsilon$
Direct materials	35
Direct labour (3 × € 22)	66
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	101
Overheads (3 × € 10)	30
	<hr/>
Full cost of the job	131
	<hr/>

note that the number of labour hours (3 hours) appear twice in deducing full cost: one for direct labour cost and second time for overheads charged to the repair

## Example 4.3

A business, which provides a service, expects to incur overheads totalling £20,000 next month. The total direct labour time worked is expected to be 1,600 hours and machines are expected to operate for a total of 1,000 hours.

During the next month, the business expects to do just two large jobs. Information concerning each job is as follows:

	<i>Job 1</i>	<i>Job 2</i>
Direct labour hours	800	800
Machine hours	700	300

How much of the total overheads will be charged to each job if overheads are to be charged on:

- a. a direct labour hour basis; and
- b. a machine hour basis?

What do you notice about the two sets of figures that you calculate?

a. direct labour hour basis

$$\text{overhead recovery rate} = 20000/1600 = 12.50 \text{ per direct labour hour}$$

$$\text{job 1: } 12.50 \times 800 = 10000$$

$$\text{job 2: } 12.50 \times 800 = 10000$$

b. machine hour basis

$$\text{overhead recovery rate} = 20000/1000 = 20.00 \text{ per machine hour}$$

$$\text{job 1: } 20.00 \times 700 = 14000$$

$$\text{job 2: } 20.00 \times 300 = 6000$$

It is irrational to prefer one basis of charging overheads to jobs as it apportions either a higher or lower amount of overheads to a particular job. This is because total overheads are same irrespective of method of charging total to individual jobs.

However, it is feasible to charge one segment of total overheads on one basis and another segment on another basis. Example:

## Activity 4.13

Taking the same business as in Example 4.3, on closer analysis we find that of the overheads that total £20,000 next month, £8,000 relates to machines (depreciation, maintenance, rent of the space occupied by the machines and so on) and the remaining £12,000 to more general overheads. The other information about the business is exactly as it was before.

How much of the total overheads will be charged to each job if the machine-related overheads are to be charged on a machine hour basis and the remaining overheads are charged on a direct labour hour basis?

direct labour hour basis:

$$\text{overhead recovery rate} = 12000/1600 = 7.50 \text{ per direct labour hour}$$

machine hour basis:

$$\text{overhead recovery rate} = 8000/1000 = 8.00 \text{ per direct labour hour}$$

overheads charged to jobs

\*\*

	<i>Job 1</i>	<i>Job 2</i>
	£	£
Direct labour hour basis:		
£ 7.50 × 800	6,000	
£ 7.50 × 800		6,000
Machine hour basis:		
£ 8.00 × 700	5,600	
£ 8.00 × 300		2,400
Total	<hr/> 11,600	<hr/> 8,400
	<hr/>	<hr/>

We can see from this that all the overheads of £20,000 have been charged.

## Cost centres

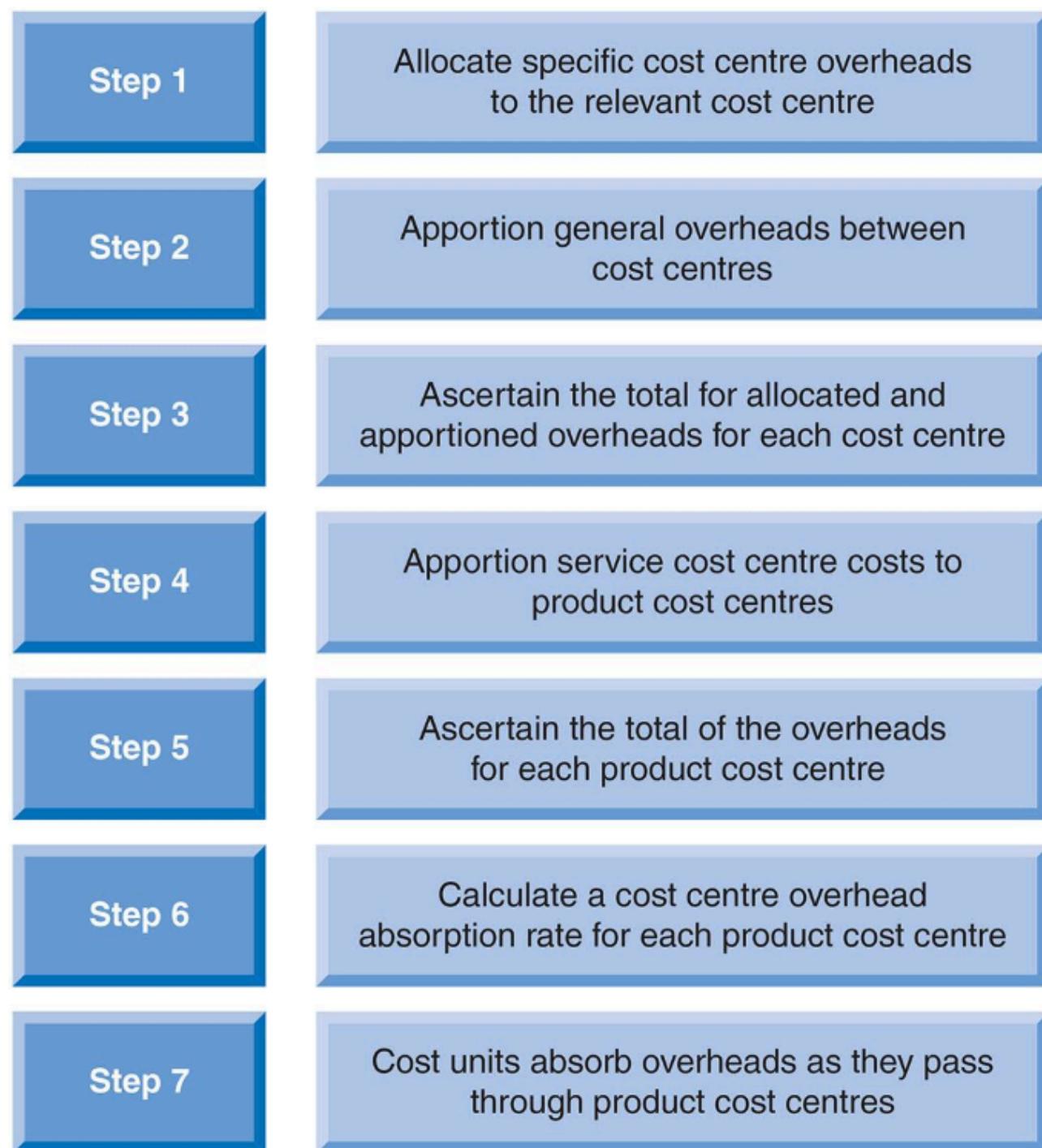
Businesses tend to be divided into departments where each department carries out a separate task. Many of these businesses charge overheads to cost units on a department-by-department basis.

You will calculate the total cost for each cost centre (direct/indirect where you pick the appropriate overhead for each cost centre) and sum them together to get the full cost of providing a service/producing a new product.

## How to handle overheads on a cost centre basis?

**Figure 4.11**

The steps in having overheads handled on a cost centre basis



There are seven steps involved with taking the overall business overheads and transferring them to their effect on individual cost units, when dealt with on a cost centre basis.

## Example of Job Costing Question:

## Example 4.5

A business consists of four cost centres:

- Preparation department;
- Machining department;
- Finishing department;
- Human resources (HR) department.

The first three are product cost centres and the last renders a service to the other three.

The level of service rendered is thought to be roughly in proportion to the number of employees in each product cost centre.

overheads:

Overheads, and other data, for next month are expected to be as follows:

	£000
Rent	10,000
Electricity to power machines	3,000
Electricity for heating and lighting	800
Insurance of building	200
Cleaning	600
Depreciation of machines	2,000

Total monthly salaries of the indirect workers:

Preparation department	200
Machining department	240
Finishing department	180
HR department	180

The HR department has a staff consisting of only indirect workers (including managers). The other departments have both indirect workers (including managers) and direct workers. There are 100 indirect workers within each of the four departments and none does any 'direct' work.

Each direct worker is expected to work 160 hours next month. The number of direct workers in each department is:

Preparation department	600
Machining department	900
Finishing department	500

Machining department direct workers are paid £24 an hour; other direct workers are paid £20 an hour.

All of the machinery is in the machining department. Machines are expected to operate for 120,000 hours next month.

The floor space (in square metres) occupied by the departments is as follows:

Preparation department	16,000
Machining department	20,000
Finishing department	10,000
HR department	2,000

dividng the overheads in cost-centre basis:

	<i>Total</i>	<i>Prep'n</i>	<i>Mach'g</i>	<i>Fin'g</i>	HR
	£000	£000	£000	£000	£000
<b>Allocated cost:</b>					
Machine power	3,000		3,000		
Machine depreciation	2,000		2,000		
Indirect salaries	800	200	240	180	180
<b>Apportioned cost</b>					
Rent	10,000				
Heating and lighting	800				
Insurance of buildings	200				
Cleaning	600				
Apportioned by floor area	11,600	3,867	4,833	2,417	483
Cost centre overheads	17,400	4,067	10,073	2,597	663
Reapportion HR cost by number of staff (including the indirect workers)	—	202	288	173	(663)
	17,400	4,269	10,361	2,770	—

finding full (absorption) cost:

## Activity 4.16

Assume that the machining department overheads (in Example 4.5) are to be charged to jobs on a machine hour basis, but that the direct labour hour basis is to be used for the other two departments. What will be the full (absorption) cost of a job with the following characteristics?

	Preparation department	Machining department	Finishing department
Direct labour hours	10	7	5
Machine hours	-	6	-
Direct materials (£)	85	13	6

**(Hint: This should be tackled as if each cost centre were a separate business, then departmental cost elements are added together for the job so as to arrive at the total full cost.)**

### Step 1: find the recovery rates

preparation department (direct hour based):

$$\frac{4269000}{600 \times 160} = 44.47$$

machining department (machine hour based):

$$\frac{10361000}{120000} = 86.34$$

finishing department (direct hour based):

$$\frac{2770000}{500 \times 160} = 34.63$$

**step 2: find the cost of total job:**

	£	£
Direct labour:		
Preparation department (10 × £ 20)	200.00	
Machining department (7 × £ 24)	168.00	
Finishing department (5 × £ 20)	100.00	
	<hr/>	
		468.00
Direct materials:		
Preparation department	85.00	
Machining department	13.00	
Finishing department	6.00	
	<hr/>	
		104.00

### Overheads:

Preparation department (10 × £ 44.47)	444.70
Machining department (6 × £ 86.34)	518.04
Finishing department (5 × £ 34.63)	173.15
	_____
	1,135.89
	_____
Full cost of the job	1,707.89
	_____

## Full (absorption) costing vs variable costing

Variable (marginal) costing is an alternative to **full (absorption) costing**

### Full (absorption) Costing

- fixed production costs are assigned to inventories and only fixed production costs linked to those inventories sold are charged against that period's sales revenue
- includes both fixed and variable costs in the product cost and treated as expenses when product is sold

### Variable Costing

- includes **variable cost** as part of cost of goods or service provided
- all fixed production costs are charged to the period in which they are incurred
- highlights relationship between cost, value and profit (obscured under a full costing system)

### Which method is better?

- In variable costing, profit is influenced only by **change in sales**
- In full (absorption costing), profit is influenced by **changes in the level of both sales and production.**
- variable costing tend to be more straightforward than full costing

## Week 3: CVP (Cost-volume-profit) Analysis

## Cost behaviour

Cost represents the resources sacrificed in order to achieve benefits. Costs incurred can be classified as:

- **fixed cost:** cost that remain constant (fixed) when changes occur to volume of activity
- **variable cost:** cost that vary according to volume of activity

examples (for a restaurant):

- fixed cost: rent paid for premises
- variable cost: cost of unprepared food

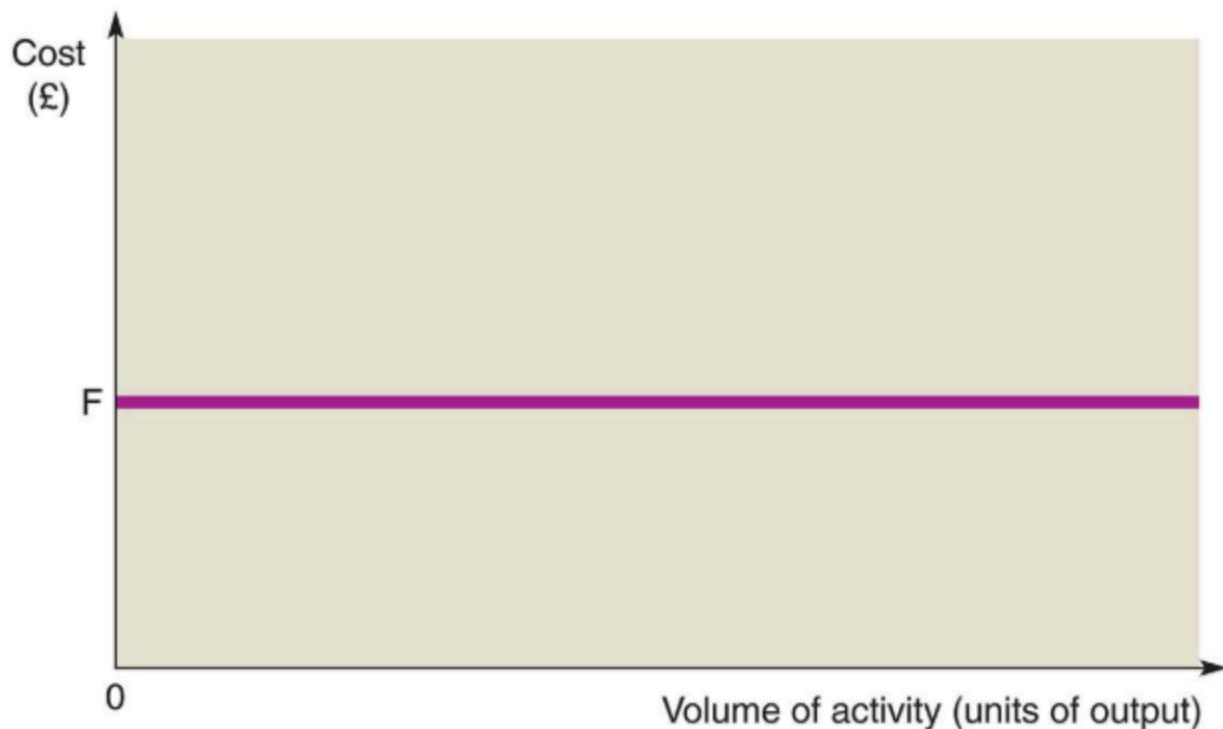
note: staff salaries/wages tend to be fixed costs as they aren't paid according to volume of output. labour cost can be either fixed or variable, depending on circumstances

## Fixed Cost

Stays the same irrespective of volume of activity

**Figure 3.1**

Graph of fixed cost against volume of activity



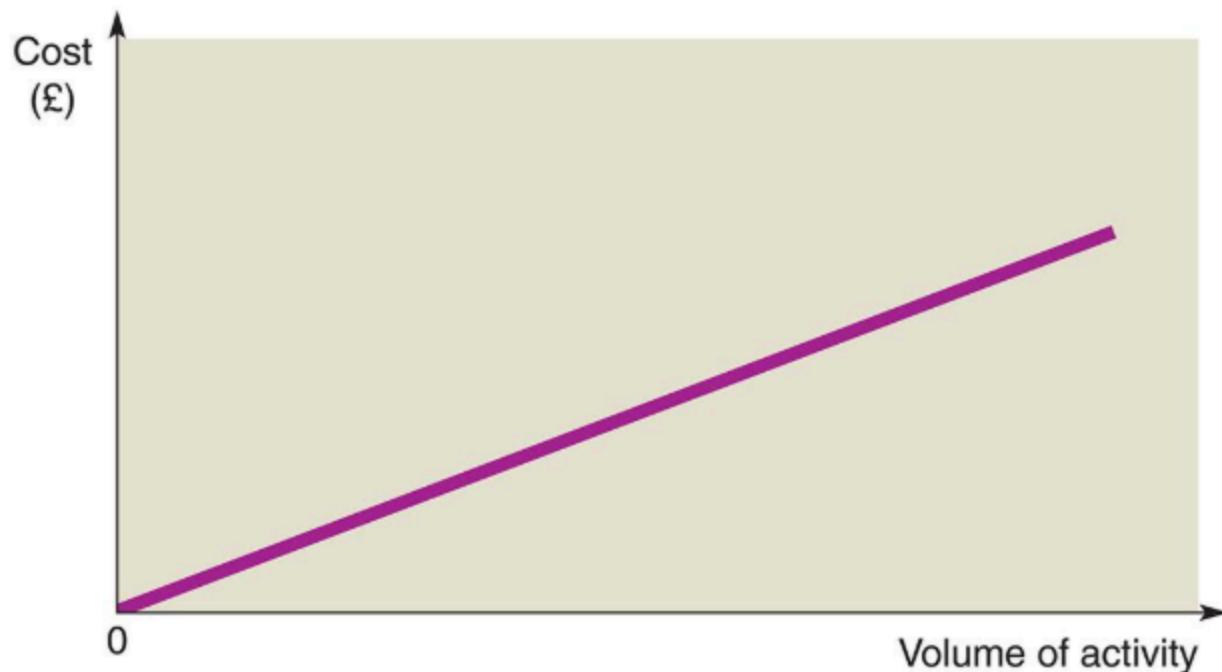
As the volume of activity increases, the fixed cost stays exactly the same (0F).

## Variable Cost

Varies with volume of activity - assumed to be same per unit of activity, irrespective of volume of activity.

**Figure 3.3**

Graph of variable cost against the volume of activity



At zero activity, there is no variable cost. However, as the volume of activity increases, so does the variable cost.

