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Run through the **Passcards** as often as you can during your final revision period. The day before the exam, try to go through the **Passcards** again! You will then be well on your way to passing your exams.

Good luck!

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1: Costing

Topic List

Costing

Absorption costing

Absorption costing vs marginal costing

You will have covered the basics of these costing methods in your earlier studies but you need to make sure you are familiar with the concepts and techniques so you can answer interpretation questions.

Cost accounting

A management information system which analyses past, present and future data to provide a bank of data for the management accountant to use.

Costing

The process of determining the cost of products, services or activities. Methods include absorption costing and process costing.

What is absorption costing?

Absorption costing is a method of sharing out overheads incurred amongst units produced.

1. Allocation
2. Apportionment
3. Absorption → under/over absorbed overhead

Practical reasons for using absorption costing

- Inventory valuations
- Pricing decisions
- Establishing profitability of products

Arguments in favour of absorption costing

- When sales fluctuate because of seasonality in sales demand but production is held constant, absorption costing avoids large fluctations in profit.
- Marginal costing fails to recognise the importance of working to full capacity and its effects on pricing decisions if cost plus method of pricing is used.
- Prices based on marginal cost (minimum prices) do not guarantee that contribution will cover fixed costs.
- In the long run all costs are variable, and absorption costing recognises these long-run variable costs.
- It is consistent with the requirements of accounting standards.

Arguments in favour of marginal costing

- It shows how an organisation's cash flows and profits are affected by changes in sales volumes since contribution varies in direct proportion to units sold.
- By using absorption costing and setting a production level greater than sales demand, profits can be manipulated.
- Separating fixed and variable costs is vital for decision making.
- For short-run decisions in which fixed costs do not change (such as short-run tactical decisions seeking to make the best use of existing resources), the decision rule is to choose the alternative which maximises *contribution*, fixed costs being irrelevant.

2: Modern management accounting techniques

Topic List

- Activity based costing (ABC)
- Target costing
- Life cycle costing
- Throughput accounting
- Environmental accounting

All five techniques covered are equally important and equally examinable. You need to develop a broad background in management accounting techniques.

Features of a modern manufacturing environment

- An increase in support services, which are unaffected by changes in production volume, varying instead with the range and complexity of products
- An increase in overheads as a proportion of total costs

Inadequacies of absorption costing

- Implies all overheads are related to production volume
- Developed at a time when organisations produced only a narrow range of products and overheads were only a small fraction of total costs
- Tends to allocate too great a proportion of overheads to larger products
- Leads to over production?

Outline of an ABC system

1. Identify major activities.
2. Identify **cost drivers** (factors which determine the size of an activity/cause the costs of an activity).
3. Collect costs associated with each activity into **cost pools**.
4. Charge costs to products on the basis of the number of an activity's cost driver they generate.

Cost drivers

- Volume related (eg labour hrs) for costs that vary with production volume in the short term (eg power costs)
- Transactions in support departments for other costs (eg number of production runs for the cost of setting-up production runs)

Example

Cost of goods inwards department = $10,000

Cost driver for goods inwards activity = number of deliveries

During 20X0 there were 1,000 deliveries, 200 of which related to product X. 4,000 units of product X were produced.

Cost per unit of cost driver = $10,000 ÷ 1,000 = $10

Cost of activity attributable to product X = $10 × 200 = $2,000

Cost of activity per unit of X = $2,000 ÷ 4,000 = $0.50

Merits of ABC

- ☑ Simple (once information obtained)
- ☑ Focuses attention on what causes costs to increase (cost drivers)
- ☑ Absorption rates more closely linked to causes of overheads because