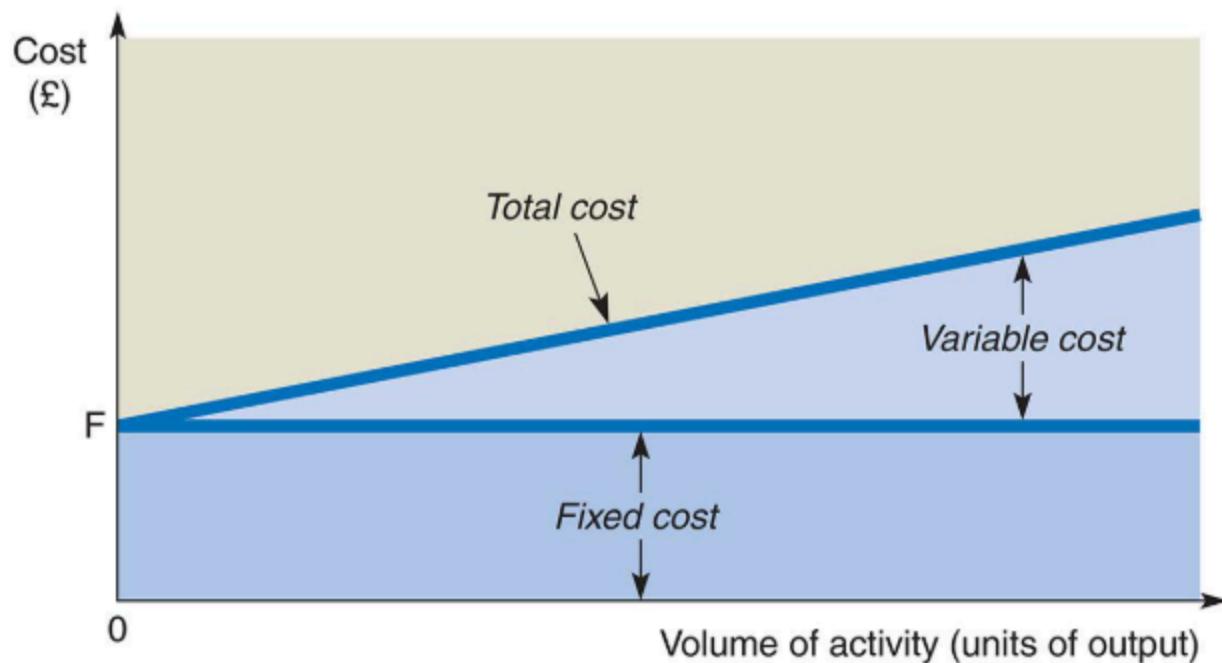
## Break-even analysis

If we know the fixed cost for period and variable cost per unit, we can produce a graph of total cost over possible range of volume of activity, for a particular product or service.

every project would need to **break even** to avoid making a loss

**Figure 3.5**

Graph of total cost against volume of activity



The bottom part of the graph represents the fixed cost element. To this is added the wedge-shaped top portion, which represents the variable cost. The two parts together represent total cost. At zero activity, the variable cost is zero, so total cost equals fixed cost. As activity increases so does total cost, but only because variable cost increases. We are assuming that there are no steps in the fixed cost.

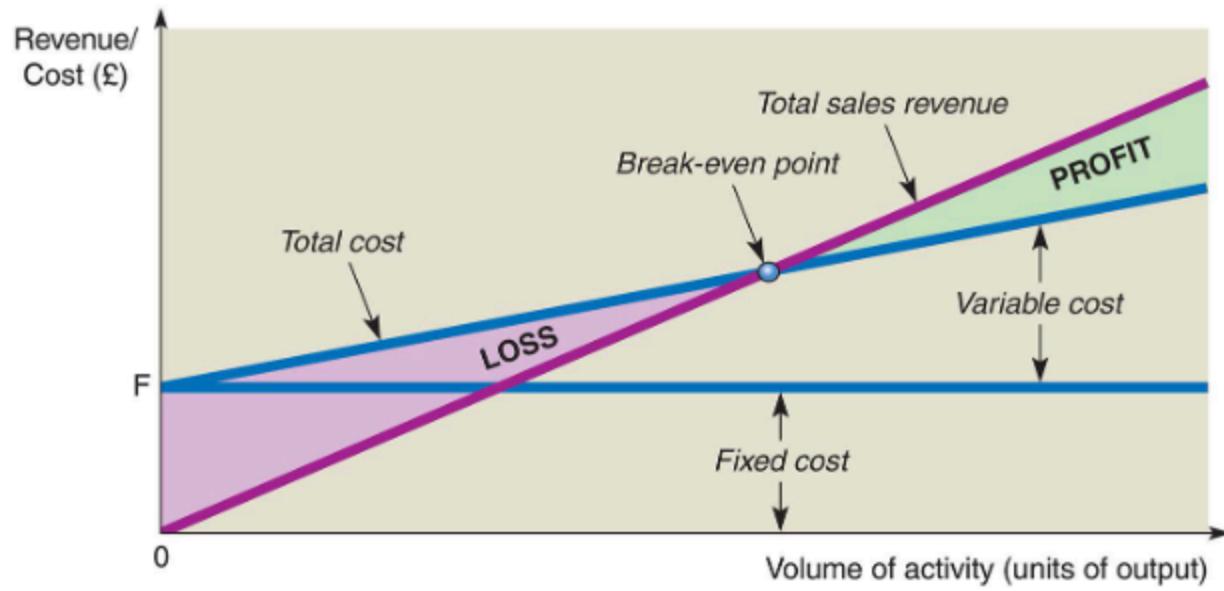
as volume of activity increases from 0, fixed cost is augmented by relevant variable cost to give total cost. even when nothing is happening, a business can still be paying fixed costs e.g. rent/salaries/etc.

## Break-even (BE) Chart

Adding the total sales revenue onto the total cost graph

**Figure 3.6**

A break-even chart



The sloping line starting at zero represents the sales revenue at various volumes of activity. The point at which this finally catches up with the sloping total cost line, which starts at F, is the break-even point (BEP). Below this point a loss is made, above it a profit.

**profit/loss** = difference between total sales revenue and total cost, for a particular volume of activity, as well as vertical distance between total sales revenue line and total cost line at that volume of activity

## Break-even point (BEP)

The point where

- there is **neither profit or loss** (activity **breaks even**)
- **Total sales revenue = Total cost** (0 net profit)
- Total sales revenue = Fixed cost + Variable cost
- no vertical distance between total cost and total revenue lines.

when

- volume of activity is **below BEP** = loss
- volume of activity **above BEP** = profit

you must express the BEP with respect to a period of time.

knowing the BEP for a particular activity can be used to assess risk.

## Calculating the BEP

At BEP:

- total sales revenue = total cost

it is same as:

- total sales revenue = fixed cost + variable cost

if we call the number of units of output at BEP  $b$ , then:

$$b \times \text{sales revenue per unit} = \text{fixed cost} + (b \times \text{variable cost per unit})$$

$$(b \times \text{sales revenue per unit}) - (b \times \text{variable cost per unit}) = \text{fixed cost}$$

$$b \times (\text{sales revenue per unit} - \text{variable cost per unit}) = \text{fixed cost}$$

giving

$$b = \frac{\text{Fixed cost}}{\text{Sales revenue per unit} - \text{Variable cost per unit}}$$

## Example of calculating the BEP:

## Example 3.2

Cottage Industries Ltd makes baskets. The fixed cost of operating the workshop for a month totals £500. Each basket requires materials that cost £2. The business pays the basket makers £10 for each basket completed. The basket makers are all on contracts such that if they do not work for any reason, they are not paid. The baskets are sold to a wholesaler for £14 each.

What is the BEP for basket making for the business?

## Solution

The BEP (in number of baskets) is:

$$\begin{aligned} \text{BEP} &= \frac{\text{Fixed cost}}{\text{Sales revenue per unit} - \text{Variable cost per unit}} \\ &= \frac{\text{£ } 500}{\text{£ } 14 - (\text{£ } 2 + \text{£ } 10)} \\ &= 250 \text{ baskets a month} \end{aligned}$$

Note that the BEP must be expressed with respect to a period of time.

## Weakness of BE analysis:

- **non-linear relationships** - total variable cost/total revenue lines are not always straight
- **stepped fixed cost** - most types of fixed cost are not fixed over whole range of activity, but tend to be 'stepped'
- **multi-product businesses** - additional sales of one product may affect sales of another of the business's products as some businesses sell multiple products

## Contribution

### What is Contribution?

Also known as **variable costing** or **marginal costing**

- Contribution per unit = Sales revenue per unit – Variable cost per unit

Contribution = excess of sales revenue over variable cost.

it's called contribution as the figure 'contributes' to meeting the fixed cost, where if there is any excess, it then contributes to profit

## Uses of Contribution

- Used to calculate BEP (break-even point) as shown above
- units of output to break even:  $\frac{\text{Fixed costs}}{\text{Contribution per unit}}$

## Contribution margin ratio

- The contribution from an activity expressed as percentage of sales revenue

$$\text{Contribution margin ratio} = \frac{\text{Contribution}}{\text{Sales revenue}} \times 100\%$$

example: (for the BEP example)

$$\text{Without the machine, } \frac{14 - 12}{14} \times 100\% = 14\%$$

$$\text{With the machine, } \frac{14 - 7}{14} \times 100\% = 50\%$$

ratio helps to provide an impression of degree to which sales revenue is consumed by variable cost

## Example Question



# Contribution: Good for Decision Making

Product	1	2	3	4	Total
All £m					
Sales	30	20	10	5	65
Less: Variable costs	8	8	4	2	22
Contribution	22	12	6	3	43
Less: Fixed costs in total					40
Profit (loss)					3
Contribution margin on sales ratio	22/30 = 73.3%	12/20 = 60%	6/10 = 60%	3/5 = 60%	
Ranking order	1st	2nd	2nd	2nd	

Textbook example:

## Activity 3.9

Cottage Industries Ltd (see Example 3.2) expects to sell 500 baskets a month. The business has the opportunity to rent a basket-making machine. Doing so would increase the total fixed cost of operating the workshop for a month to £3,000. Using the machine would reduce the labour time to £5 per basket.

(a) How much profit would the business make each month from selling baskets:

- without the machine; and
- with the machine?

(b) What is the BEP if the machine is rented?

(c) What do you notice about the figures that you calculate?

(a) Estimated monthly profit from basket making:

	<i>Without the machine</i>	<i>With the machine</i>
	£	£
Sales revenue (500 × £ 14)	7,000	7,000
Materials (500 × £ 2)	(1,000)	(1,000)
Labour (500 × £ 10) (500 × £ 5)	(5,000)	(2,500)
Fixed cost	(500)	(3,000)
	<hr/>	<hr/>
	(6,500)	(6,500)
	<hr/>	<hr/>
Profit	500	500
	<hr/>	<hr/>

(b) The BEP (in number of baskets) with the machine:

$$\begin{aligned}
 \text{BEP} &= \frac{\text{Fixed cost}}{\text{Sales revenue per unit} - \text{Variable cost per unit}} \\
 &= \frac{\text{£ } 3,000}{\text{£ } 14 - (\text{£ } 2 + \text{£ } 5)} \\
 &= 429 \text{ baskets a month}
 \end{aligned}$$

The BEP without the machine is 250 baskets per month (see Example 3.2).

## Margin of Safety

- Difference between target sales level and the BEP

- Bigger the MOS, the greater the degree to which matters can move in wrong direction without causing too much concern - less risk!
- The extent to which planned level of output or sales lie above the BEP (excess of planned volume of activity over volume at BEP)

We can also use the formula from BEP, to calculate volume of activity needed to achieve a target profit where:

Total sales revenue = Fixed cost + Variable cost + Target profit

let  $t$  be the number of units of output to achieve target profit, the formula to obtain  $t$  is:

$$t = \frac{\text{Fixed cost} + \text{Target profit}}{\text{Sales revenue per unit} - \text{Variable cost per unit}}$$

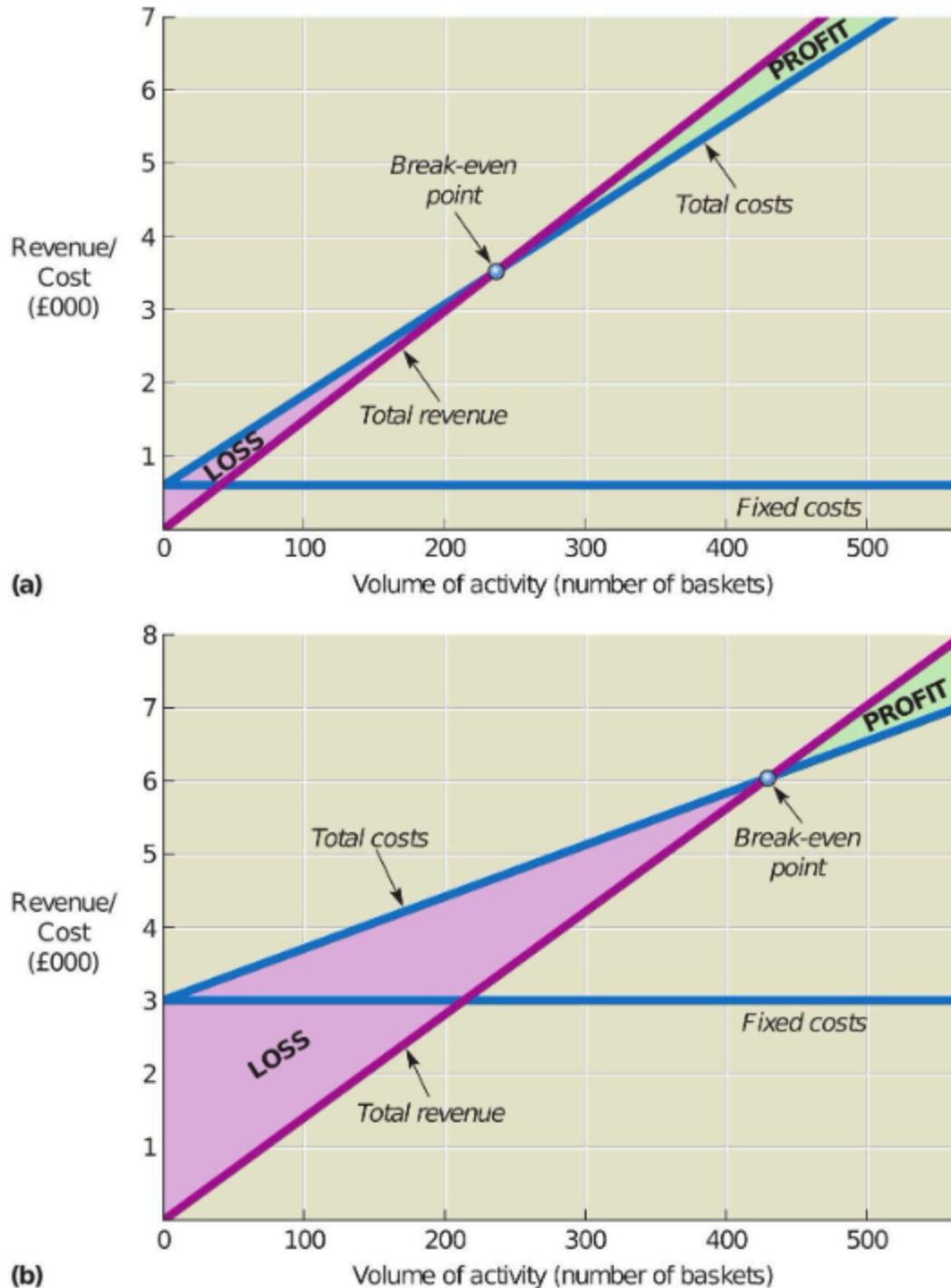
## Example

	<i>Without the machine (number of baskets)</i>	<i>With the machine (number of baskets)</i>
(a) Expected volume of sales	500	500
(b) BEP	250	429
Margin of safety (the difference between (a) and (b))	250	71
Expressed as a percentage of expected volume of sales	50%	14%

## BE charts:

**Figure 3.9**

Break-even charts for Cottage Industries Ltd's basket-making activities (a) without the machine and (b) with the machine



to find units needed to achieve target profit:

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## Activity 3.11

Cottage Industries Ltd (see Example 3.2 and Activity 3.9) has a target profit of £4,000 a month. What volume of activity is required to achieve this:

(a) without the machine; and (b) with the machine?

(a) Using the formula above, the required volume of activity without the machine:

$$\begin{aligned} & \frac{\text{Fixed cost} + \text{Target Profit}}{\text{Sales revenue per unit} - \text{Variable cost per unit}} \\ &= \frac{\text{£ } 500 + \text{£ } 4,000}{\text{£ } 14 - (\text{£ } 2 + \text{£ } 10)} \\ &= 2,250 \text{ basket a month} \end{aligned}$$

(b) The required volume of activity with the machine:

$$= \frac{\text{£ } 3,000 + \text{£ } 4,000}{\text{£ } 14 - (\text{£ } 2 + \text{£ } 5)} = 1,000 \text{ baskets a month}$$

## CVP Analysis - Marginal Analysis

- Used to look at inter-relationships between fixed costs, variable costs, sales and profit at varying levels of activity
- When deciding between 2 or more possible courses of action, only include costs that vary with the decision in the analysis.
- we can use **contribution** to make decisions (marginal analysis) involving:
  - relatively small variations from existing practice and/or
  - relatively limited periods of timeFixed cost is not relevant as it'll be same irrespective of decision made, as they cant be altered in short term.

Marginal analysis is a form of cost-benefit analysis where it compares additional costs of a particular activity with additional benefits that it generates. only consider costs and revenues that vary with the decision when adopting marginal analysis approach. the end goal is to enhance the owners' (aka shareholders') wealth.

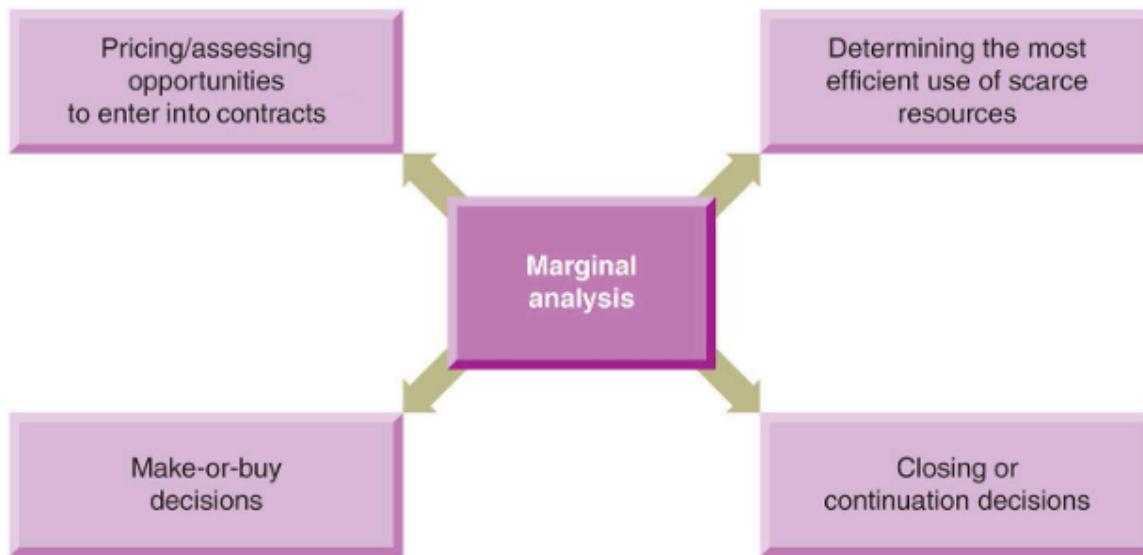
Marginal analysis is **only** used in the **short-term**, where you **ignore fixed cost as its not affected by the decision**

marginal analysis may be used in 4 areas of decision-making:

- pricing/**assessing opportunities to enter contracts**; - consider only the effect on contribution
- **determining the most efficient use of scarce resources**; - limiting factor is most effectively used by maximising its contribution per unit
- **make-or-buy decisions** - take action that leads to the highest total contribution
- **closing or continuation decisions** (not covered in syllabus) - assessed by net effect on total contributions

**Figure 3.14**

The four key areas of decision making using marginal analysis



Marginal analysis tends to be used in four main decision-making areas.

## Assessing contracts on contribution basis

Marginal analysis can be used to assess an opportunity.

example:

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## Activity 3.16

Cottage Industries Ltd (see Example 3.2) has spare capacity as its basket makers have some spare time. An overseas retail chain has offered the business an order for 300 baskets at a price of £13 each.

Without considering any wider issues, should the business accept the order? (Assume that the business does not rent the machine.)

Since the fixed cost will be incurred in any case, it is not relevant to this decision. All we need to do is to see whether the price offered will yield a contribution. If it will, the business will be better off by accepting the contract than by refusing it.

£	
Additional revenue per unit	13
Additional cost per unit	(12)
Additional contribution per unit	<hr/> 1 <hr/>

For 300 units, the additional contribution will be £300 (that is,  $300 \times £1$ ). Since no fixed cost increase is involved, it will be £300 better off by taking this contract than by refusing it.

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there are other factors that can be difficult or impossible to quantify, which should be taken into account before reaching a final decision, as ever with decision making,

**marginal cost:** minimum price at which the business can offer a product or service for sale, where the business will be no better or worse off as a result of making the sale. the marginal cost approach to pricing should only be used where it is not possible to sell at a price that will cover the full cost.

## Using scarce resources

Output of business is determined by customer demand for the particular good or services. When there is limited productive capacity due to shortages in any factor of production, management

must decide on how to best deploy the scarce resource, i.e. which products, from available range, should be produced and how many of each should be produced.

This is why marginal analysis can be useful, as it can find out the **contribution per unit of the scarce factor** and maximise that.

### **Example 1:**

## Example 3.3

A business provides three different services, the details of which are as follows:

Service (code name)	AX107	AX109	AX220
	£	£	£
Selling price per unit	50	40	65
Variable cost per unit	(25)	(20)	(35)
Contribution per unit	25	20	30
Labour time per unit	2.5 hours	1.5 hours	3 hours

Within reason, the market will take as many units of each service as can be provided. However, the ability to provide the services is limited by the availability of labour, all of which needs to be skilled. Fixed cost is not affected by the choice of service provided because all three use the same facilities.

The most profitable service is AX109 because it generates a contribution of £13.33 (£20/1.5) an hour. The other two generate only £10 each an hour (£25/2.5 and £30/3). So, to maximise profit, priority should be given to the production that maximises the contribution per unit of limiting factor.

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## Example 2:

<i>Product (code name)</i>	<i>B14</i>	<i>B17</i>	<i>B22</i>
	€	€	€
Selling price per unit	25	20	23
Variable cost per unit	(10)	(8)	(12)
Contribution per unit	15	12	11
Machine time per unit	4 hours	3 hours	4 hours
Contribution per machine hour	€ 3.75	€ 4.00	€ 2.75
Order of priority	2nd	1st	3rd

Therefore produce:

20 units of product B17 using	60 hours
22 units of product B14 using	88 hours
	148 hours

This leaves unsatisfied the market demand for a further three units of Product B14 and 30 units of Product B22.

## Make or buy decisions

Marginal analysis can be used for businesses who need to decide whether to produce a product or service that they sell themselves, or to buy it in from some other business (subcontracting).

Virtually any part, component or service that is required in production of main product or service, or the main product or service itself, could be the subject of a make-or-buy decision.

Obtaining services or products from a subcontractor is referred to as **outsourcing**. There can be a risk of unexpected costs when outsourcing which are proven to be difficult to quantify.

However these costs can be mitigated or avoided by choosing a reliable and experienced outsource partner and by detailed planning prior to any outsourcing agreement.

**Example:**

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## Activity 3.21

Shah Engineering needs a component for one of its products. It can outsource production of the component to a subcontractor who will provide the components for €20 each. The business can produce the components internally for a total variable cost of €15 per component. Shah Engineering has spare capacity.

Should the component be subcontracted or produced internally?

The answer is that the business should produce the component internally, since the variable cost of subcontracting is greater by €5 (that is, €20 – €15) than the variable cost of internal manufacture.

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## Activity 3.22

Now assume that Shah Engineering (Activity 3.21) has no spare capacity, so it can produce the component internally only by reducing its output of another of its products. While it is making each component, it will lose contributions of €12 from the other product.

Should the component be subcontracted or produced internally?

The answer is to subcontract. In this case, both the variable cost of production and the opportunity cost of lost contributions must be taken into account. Thus, the relevant cost of internal production of each component is:

€	
Variable cost of production of the component	15
Opportunity cost of lost production of the other product	12
	<hr/>
	27
	<hr/>

This is obviously more costly than the €20 per component that will have to be paid to the subcontractor.

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**note: closing or continuation decisions not covered in syllabus.**

## Week 4: ABC (Activity-based costing)

(TEXTBOOK: Chapter 5: Costing and cost management in a competitive environment - **only ABC is covered**)

Traditional full costing approach has limitations where overhead recovery rates can be high due to changes in competitive environment, affecting the calculation for total cost. Thus the introduction of **Activity-based costing (ABC)** which is a different approach that links costs to activity patterns, where each activity causes cost.

# ABC (Activity-based Costing)

Directly tracing the cost of **all activities supporting production process** (overheads) and linking these costs to particular units of output (of products or services), to provide a more realistic/measured account of overhead cost element for particular unit of output.

example for manufacturing, activites that support production process may include material ordering, running machines, inspectiion, processing customer orders, storage, and so on. THe cost of these support activities all make up the total overhead cost

To implement ABC, managers would need to identify:

- **cost drivers** - factors that cause a change in the costs of each support activity
- **cost pools** - areas of support activity to which overhead costs are subsequently assigned (equivalent to cost centres)

**definition:**

**cost pool** = the sum of the overhead costs that are seen as being caused by the same cost driver

It is vital to identify the cost drivers (also the most difficult) as they have a cause-and-effect relationship with activity costs and so are used as basis for assigning support activity costs to a particular unit of output.

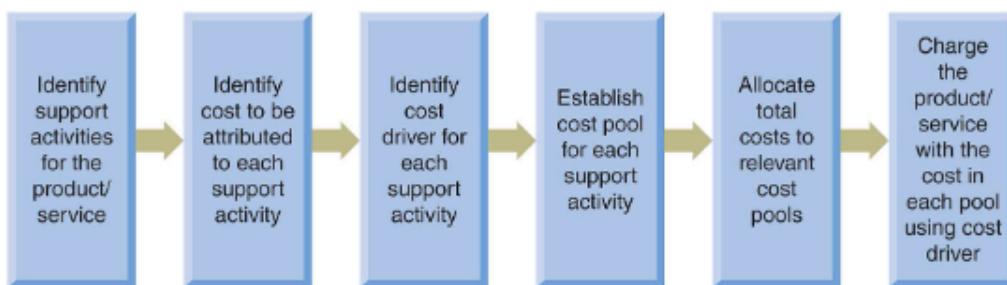
## ABC Process

1. Identify different activities of the business
2. Create cost pools by calculating the total cost of each activity
3. Identify a cost driver (i.e. a causation factor) for each activity
4. Calculate cost driver rate (i.e. average cost of 1 occurrence of the cost driver)

## 5. Attach activity costs to products according to their demand for each activity

**Figure 5.1**

Key steps in the ABC process



The support activities reflect how resources such as labour and machinery are being deployed. The costs attributed to each cost activity are allocated to a separate cost pool and then charged to products or services using the relevant cost driver.

## Assigning overheads

after identifying various support activities, along with their costs and factors that drive these costs, ABC would require:

1. **Establishing an overhead cost pool for each support activity**, where each cost pool is needed for each separate cost driver. (cost pool is equivalent to cost centres)
2. **Assigning the total cost associated with each support activity to the relevant cost pool.**
3. **Charging the units of output with the total cost within each pool using the relevant cost driver.** (by dividing amount in each cost pool by estimated total usage of cost driver to get a cost per unit of the cost driver, which is then multiplied by number of units of the cost driver used by particular unit of output, obtaining amount of overhead cost to be attached to it)

## Example:

## Example 5.2

The management accountant at Modern Producers Ltd (see Example 5.1) has estimated that the cost of running the storage area for finished goods for next year will be £90,000. This will be the amount allocated to the 'storage area cost pool'.

It is estimated that each Product A will spend an average of one week in the storage area before being sold. With Product B, the equivalent period is four weeks. Both products are of roughly similar size and have very similar storage needs. It is felt, therefore, that the period spent in the storage area ('product weeks') is the cost driver.

Next year, 50,000 Product As and 25,000 Product Bs are expected to pass through the storage area. The estimated total usage of the cost driver will be the total number of 'product weeks' that the products will be in the storage area. For next year, this will be:

Product A	50,000	×	1 week	=	50,000
Product B	25,000	×	4 weeks	=	100,000
					150,000

The cost per unit of cost driver is the total cost of the storage area divided by the number of 'product weeks', as calculated above. This is:

$$\text{£ } 90,000 / 150,000 = \text{£ } 0.60$$

To determine the cost to be attached to a particular unit of each product, the figure of £0.60 must be multiplied by the number of 'product weeks' that a product stays in the storage area. Thus, each unit of Product A will be charged with £0.60 (that is,  $\text{£ } 0.60 \times 1$ ) and each Product B with £2.40 (that is,  $\text{£ } 0.60 \times 4$ ).

## Identifying cost drivers

Nature of support activities (cost pools) and what drive their costs (cost drivers) will vary between businesses.

<i>Support activity</i>	<i>Potential cost driver</i>
Purchasing	Number of purchase orders
Setting up machinery	Number of set-ups
Running machinery	Machine hours
Machinery maintenance	Maintenance staff hours
Scheduling production lines	Production schedulers' hours
Product testing	Number of tests conducted
Reworking defective products	Number of defective products

there are two types of cost drivers: **activity drivers** (measures frequency/intensity with which an activity is performed) and **resource drivers** (measures amount of resources consumed to carry out the activity)

## ABC vs Traditional Approach

Both approaches adopt a two-stage allocation process for assigning overhead costs.

### Traditional:

- Overhead costs first assigned to product cost centres (based around department).
- Costs accumulated in each cost centre are charged to units of output using overhead recovery rate

### ABC:

- Overhead costs first assigned to cost pools (based around an activity)
- Costs accumulated in cost pools are then charged to units of outputs using cost driver rate for each activity

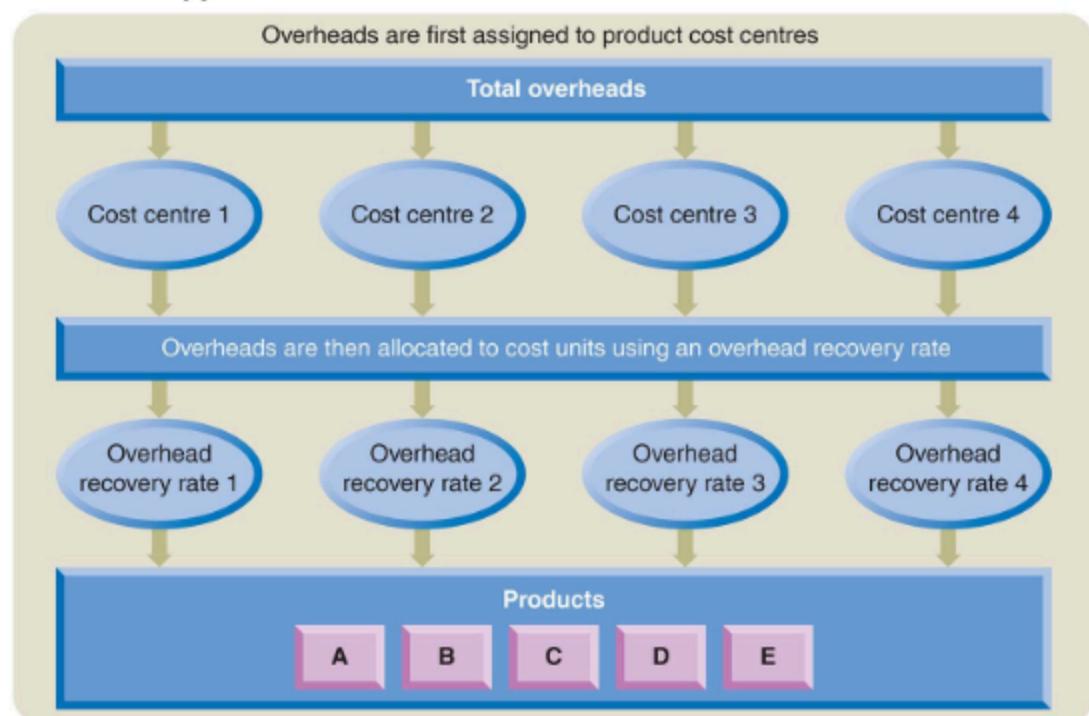
ABC takes into consideration the overhead costs within modern manufacturing environment as it does not vary on basis of either machine hours or direct labour hours. ABC is usually **more complex** than traditional as ABC can identify more support activities which means more cost pools than cost centres identified using traditional approach.

The difference between ABC and traditional approaches only concern how overheads are charged to jobs to derive the full cost.

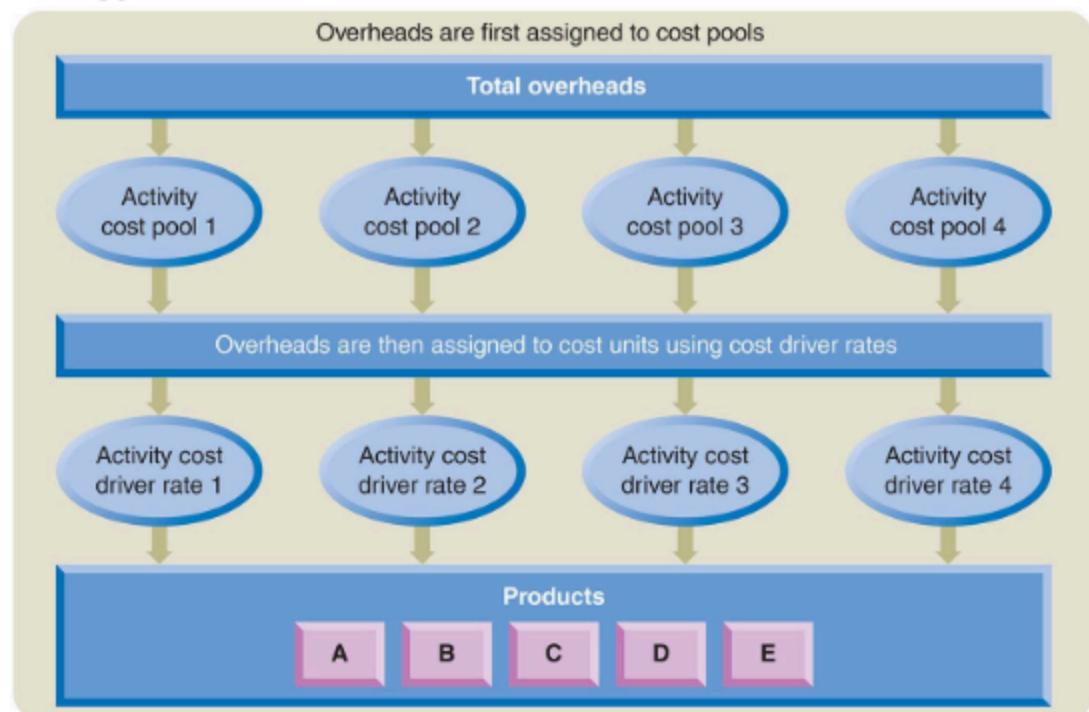
**Figure 5.2**

Traditional versus activity-based costing

### Traditional approach



### ABC approach



With the traditional approach, overheads are first assigned to product cost centres and then absorbed by cost units based on an overhead recovery rate (using direct labour hours worked on the cost units or some other approach) for each cost centre. With activity-based costing, overheads are assigned to cost pools and then cost units are charged with overheads to the extent that they drive the costs in the various pools.

## Example ABC Calculation:

### Cost Driver Rates: ABC Calculation Question

Activity cost pools	Annual cost £
Controlling quality	50,000
Setting up machinery	10,000
Operating machinery	20,000
Using materials	700,000



Products	A	B	C
Quality inspections 1,000	250	350	400
Machine set-ups 50	10	25	15
Machine hours 40,000	10,000	14,000	16,000
Kilograms of material 35,000	8,000	12,000	15,000

Finding ABC overhead cost of one unit of B?

Product B:

- a) Batch of 1,000 units of product B.
- b) Two (2) quality inspections.
- c) Three (3) machine set-ups.
- d) Two thousand (2,000) machine hours.
- e) Two hundred (200) kg of material.

### Finding cost driver rates:

Activity	Cost driver rate	
Controlling quality	<u>£50,000</u>	= £50 each inspection 1,000 inspections
Setting up machinery	<u>£10,000</u>	= £200 each set up 50 set ups
Operating machinery	<u>£20,000</u>	= £0.50 each machine hour 40,000 machine hours
Using materials	<u>£700,000</u>	= £20 each kg 35,000 kg



### Now calculate to find ABC overhead cost of one unit

Quality inspections	2 x Driver rate £50	= £100
Machinery set-ups	3 x Driver rate £200	= £600
Machine hours	2,000 x Driver rate £0.50	= £1,000
Materials used	200 x Driver rate £20	= <u>£4,000</u>
<b>Batch ABC overhead cost</b>		<b>= <u>£5,700</u></b>



(

### Overhead cost of one unit of B

$$\frac{\underline{£5,700}}{1,000 \text{ units in the batch}} = \underline{\text{£5.70 ABC total overhead charge}}$$

### Limitations of ABC

- Time-consuming and costly (resource-demanding) and can suffer from measurement problems - unlikely to suit all businesses where their products and markets are relatively simple and stable
- some costs (e.g. site security) can apply to more than 1 cost pool
- cost pools can have more than 1 cost driver
  - setting up machinery can use number of set-ups or number of set-up hours
  - different product costs

## Week 5: Relevant Costs for Decision Making

(TEXTBOOK: Chapter 2 - relevant costs / benefits of decision making)

How do we identify relevant costs and benefits when making management decisions that are consistent with the aims of the business, especially when proposing a new course of action?

# Cost-benefit analysis

- Involves systematically **weighing** the **cost** of pursuing some objective (plans/decisions) **against** the **benefits** that it is likely to generate to help decide whether to proceed.
- For a proposed plan or decision to be economically viable, the likely benefits should exceed additional costs
- Not all costs and benefits can be measured in monetary terms
- Easier to evaluate incremental change than transformative change

Managers would assess likely outcome from each course of action being considered, which involves weighting prospective benefits (outcomes that result from that course of action that help a business reach its objectives) against costs involved (sacrifice of resources needed to achieve those benefits).

Cost-benefit analysis provides a framework for decision making that promotes a systematic appraisal of plans of projects where all costs and benefits relating to a plan/project must be identified and evaluated along with any underlying assumptions.

## About 'cost'

There are many definitions of the term 'cost' when discussing cost-benefit analysis, where the cost is measured for decision-making purposes.

## Relevant / Irrelevant costs

Historic costs are deemed irrelevant, as decisions are made concerning the future.

## Relevant costs

For a cost to be deemed relevant to a particular decision, a future **outlay cost** or **opportunity cost** must satisfy the three criteria:

1. **it must relate to the objective of business** - cost must have effect on wealth of business
2. **it must be a future cost** - past costs are irrelevant to decisions being made about the future
3. **it must vary with the decision** - only costs that are different between outcomes can be used to distinguish between them

therefore, relevant costs will include:

- opportunity costs
- differential future outlay costs

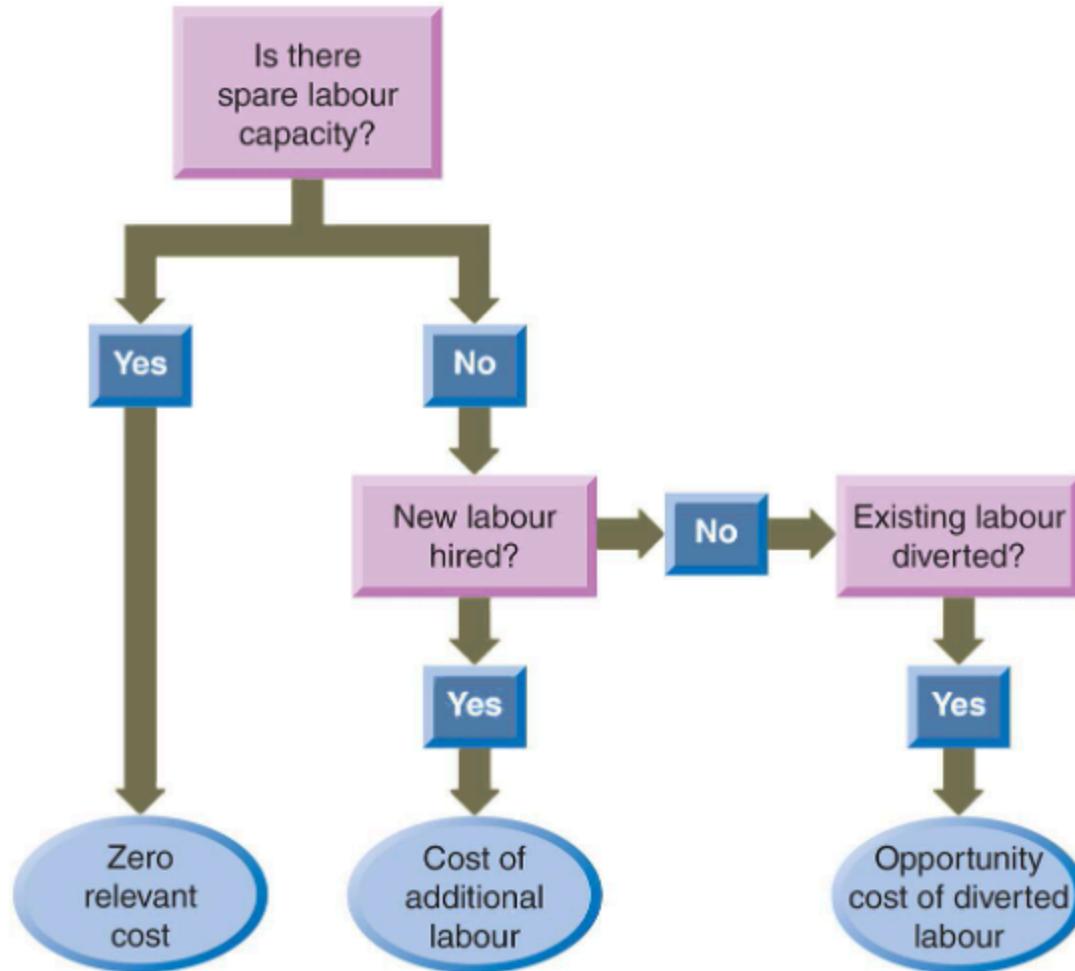
# How to determine relevant cost for labour/materials

## Labour

- will vary depending on whether the business is operating with spare or full capacity

**Figure 2.2**

A decision flow diagram for identifying the relevant cost of labour



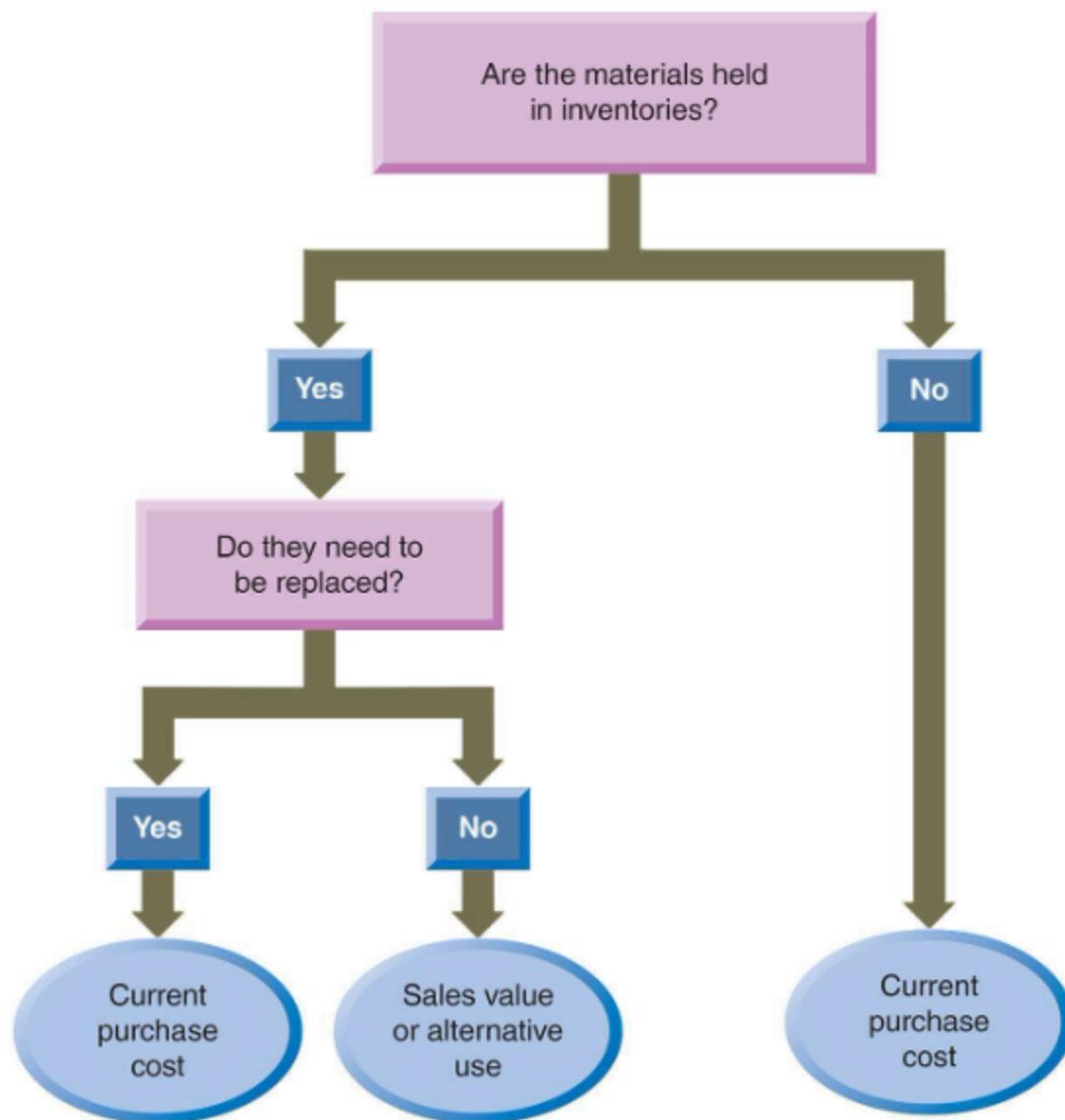
The starting point is to determine whether there is temporary spare capacity. In these circumstances, the relevant cost of labour is usually zero. Relevant labour costs often only arise where the business is operating at full capacity.

## Materials

- will vary according to whether the materials are held in inventories and whether they need to be replaced
- if item of materials are not held in inventories, it will have to be purchased specifically for the job (hence purchase cost of materials is relevant cost)

**Figure 2.3**

A decision flow diagram for identifying the relevant cost of materials



The starting point is to determine whether the materials are held inventories. Relevant costs arise where inventories have to be replaced, or where there is an opportunity cost involved in their use. Where materials are not held in inventories, the cost of purchasing them is the relevant cost.

## Opportunity Costs

- The cost incurred when pursuing one course of action prevents an opportunity to derive some benefit from another course of action.

Opportunity costs can be difficult to identify due to risk of human bias. They are also rarely considered in routine accounting processes as they do not involve any out-of-pocket expenditure. They are only calculated only where they are relevant to a particular management decision.

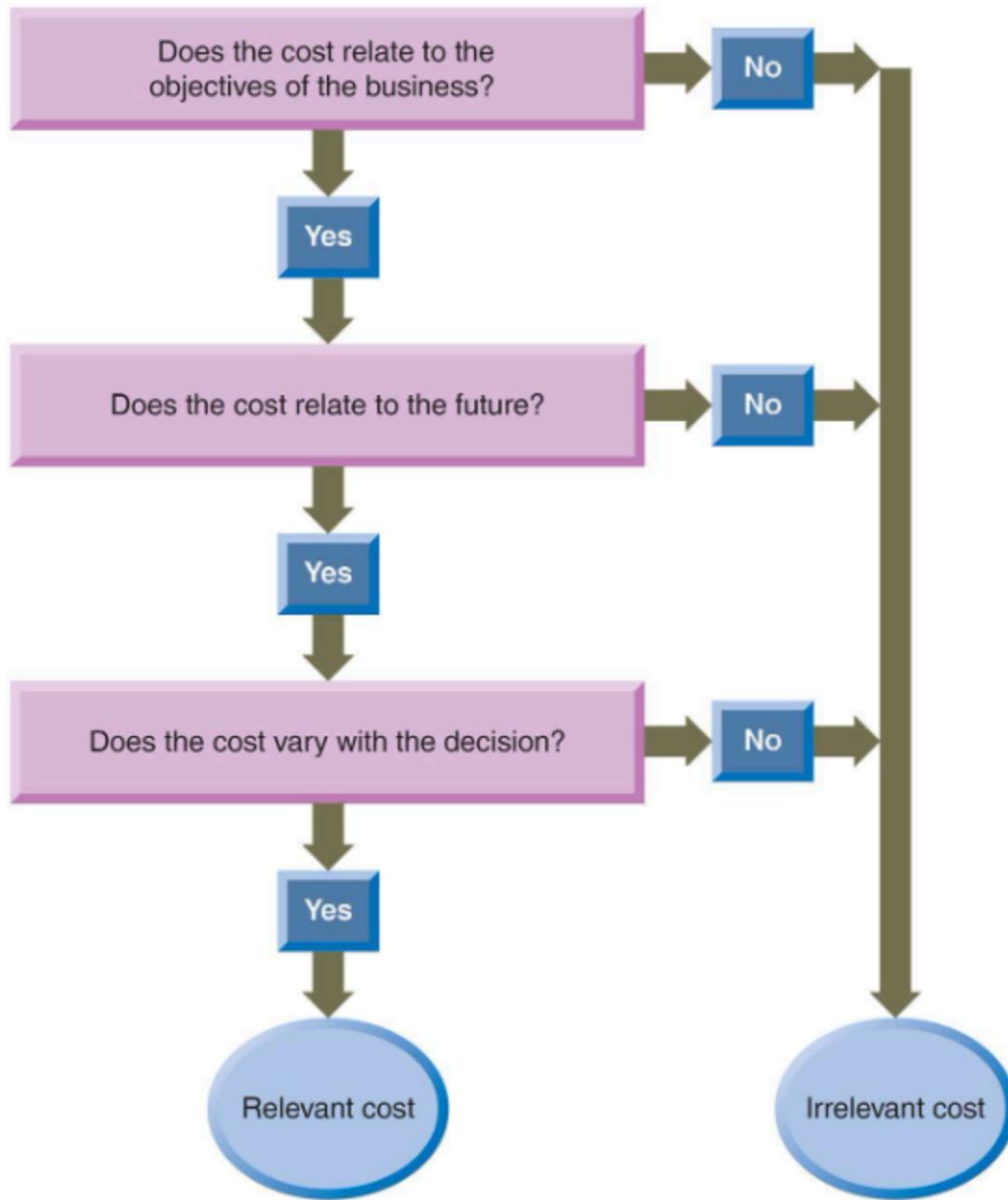
## Outlay Costs

- Amount of money that will have to be spent to achieve that objective

## How to identify relevant costs

**Figure 2.1**

A decision flow diagram for identifying relevant costs



To be relevant to a particular decision, a cost must satisfy all three criteria.

## Irrelevant costs

They include:

- **all past (or sunk) costs**
- **all committed costs** and

- non-differential future outlay costs

## Sunk Costs

- Another way of referring to a past cost.

## Sunk cost fallacy

- the refusal to abandon an attachment to an irrecoverable investment
- people tend to display an irrational commitment to past costs due to previous investment of time, effort or money, which results in making poor decisions about future direction.

## Committed Costs

- A cost incurred that has not yet been paid, but which must be paid as a result of some existing contract or obligation.

## Qualitative costs and benefits

Non-measurable costs and benefits which have a broader, but less immediate impact on the business which can affect the ability of a business to achieve its objectives.

these 'qualitative' costs and benefits should provide a further input to the final plans or decisions where including them will require judgement when attaching weights to these items.

## Week 6: CAPEX (capital expenditure)

(TEXTBOOK: Chapter 8: Making capital investment decisions)

CAPEX (Capital expenditure) - funds used by businesses to purchase long-term assets

Businesses need to assess proposed investments in long-term assets as these decisions are important for businesses where expensive and far-reaching consequences can flow from making poor decisions. There are many methods of investment appraisal where investment decisions need to be approached in a systematic manner.

### How to evaluate proposed investment opportunities?

There are **four methods of investment appraisal** used by businesses worldwide to evaluate investment opportunities:

#### 1. accounting rate of return (ARR)

- the average accounting profit from project expressed as percentage of average investment

## 2. **payback period (PP)**

- the length of time that it takes for cash outflow for initial investment to be repaid out of resulting cash flows

## 3. **net present value (NPV)**

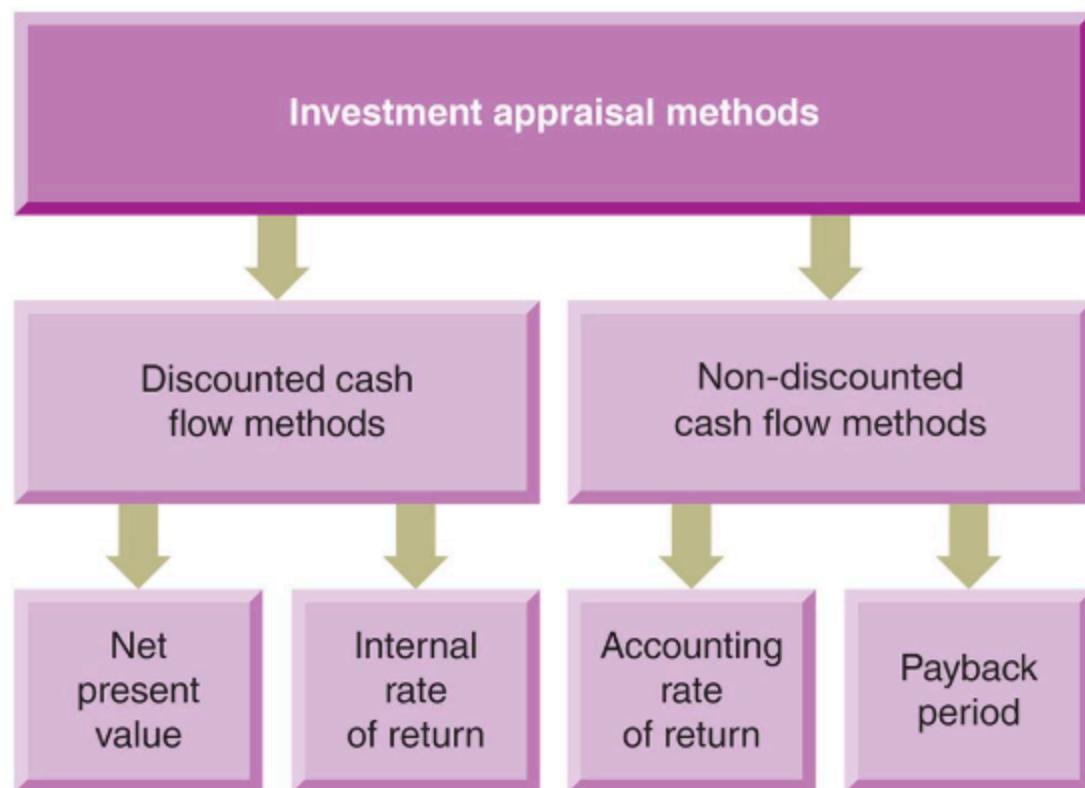
- the sum of discounted values of the net cash flows from the investment

## 4. **internal rate of return (IRR)**

- the discount rate that, when applied to cash flows of a project, causes it to have a zero NPV

**Figure 8.5**

The main investment appraisal methods

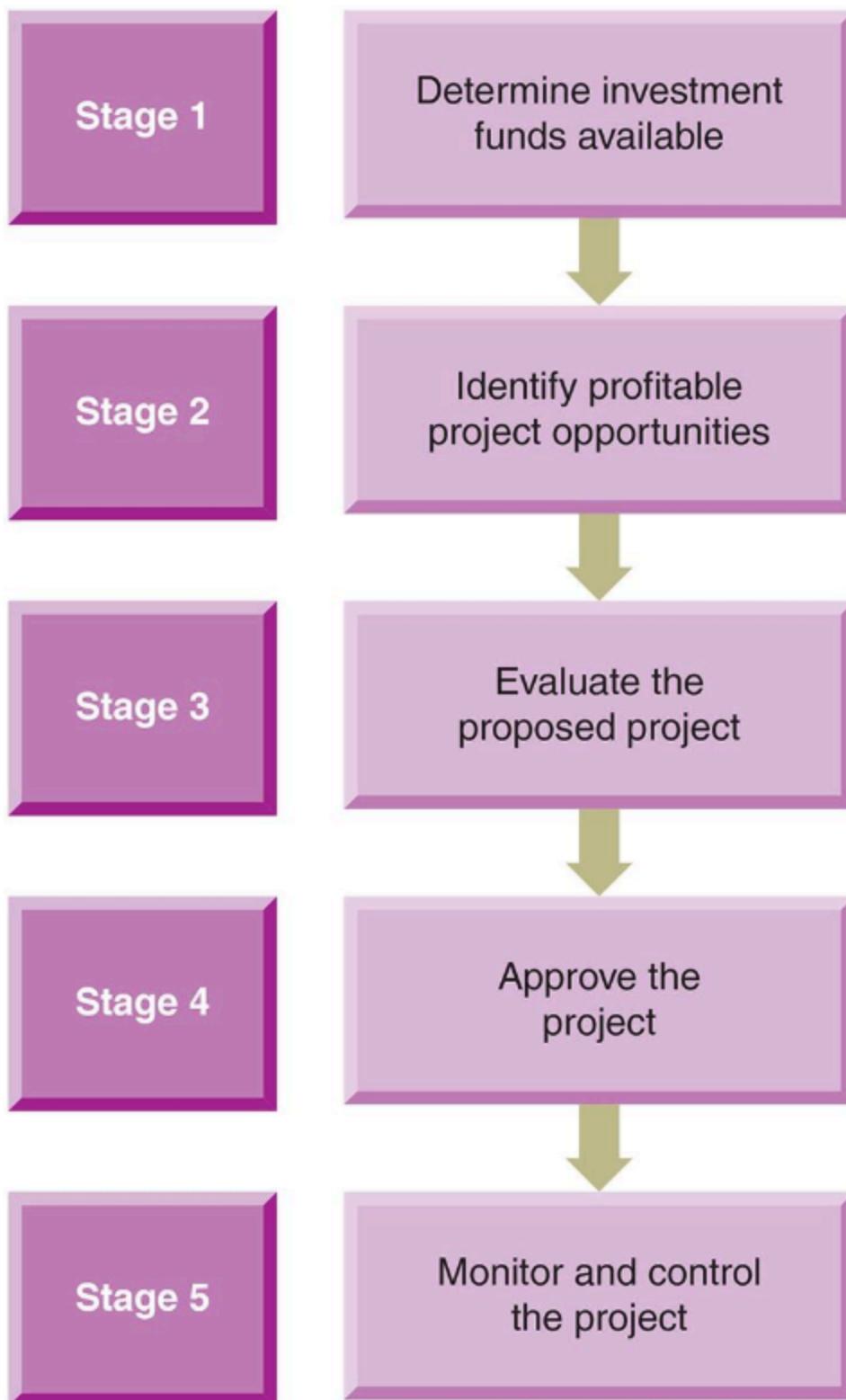


The figure shows the four investment appraisal methods discussed in the chapter.

Note that it is important businesses invest in a strategic way so as to play to their strengths.

## **How to make an investment decision:**

**Figure 8.7**  
Managing the investment decision



The management of an investment project involves a sequence of five key stages. The evaluation of projects using the appraisal techniques discussed earlier represents only one of these stages.

## Accounting rate of return (ARR)

- Also known as **return of investment** (ROI)

Takes in the **average accounting operating profit** that the investment is projected to generate and expresses it as a **percentage of average investment made over the project lifespan**.

to calculate the ARR, you need to know the:

1. **annual average operating profit**
2. **average investment**

$$ARR = \frac{\text{Average annual operating profit}}{\text{Average investment to earn that profit}} \times 100\%$$

#### **Annual average operating profit:**

Average annual operating profit before depreciation - annual depreciation charge

This will get you the **average annual operating profit after depreciation** which then can be used for ARR calculation

#### **Average investment:**

(Initial investment + Any residual value) / 2

To find average investment, we just add the value of amount invested at beginning and end of investment period together and dividing by 2.

There are two ways to use ARR:

1. Using initial, up-front investment (average annual profit/initial investment)
2. Using simple average investment (average annual profit/average investment)

### **Decision rules with ARR**

- For a project to be acceptable, it must achieve a target ARR as a minimum
- If there are two or more competing projects that achieve the target ARR, you select the one with the highest ARR among other options

**The greater the ARR, the more attractive the project becomes**

### **Example**

In our example, the average annual operating profit *before depreciation* over the five years is £40,000 (that is,  $\frac{\text{£ } 000(20 + 40 + 60 + 60 + 20)}{5}$ ). Assuming 'straight-line' depreciation (that is, equal annual amounts), the annual depreciation charge will be £16,000 (that is,  $\frac{\text{£ } (100,000 - 20,000)}{5}$ ). Therefore, the average annual operating profit *after depreciation* is £24,000 (that is, £ 40,000 – £ 16,000).

The average investment over the five years can be calculated as follows:

$$\begin{aligned}\text{Average investment} &= \frac{\text{Cost of machine} + \text{Disposal value}^*}{2} \\ &= \frac{\text{£ } 100,000 + \text{£ } 20,000}{2} \\ &= \text{£ } 60,000\end{aligned}$$

\* Note: To find the average investment we are simply adding the value of the amount invested at the beginning and end of the investment period together and dividing by two.

The ARR of the investment, therefore, is:

$$\text{ARR} = \frac{\text{£ } 24,000}{\text{£ } 60,000} \times 100\% = 40\%$$

## Conclusions of ARR:

- does not relate directly to shareholders' wealth – can lead to illogical decisions;
- takes almost no account of the timing of cash flows;
- ignores some relevant information and may take account of some irrelevant;
- relatively simpler to use
- inferior to NPV

## Payback Period (PP)

- Determines time taken for an initial investment to be repaid out of the net cash inflows (cash invested) from a project.
- Uses both cash flows and their respective timing into account.

PP doesn't take into account required rate of return by investors, so to factor that in, you discount the future cash flows to bring them back to today's value (present value) at time 0.

## **Decision rules for using PP:**

- For a project to be acceptable it should have a **payback period no longer than a maximum payback period set by the business**.
- If there are two (or more) competing projects with payback periods that are shorter than the maximum payback period, the project with the **shorter (or shortest) payback period** should be **selected**.

Projects with a payback period (PP) up to a defined maximum period are acceptable.

**The shorter the PP of a project, the more attractive the project** as projects with lower PP can recoup their cost quicker than those with longer PPs (liquidity)

It is quick and easy to calculate and can be easily understood by non-financial managers. It is an improvement of ARR as it uses cash flows instead of accounting flows and takes into account the timing of cash flows, but its an incomplete answer to solving problems.

## **Conclusion on PP:**

- does not relate to shareholders' wealth;
- doesn't take into account the **required rate of return demanded by investors**
- ignores inflows after the payback date;
- takes little account of the timing of cash flows;
- ignores much relevant information;
- does not always provide clear signals and can be impractical to use;
- much inferior to NPV, but it is easy to understand and can offer liquidity insight, which may account for its widespread use.

## **Example**

Let us consider PP in the context of the Billingsgate Battery Company example.

We should recall that the project's cash flows are:

<i>Time</i>		<i>£000</i>
Immediately	Cost of machine	(100)
1 year's time	Operating profit before depreciation	20
2 years' time	Operating profit before depreciation	40
3 years' time	Operating profit before depreciation	60
4 years' time	Operating profit before depreciation	60
5 years' time	Operating profit before depreciation	20
5 years' time	Disposal proceeds	20

Note that all of these figures are amounts of cash to be paid or received (we saw earlier that operating profit before depreciation is a rough measure of the cash flows from the project).

The PP can be derived by calculating the cumulative cash flows as follows:

Time		Net cash flows	Cumulative net cash flows
	£000	£000	
Immediately	Cost of machine	(100)	(100)
1 year's time	Operating profit before depreciation	20	(80) ( - 100 + 20)
2 years' time	Operating profit before depreciation	40	(40) ( - 80 + 40)
3 years' time	Operating profit before depreciation	60	20 ( - 40 + 60)
4 years' time	Operating profit before depreciation	60	80 (20 + 60)
5 years' time	Operating profit before depreciation	20	100 (80 + 20)
5 years' time	Disposal proceeds	20	120 (100 + 20)

We can see that the cumulative cash flows become positive at the end of the third year. If the cash flows had arisen evenly over the year, the precise PP would be:

$$2 \text{ years} + \frac{40}{60} \text{ years} = 2\frac{2}{3} \text{ years}$$

top part of fraction (40) represents cash flow needed at beginning of third year to repay initial outlay and bottom part (60) represents projected cash flow during third year

## Net present value (NPV)

Does both:

- considers **all** of the cash flows for each investment opportunity
- makes a logical allowance for timing of those cash flows

This is because **money** has a **time value** as an amount paid out now may not be equivalent to value to same amount being received in a year's time due to factors like interest lost, risk and inflation.

**risk** - things might not turn out as expected as purchase decisions must be taken before any of these things can happen

**inflation** - purchasing power of money decreases overtime. interest rates are set based on inflation

**Figure 8.2**

Factors influencing the return required by investors from a project



There are three factors that influence the required return to business owners (opportunity cost of finance).

## Decision rule for NPV

- If NPV is negative, investment will not meet expectations of investors
- If NPV is exactly 0, investment will meet expectations of investors
- If NPV is positive, investment will exceed expectations of investors (enhance shareholders' wealth)

NPV provides a logical basis for valuing an economic asset (any asset capable of yielding financial benefits) where their economic value depends on net benefits it generates. You get that value by adding together discounted (present) values of asset's future net cash flows

## How to deal with time value of money

- as money has a time value, you need to express each cash flows in similar terms
- cash inflows and cash outflows for investment cannot be compared if they arise at different points in time

## Present value:

PV of a particular cash flow:

PV of the cash flow of year  $n$  = Actual cash flow of year  $n$  divided by  $(1 + r)^n$

where  $n$  is year of cash flow (how many years into future) and  $r$  is opportunity financing cost expressed as a decimal (instead of percentage), where  $r$  is assumed to be constant

its the same as:

- PV of a cash flow = Cash flow  $\times 1/(1 + r)^n$ , assuming a constant discount rate.

The act of reducing the value of cash flow to take account of the period between present time and time that the cash flow is expected is known as **discounting**. The opposite is known as **compounding** (similar to compound interest).

Discounting brings cash flows at different points in time to a common valuation basis (their present value), which enables them to be directly compared.

Appropriate discount rate to use in NPV assessments is the opportunity cost of finance which is the cost to business of finance needed to fund the investment aka the cost of capital

## **Example:**

---

## Activity 8.10

See whether you can show that the Billingsgate Battery Company would find £27,778, receivable now, as equally acceptable to receiving £40,000 in two years' time, assuming that there is a 20 per cent investment opportunity.

To answer this activity, we simply apply the principles of *compounding*. Income earned is reinvested and then added to the initial investment to derive the future value. Thus:

£
Amount available for immediate investment
27,778
Income for year 1 (20 % × 27,778)
5,556
33,334
Income for year 2 (20 % × 33,334)
6,667
40,001

(The extra £1 is only a rounding error.)

---

## Present value tables

Deducing each PV is done by taking relevant cash flow and multiplying it by  $\frac{1}{(1+r)^n}$ . It can also be done using **present value tables** or **discount tables** which shows **discount factor** for range of values of  $r$  and  $n$  (rate and year from present year respectively).

## Example

## Activity 8.12

What is the NPV of the Chaotic Industries project from Activity 8.2, assuming a 15 per cent opportunity cost of finance (discount rate)? (Use the present value table in Appendix E.)

Remember that the net cash inflows and outflow are expected to be:

<i>Time</i>		<i>£000</i>
Immediately	Cost of vans	(150)
1 year's time	Saving before depreciation	30
2 years' time	Saving before depreciation	30
3 years' time	Saving before depreciation	30
4 years' time	Saving before depreciation	30
5 years' time	Saving before depreciation	30
6 years' time	Saving before depreciation	30
6 years' time	Disposal proceeds from the vans	30

The calculation of the NPV of the project is as follows:

<i>Time</i>	<i>Cash flows</i>	<i>Discount factor</i>	<i>Present value</i>
	£000	(15%)	£000
Immediately	(150)	1.000	(150.00)
1 year's time	30	0.870	26.1
2 years' time	30	0.756	22.68
3 years' time	30	0.658	19.74
4 years' time	30	0.572	17.16
5 years' time	30	0.497	14.91
6 years' time	30	0.432	12.96
6 years' time	30	0.432	12.96
			NPV = (23.49)

interpreting it:

project has negative NPV -> present value of benefits from investment are worth less than initial outlay.

## Benefits of NPV:

NPV fully takes account of each of the following:

- **The timing of cash flows** - by discounting various cash flows associated with each project, according to when they are expected to arise as it takes account of time value of money
- **The whole of relevant cash flows** - NPV includes all relevant cash flows but are treated differently according to their date of occurrence

- **The objectives of the business** - NPV is only method of appraisal in which output of analysis has direct bearing on wealth of owners of business. positive NPV enhance wealth; negative NPV reduce it. NPV would be more superior if main aim is to enhance shareholders/owners' wealth

NPV also:

- provide clear signals and is practical to use
- takes all relevant information into account

## **Internal rate of return (IRR)**

Internal rate of return (IRR) of an investment is:

- The discount rate that, when applied to its projected future cash flows, will produce **0 NPV**
- represents the yield on project, or percentage return, from a particular investment opportunity

IRR cannot usually be calculated directly, but done via iteration (aka trial and error) through computer spreadsheet with interpolation.

## **Decision Rule of IRR**

- projects with IRR greater than cost of capital are acceptable
- the greater the IRR, the more attractive the project

## **Conclusion on IRR:**

### **Problems**

- Does not directly address the question of wealth generation, and could therefore lead to wrong decision
- Completely ignores the scale of investment
- Difficultly handling projects with unconventional cash flows as theres problems of multiple IRRs (as other projects can have negative cash flows arising at the start of operations and then positive cash flows thereafter, or projects can have both positive and negative cash flows at future points in its life, hence the pattern might result in more than 1 IRR or even no IRR at all)
- Inferior to NPV
- Difficult to use (its quite rare to use IRR in practice)

Benefits:

- takes all relevant information into account
- takes account of timing of cash flows

# Week 7: Budgeting and Financial Planning

(TEXTBOOK: Chapter 6: Budgeting)

What is a budget? What is it for? How is it prepared? Who prepares it? Why does the board regard it as important enough to consider?

## What is a Budget?

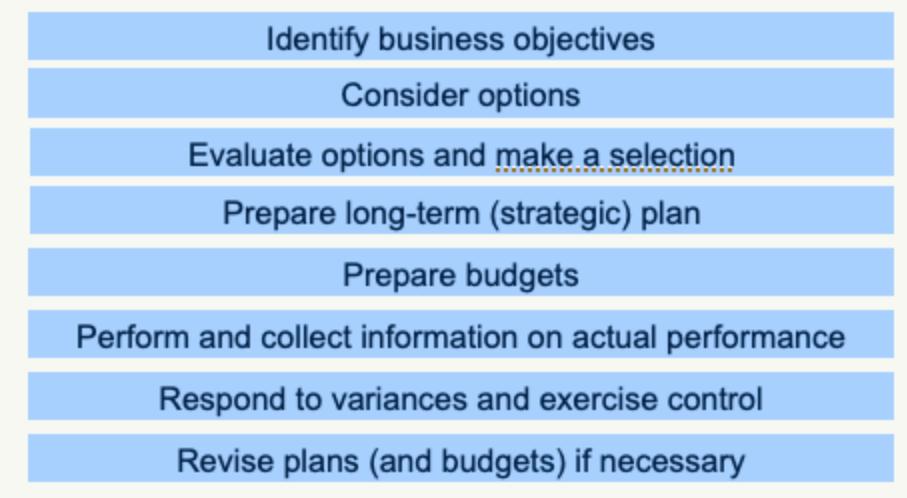
- **A budget sets out the short-term business plans, expressed in financial terms, to translate the long-term strategic plans into an actionable blueprint for the immediate future, fulfilling the business's strategic long-term objectives**
- They provide the means to assess whether actual performance was as planned or not, and their reasons.
- They are often stated in terms of money, but can be quantified in many ways e.g. quantities made/sold, etc
- They are an integral part of an internal planning framework adopted by well-run businesses
- Budgets are part of the **planning and control process** of setting strategic plans, as they are linked with strategic plans and objectives
- Usually prepared for a **one year period**

Budgets will set clear targets concerning such things as:

- cash receipts and payments;
- sales volumes and revenues, broken down into amounts and prices for each of the products or services provided by the business;
- detailed inventories' requirements;
- detailed labour requirements; and
- specific production requirements

Annual budgets tend to set targets for forthcoming years for all aspects of business, where they are broken down into monthly budgets which define monthly targets. Annual budgets can be built up from monthly figures.

## Planning and Control Process



Budgets are expressed mainly in financial terms and actual outcomes can also be expressed in these terms, where variances can be calculated in financial terms when actual outcomes do not align with budget outcomes.

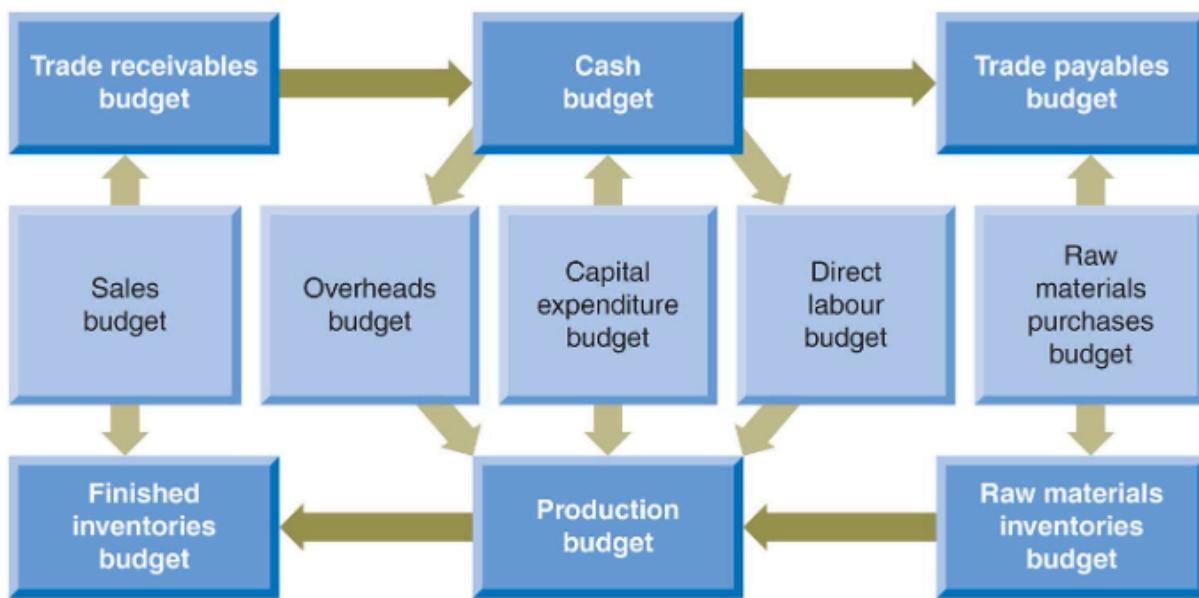
## Thinking about limiting factors

- Some aspects of the business (e.g. lack of sales demand) that will prevent it from achieving its objectives to the maximum extent
- They must be identified as most (if not all) budgets will be affected by the limiting factor as they can limit ability of the business to sell its products

## Inter-relationship of budgets

**Figure 6.2**

The interrelationship of operating budgets



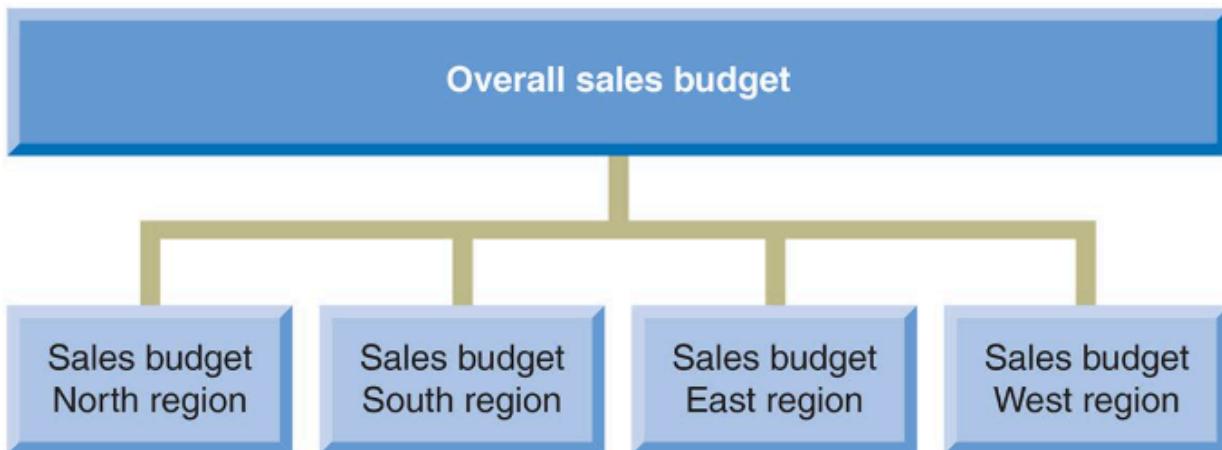
The starting point is usually the sales budget. The expected level of sales normally defines the overall level of activity for the business. The other operating budgets will be drawn up in accordance with this. Thus, the sales budget will largely define the finished inventories requirements and from this we can define the production requirements and so on. This shows the interrelationship of operating budgets for a manufacturing business.

Sales budget is usually first to be prepared as level of sales often determine overall level of activity for forthcoming period. Sales demand can be the most common limiting factor. Sales budget is normally taken from required returns on investment

There are both horizontal and vertical relationships between budgets, where for example, sales budgets can be broken into number of subsidiary budgets lets say one sales budget for each regional sales manager.

**Figure 6.3**

The vertical relationship between a business's sales budgets



This business manages its sales through four geographical areas. The overall sales budget for the business as a whole is the sum of the four regional sales budgets.

## Over-arching Budget

- Also known as the **master budget**
- A summary of each individual operating budgets
- Comprises of **budgeted Income Statement** and **budgeted Balance Sheet**, the **statement of financial position** and **budget cash flow statement**

## Variances

### What is variance?

- The difference between actual results and budgeted results, usually done at the end of the time period (when monitoring budgets).
- Monitoring variances will provide the basis of a system of control for a budget
- Differences are related to activity/volume cause and/or rate/spend causes.

If feedback is:

- worse than budget: gives an **adverse variance**
- better than budget: gives a **favourable or positive variance**

## Periodic / Continual Budgets

Budgets can be undertaken in a periodic or continual basis

### Periodic

- Prepared for a particular period (usually 1 year)
- They can be broken down into smaller time intervals (usually monthly periods) to help control the activities of a business
- Preparing a periodic budget tends to be a one-off exercise during each financial year
- Example: annual budgets

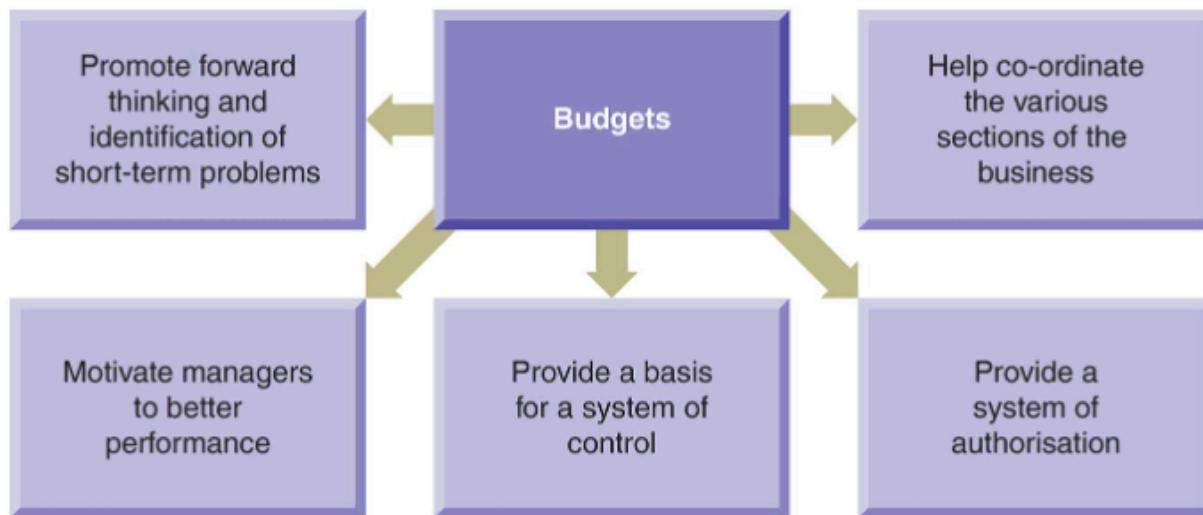
## Continual

- A budget that is continually updated
- Will add a new month to replace the month that has just passed, ensuring that a budget for a full planning period is available at all times
- Encourages forward-thinking attitude, but can be time-consuming, resulting in lesser time taken on exercising control
- Also known as a **rolling budget**

## Benefits of budgeting

**Figure 6.4**

Budgets are seen as having five main benefits to the business



The following two activities pick up issues that relate to some of the uses of budgets.

Budgets are useful for:

- **promoting forward thinking and identifying short-term problems**
  - discovering limiting factors will help identify the best ways to overcome these problems
- **helping coordination between various sections of the business**
  - it is important that activities of various departments and sections of business are linked so that activities of one are complementary to those of another

- **motivating managers to better performance**
  - having stated tasks can motivate managers and staff in their performance with a set required level of achievement.
  - managers will be better motivated by being able to relate their particular role to business's overall objectives
- **providing a basis for a system of control**
  - control is concerned with ensuring that events align accordingly to plans
- **provide a system of authorisation** for managers to spend up to a particular limit
  - provides the authority to spend given an allocation of a fixed amount of funds for some activities to take place

## How to set a budget

Steps taken to set a budget:

### 1. Establish who will take responsibility

- It is vital for good co-ordination between budgets so that plans of one departments match/complement those of other departments

### 2. Communicate budget guidelines to relevant managers

- Managers are well aware of what the strategic plans are and how the forthcoming budget period is intended to work towards them.
- Budgets are meant to be short-term plans that seek to work towards achievement of strategic plans and to overall objectives of the business
- Managers need to have all the necessary information

### 3. Identify the key, or limiting factor

- As limiting factors can restrict the business from achieving its objectives to the maximum extent

### 4. Prepare the budget for the area of limiting factor

- Limiting factor will determine overall level of activity for the business
- Usually would be the sales budget as ability to sell is often constraint on future growth

### 5. Prepare draft budgets for all other areas

- Prepare other budgets that are consistent with budget for the area of the limiting factor
- Individual budgets can be set up using top down or bottom up approach

### 6. Review and coordinate budgets

- review to see if the budgets are consistent with one another and adapt accordingly

### 7. Prepare the master budgets

- Master budget = budgeted income statement and budgeted statement of financial position.

- Individual operating budgets should already have been prepared to provide information needed to prepare the master budget

#### **8. Communicate the budgets to all interested parties**

- Formally agreed operating budget will be passed to individual managers who will have to implement them

#### **9. Monitor performance relative to budget**

- compare actual performance with benchmark of planned performance as set out in the budget
- investigate any significant variance between actual and budget performance

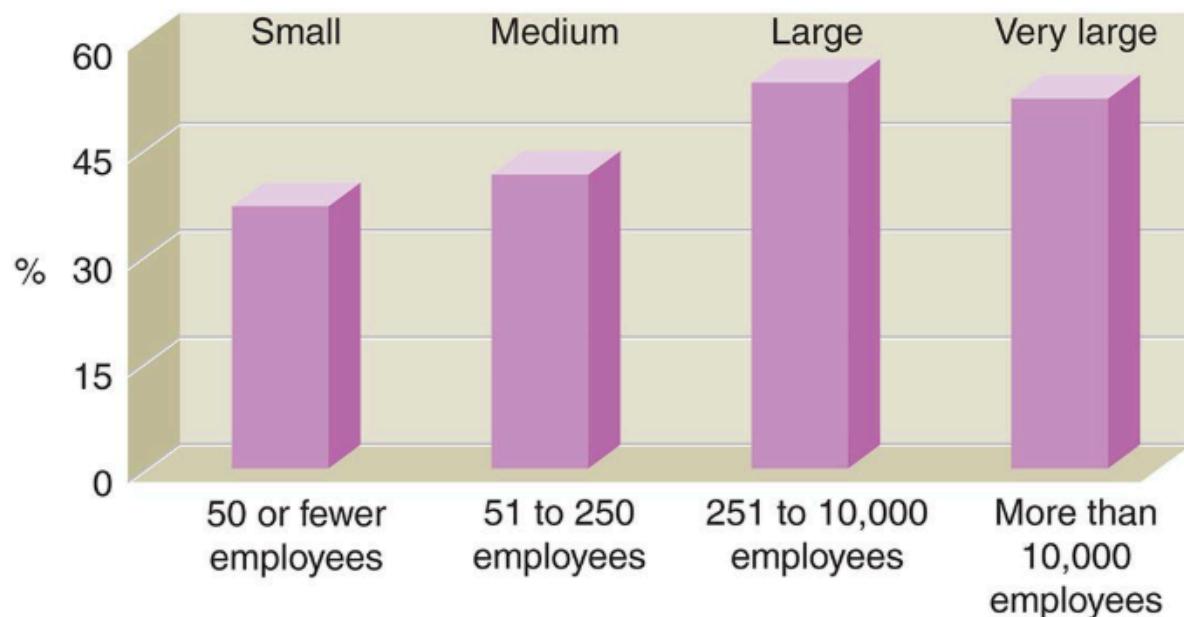
If established budgets are proving to be unrealistic (could be due to poor decisions or wrong assumptions or other reasons), it is usually better to revise them.

## **Incremental Budgeting**

- Method of budget setting that is often based on what happened in the previous period (usually last year), with some adjustment for expected changes due to factors affecting the forthcoming period (e.g. inflation)
- Starts with last year's figures and adds for inflation
- Susceptible to people playing games
- Usually used for **discretionary budgets** (found in areas where there is no clear relationship between inputs (resource applied) and outputs (benefits))
  - no tangible outputs

**Figure 6.7**

The use of incremental budgeting



Incremental budgeting is used by about 47 per cent of all of the businesses surveyed.

It seems reasonable to presume that where businesses use an incremental approach, it is in the context of discretionary budgets.

Source: CIMA (2009) *Management Accounting Tools for Today and Tomorrow*, page 15.

## Zero-base Budgeting

- **rests on philosophy that all spending must be justified**, where each new budget period should start with a blank sheet (zero-base).
- **starts at zero** (where each new budget period should start with a blank sheet)
  - Budget will only increase above zero if a good case can be made for allocating scarce resources to this activity (good value for money and fit set priorities)
- **Sets targets for next year**
- **Identifies activities needed to achieve targets**
  - ZBB closely examines all cost areas (takes lots of time) as new budgets are developed from scratch
- **Costs those activities**
- **promotes a more questioning approach to achieve more efficient resource usage**
  - challenging conventional assumptions and treating scarce business resources as though they were their own

- managers justify allocation resources by thinking about activities and the ways they are undertaken
- **can be very time-consuming and costly**
  - ZBB can be implemented on business-wide basis and operated on a continuous cycle

ZBB can identify non-value-added activities and help to simplify procedures that have become too unwieldy or complex over time. It can ensure that resources are more closely aligned to strategy of the business

It can help control costs as it scrutinises processes/costs by costing activities (its a cost management technique)

Usually used by businesses that

- operate within a highly competitive industry where profit margins are slim and for which cost savings are vital;
- seek to rationalise their wide range of support activities by identifying suitable candidates for elimination;
- operate in a mature industry where the prospects for growth are limited and where reducing costs offers the only path to higher profits; and
- have large discretionary budgets, relating to marketing, training and so on, and are seeking better value for money

## How to prepare budgets

- No standard style - practicality and usefulness are key issues
- Usually prepared in columnar form, with a column for each month (or similarly short period)
- Budgets should **show inflows and outflows** during each month and **opening and closing balances** in each month - same pattern as cash budget (master budget)
- Each budget must link (coordinate) with others

## Problems with budgets

There are various criticisms involving budgets due to today's fast-changing and competitive environment causing them to undermine the achievement of business objectives.

## Summary of criticisms of conventional budgeting

**Figure 6.11**

### Criticisms of conventional budgeting



Conventional budgeting is criticised for a number of reasons.

According to criticisms, budgets:

- **cannot deal with rapid change**
  - they can be out of date before start of budget period due to fast-changing environments
- **focus on short-term financial targets, rather than value creation**
  - managers should focus on things that create value for business
- **encourage a 'top-down' management style**
  - reinforce a 'command and control' structure
- **can be time-consuming**
  - can be a lengthy process that may involve much negotiation, reworking and updating
- **based around traditional business functions and do not cross boundaries**
  - business functions e.g. sales, marketing, production, etc
- **encourage incremental thinking** (last year plus  $x$  per cent approach to planning)
- **protect costs rather than lower costs**
  - particularly in area of discretionary budgets

- managers may protect the funds they receive if fixed budget may be unused, where they can spend the whole of budget, irrespective of need
- **promote 'sharp' practice among managers**
  - managers may try to negotiate lower sales targets or higher costs allocations than necessary to meet budget targets
  - can result in politics

## Commitment Accounting (CA)

### What is CA

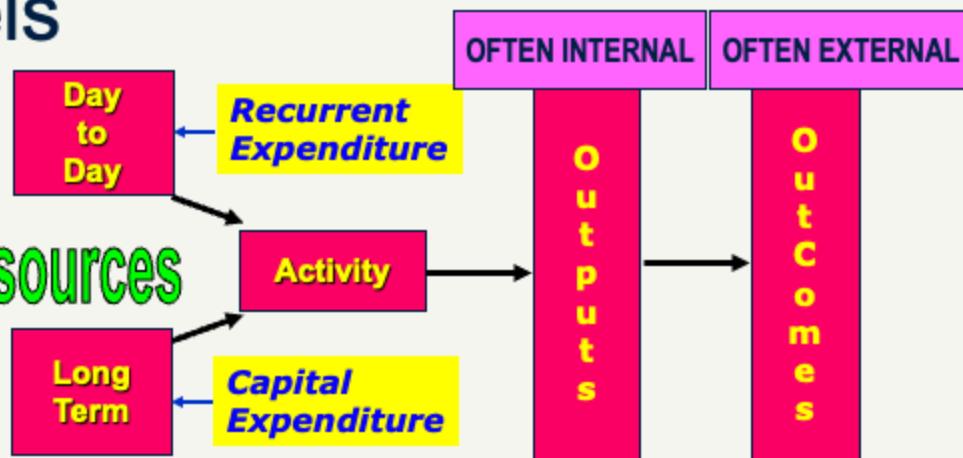
- Process of being able to view not only all invoiced costs in budgeting system but also **committed costs**
  - **Committed costs** - costs that have been committed to expenditure but not yet invoiced let alone paid for
- CA refers to the commitment you make to pay for something ordered but not yet paid for

### Benefits of CA

- Can be a useful tool to improve budgetary control
- Represents an accounting solution through technology based automated process through issue and use of purchase orders
- allows those responsible for budgets to instantly get a snapshot of their financial commitments and true financial position based on both cash and commitments
- Overcomes disadvantages of paper based record systems
- Allows tracking of how much of a fund has been committed and how much of it has actually been spent where it helps to:
  - improve accuracy of information
  - delivery better budgetary control
  - offer more up to date financial information to facilitate better decision making

### Inputs into Outputs at Unit Levels

# Inputs into Outputs at Unit Levels



*The Budget is set in the context of we are trying to achieve and feedback of ACTUAL is compared with BUDGET on a monthly basis.*

**Cost of activity:** Wages, power costs, depreciations

**Activity produces outputs**

Tasked with manufacturing tables. 500 tables of an appropriate quality. Hit appropriate quality.

Speed etc. There's also an external output: Customer are happy. Needs?

Present – for the future – a year goes by. What is the difference

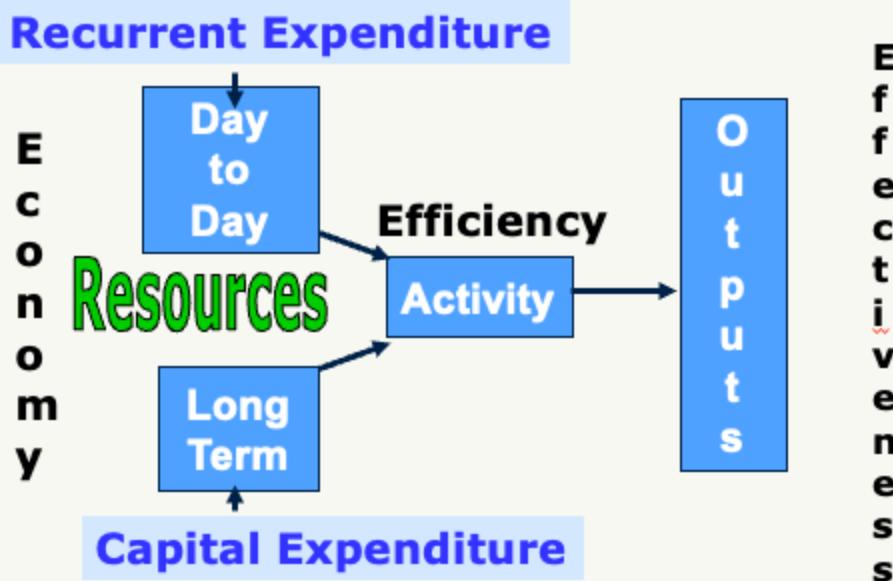
## 3E & VFM & Resources

**Efficiency:** about **activity** - how well we carry out our activities

**Effectiveness:** about **targets and outputs** - about how well we hit them

**Economy:** about **resources we consume in undertaking activities to achieve our outputs**

VFM: judgement about the balance of the 3 E's



### **Example:**

Effectiveness: do I get the 100 tables at appropriate quality

Efficiency: max productivity

Economical: waste (100 tables, 20h longer, not efficient, cost more money/ claim overtime/ waste, not economical) - Is there a balance? Value for money - balance

## **Week 8: Accounting for Control**

(TEXTBOOK: Chapter 7: Accounting for Control)

This week focuses on:

- **initial analysis of variances** by using **flexed budgets**
- **detailed analysis of variances** (adverse/favourable) within **standard costing** to identify why actual profit is higher/lower than what is budgeted

Variances are used to measure actual performance in same terms as those stated in budget, as a basis for exercising control.

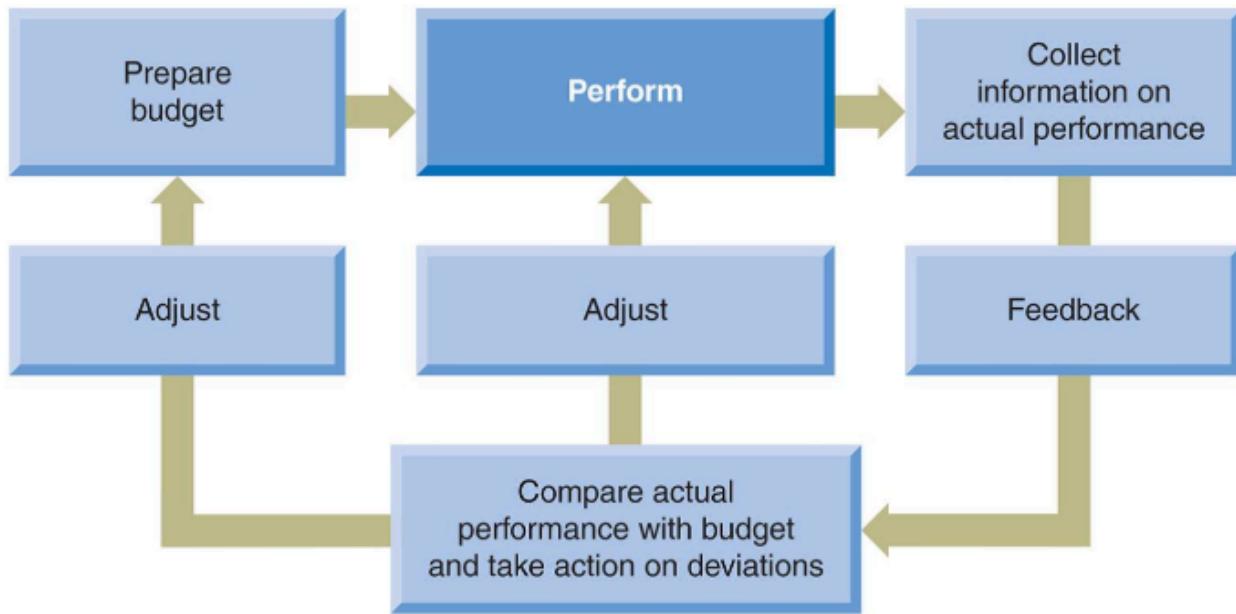
Budgets can be **flexed** to match actual volume of output to exercise control

## **Feedback/Feedforward Control**

### **Feedback Control**

- A control process where actual performance is compared with planned performance and where action is taken to deal with possible future divergences between these
- Steps are taken to get operations back on track as soon as there is signal that things have gone wrong (e.g. a thermostatic control which uses a feedback control system)
- Budgets can use a feedback control system
- Simply reacts to existing problems (remedial)

**Figure 7.2**  
Feedback control



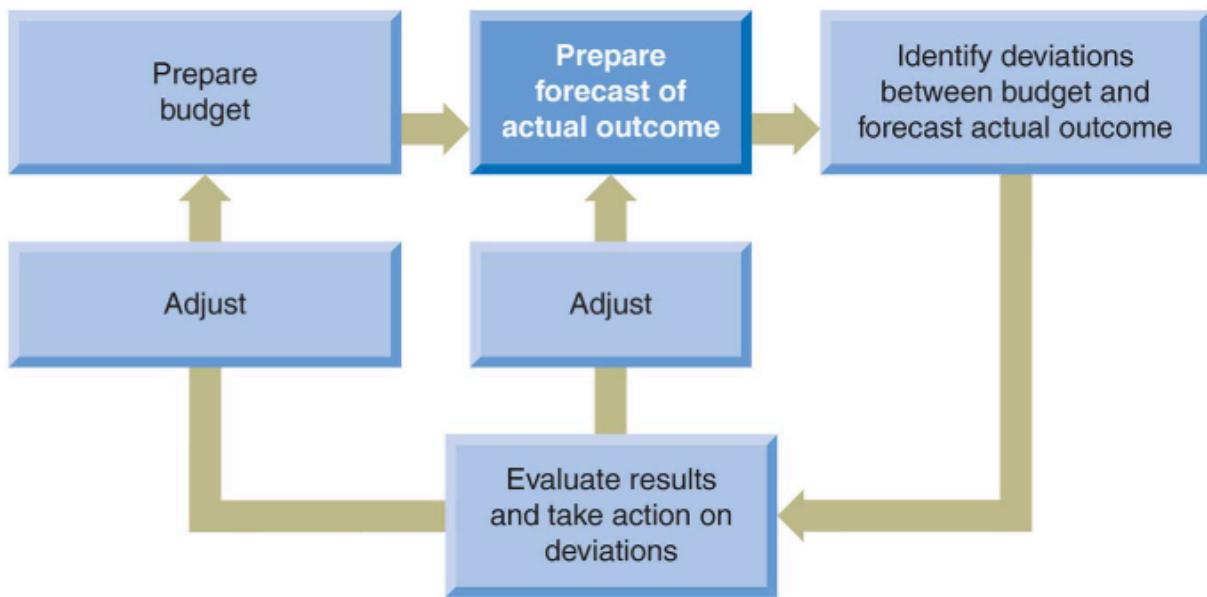
When a comparison of budgeted and actual performance shows a divergence, steps can be taken to get performance back on track. If the budget needs revising, this can be done.

## Feedforward Control

- A control device where forecast future performance is compared with planned performance, and where action is taken to deal with divergences between these.
- Proactive and tries to anticipate problems beforehand (preventative)
- Predictions are made to what can go wrong and steps are then taken to avoid any undesirable outcome
- Budgets can be used to exert this control where a budget is prepared and compared with **forecast** of actual outcomes - to identify potential problems
- Allows corrective action to be taken before problems arise
- Preferable to feedback control but require timely and accurate predictions of actual outcomes which aren't always available

**Figure 7.3**

Feedforward control



When a comparison of budgeted performance and forecast actual outcomes shows a divergence, preventative measures can be taken. If the budget needs revising, this can be done.

## Flexing the Budget

We can '**flex** the budget' where the budget is revised based on different volume of output by knowing which revenues/costs are fixed and variable relative to volume of output e.g. fixed overheads, labour cost, etc.

This involves identifying behaviour of costs and revenue and applying these behaviours to the different output levels to establish what the budget would have been for actual level of activity achieved

Having a flexible budget allows us to make more valid comparisons between budget (using flexed figures) and actual results, allowing us to identify variances to explain why these variances occur.

Many other forms of variances can be calculated (sales/materials/labour)

## Basic Variance Analysis

Variances can be calculated between budgeted and actual results for each aspect of business's activities

Variances may be **favourable** or **adverse** according to whether they result in **increase to**, or **decrease from** budgeted profit figure. Its the effect of one factor (taken alone) on budgeted profit

We can find the cause of variances by **flexing** the budget

There are also other forms of variance where some may be favourable or adverse. Difference between sum of all various favourable and adverse variances will represent difference between budgeted and actual profit.

## Variances

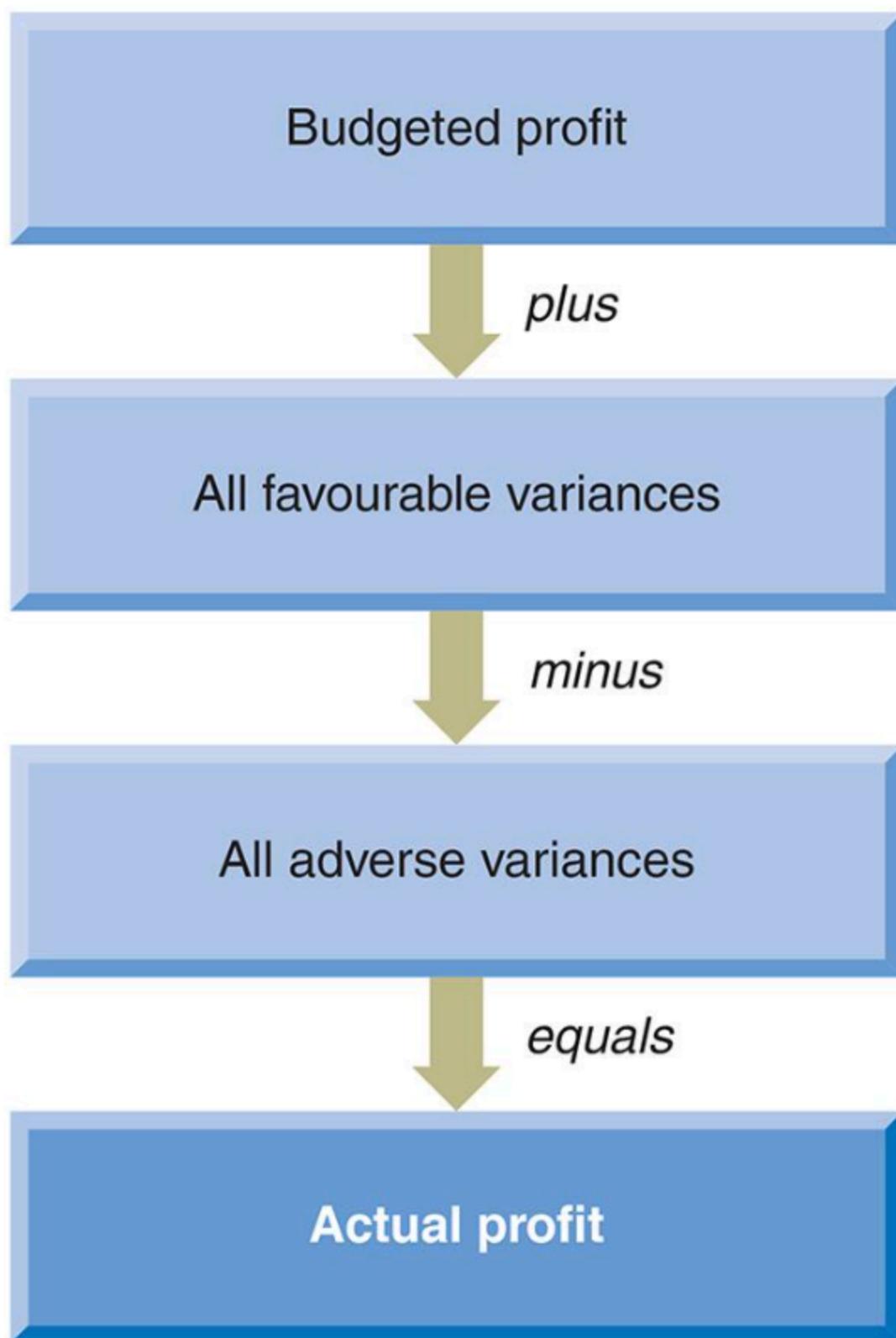
If the actual sales is:

- worse than budget: **adverse** or **negative** variance (less profit)
- better than budget: **favourable** or **positive** variance (more profit)
- Variances are explained, in broad terms, through differences in planned and actual events relating to ACTIVITY/VOLUME causes and/or RATE/SPEND causes.

## Relationship between budgeted and actual profit

**Figure 7.4**

Relationship between the budgeted and actual profit

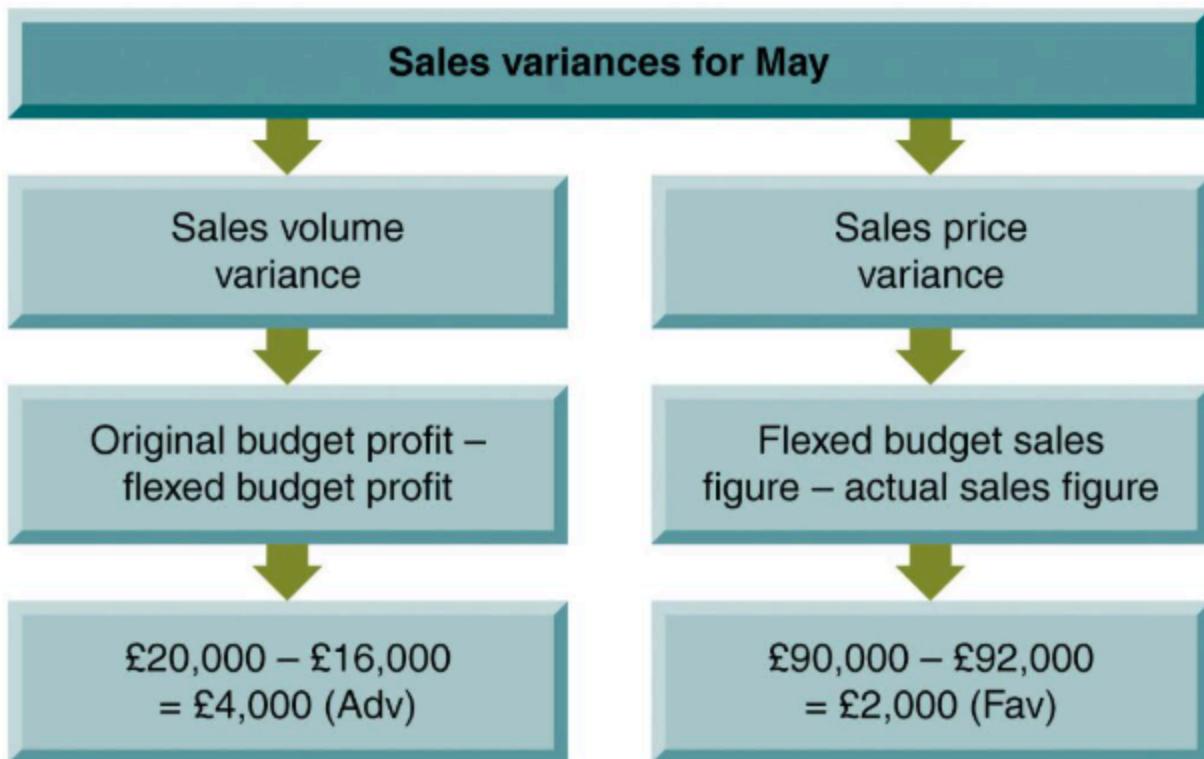


The variances represent the differences between the budgeted and actual profit and so can be used to reconcile the two profit figures.

When calculating particular variance, we assume all other factors went according to plan. If there is an adverse variance, managers need to know why volume of sales fell below budgeted figure so they can avoid this happening again

## Sales Variances

**Figure 7.5**  
Sales variances



The sales volume variance and the sales price variance are the two main sales variances.

### Sales volume variance

$$\text{Sales volume variance} = \text{Original budget profit} - \text{Flexed budget profit}$$

**Difference between original and flexed budget profit figures** as shown in flexed budget

### Sales price variance

$$\text{Sales price variance} = \text{Flexed budget sales figure} - \text{Actual sales figure}$$

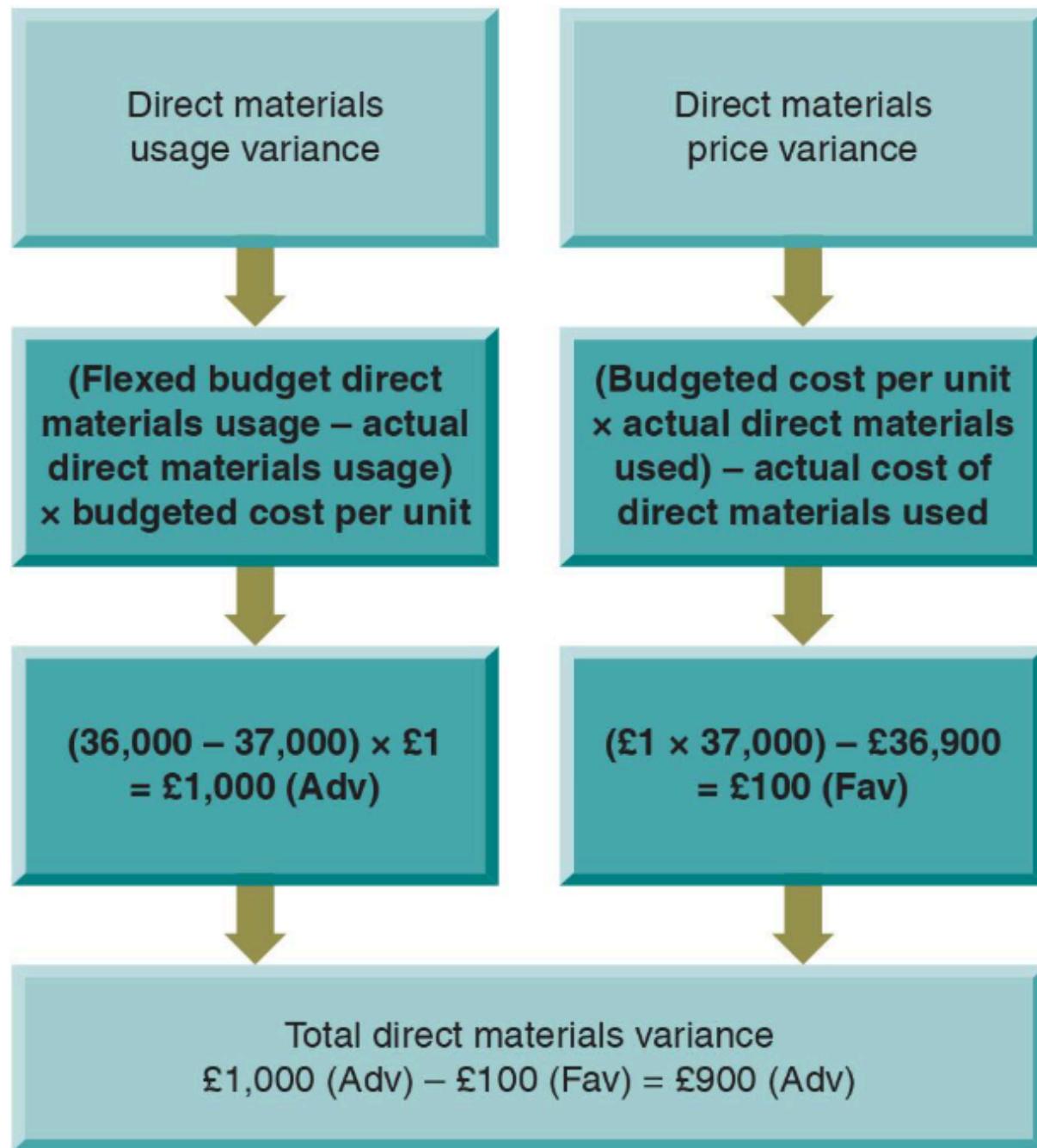
**Difference between the actual sales revenue figure for the period and the sales revenue figure** as shown in the flexed budget. Variance arising from price difference has already been 'stripped out' in flexing process

## Material variances

For direct materials, we can calculate the **direct materials usage variance**, **direct materials price variance** and thus the **total direct materials variance**, which is the sum of both variances.

**Figure 7.6**

Total, usage and price variances for direct materials for May



The total direct materials variance is the sum of the direct materials usage variance and the price variance. It can be analysed into those two.

## Total direct materials variance

Total direct material variance is overall variance for raw materials and represents difference between flexed budget and actual figures

$$\text{Total direct materials variance} = \text{Flexed budget direct materials cost} - \text{Actual direct materials cost}$$

## Direct materials usage variance

The difference between quantity of materials as shown in flexed budget and actual quantity of materials used, multiplied by budgeted cost per unit

$$\text{Direct materials usage variance} = \text{Flexed budget direct materials usage} - \text{Actual direct materials usage} \times \frac{\text{Budgeted cost per unit}}{\text{Actual quantity}}$$

## Direct materials price variance

The difference between the actual cost of the direct material used and the direct materials cost allowed (actual quantity of material used at the budgeted direct material cost). discount factor

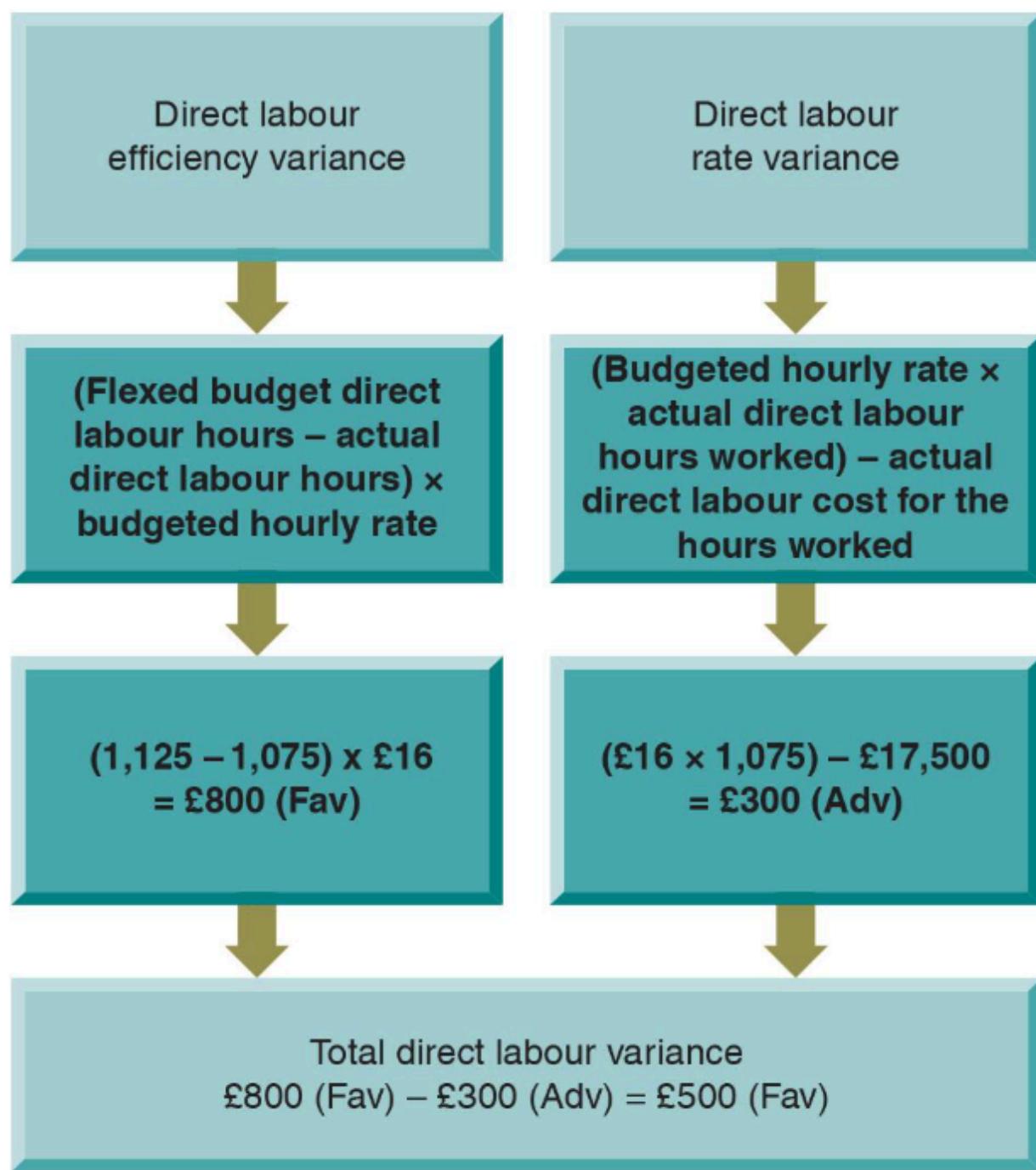
$$\text{Direct materials price variance} = \frac{\text{Budgeted cost per unit}}{\text{Actual quantity}} \times \text{Actual direct materials used} - \text{Actual cost of direct materials used}$$

## Labour variances

We obtain the **total direct labour variance** from both the **direct labour efficiency variance** and **direct labour rate variance**

**Figure 7.7**

Total, efficiency and rate variances for direct labour for May



The total direct labour variance is the sum of the direct labour efficiency variance and the rate variance. It can be analysed into those two.

## Total direct labour variance

Overall variance that represents difference between actual direct labour cost and direct labour cost according to flexed budget (budgeted direct labour hours for actual output)

$$\text{Total direct labour variance} = \text{Flexed budget direct labour cost} - \text{Actual direct labour cost}$$

## **Direct labour efficiency variance**

Difference between number of hours budgeted for actual level of production and actual number of hours taken, multiplied at budgeted hourly rate

$$\text{Direct labour efficiency variance} = \frac{\text{Flexed budget direct labour hours}}{-} \frac{\text{Actual direct labour hours}}{\times} \text{Budgeted hourly rate}$$

## **Direct labour rate variance**

Difference between actual hours worked at budgeted labour rate and actual cost for labour for the hours worked.

$$\text{Direct labour rate variance} = \frac{\text{Budgeted hourly rate}}{\times} \frac{\text{Actual direct labour hours worked}}{-} \text{Actual direct labour cost for the hours worked}$$

## **Fixed overhead variance**

One way to examine the variance where we can calculate the variance relating to variable overheads i.e. **Fixed overhead spending variance**

### **Fixed overhead spending variance**

The difference between the flexed (original - they will be the same) budget and actual figures

$$\text{Fixed overhead spending variance} = \frac{\text{Flexed budget fixed overheads}}{-} \frac{\text{Actual fixed overheads}}$$

In theory, the variance is responsibility of whoever controls overheads expenditure.

## **Investigating variances**

Significant and/or persistent variances should normally be investigated to establish their cause. However, the costs and benefits of investigating these variances should be considered.

Trading off favourable variances against linked adverse variances should not be automatically acceptable. (compensating variances)

Not all activities can usefully be controlled through traditional variance analysis

## **Example:**

## Example 7.1

The following are the budgeted and actual outcomes for Baxter Ltd, a manufacturing business, for the month of May:

	<i>Budget</i>		<i>Actual</i>	
Output (production and sales)	1,000	units	900	units
	£		£	
Sales revenue	100,000		92,000	
Raw materials	(40,000)	(40,000 metres)	(36,900)	(37,000 metres)
Labour	(20,000)	(1,250 hours)	(17,500)	(1,075 hours)
Fixed overheads	(20,000)		(20,700)	
Operating profit	20,000		16,900	

As you can see, budgeted profit is not achieved, so managers would have to investigate what went wrong during that period and ensure that these deviations won't repeat for the later months. You need to know precisely where and why by comparing budgeted and actual figures for various items.

Example: actual level of output was not as budgeted but was 10% lower than budget

## Standard Costing

Budgets tend to be constructed from **standards** (standard cost) where they are used in the management of business activities

### What is standard quantities and costs?

- Planned quantities and costs (or revenue) for individual units of input (or output). Standards are the building blocks used to produce the budget

# What are standards

- Standards are budgeted physical quantities and financial values for one unit of inputs and outputs.
- They represent targets against which actual performance can be measured
- Provide basis for variance analysis which help managers identify where deviations from planned, or standard, performance have occurred

## Standard costing system

- Standard costing (SC) system sets out the standard cost of doing something
- Often used in manufacturing, where margins are low and efficiency is very important
- Measures actual costs and compares those with standard costs
- Highlights differences between actual and standard costs (variances)
- Seeks detailed explanations for variances with a view to improving planning and cost control

## Gathering standards information and setting standards

Information necessary for developing standards can be gathered by analysing the task or by using past data.

When setting the standards:

- Using appropriate standards is essential - these are calculated and shown in detail on a standard cost card. Must get standard cost right
- Using wrong standards invalidate the whole system (GIGO - garbage in, garbage out)
- SC system may use **ideal** or **attainable** (practical) standards

## What standards can be used

There are two types of standards: **ideal standards** and **practical standards**, that can be used

### Ideal standards

- Standards that assume perfect operating conditions where there is no inefficiency due to lost production time, defects and so on. The objective of setting ideal standards is to encourage employees to strive towards excellence.

There are 2 major difficulties of using ideal standards:

- they do not provide useful basis for exercising control unless standards set are realistic

- they may not achieve their intended purpose of motivating managers

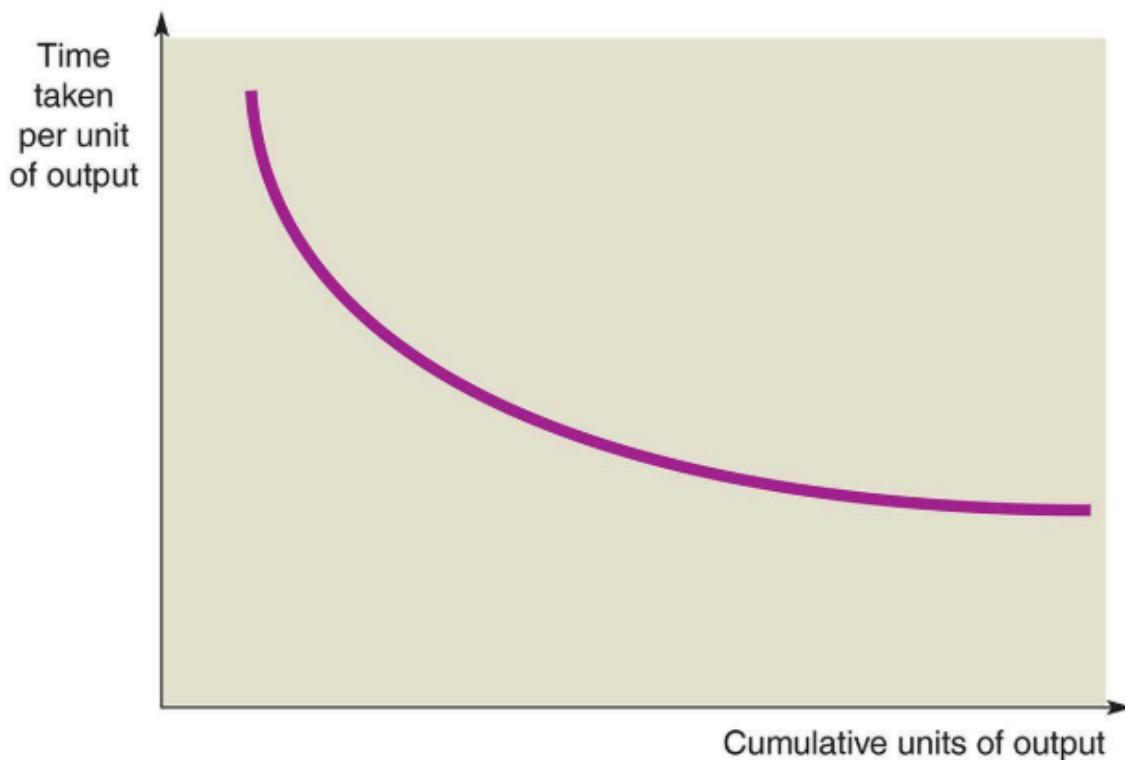
## Practical standards

- Standards that do not assume perfect operating conditions. Although they demand a high level of efficiency, account is taken of possible lost production time, defects and so on. They are designed to be challenging yet achievable.

## Learning-curve effect

Standard costing tends to have the **learning-curve effect** where routine tasks are performed more quickly with experience

**Figure 7.12**  
The learning-curve effect



Each time a particular task is performed, people become quicker at it. This learning-curve effect becomes less and less significant until, after performing the task a number of times, no further learning occurs.

Effect will apply equally well to activities involved with providing a service as to manufacturing-type activities.

It is important to consider learning-curve effect when setting standards and when interpreting any adverse labour efficiency variances

## Other uses for standard costing

Standards related to costs, usage, selling prices, etc. can be used for other purposes such as:

- measuring operating efficiency
- product-sourcing decisions
- determining cost of inventories and work in progress for income measurement purposes
- determining cost of items for use in pricing decisions

## **Limitations of standard costing**

There are potential problems when applying standard costing techniques, including:

- Standards can quickly become out of date as a result of both changes in the production process and price changes.
- Factors may affect a variance for which a particular manager is accountable but over which the manager has no control, like labour cost in the previous point.
- In practice, creating clear lines of demarcation between the areas of responsibility of various managers may be difficult.
- Once a standard has been met, there is no incentive for employees to improve the quality or quantity of output further.
- Standard costing may create incentives for managers and employees to act in undesirable ways.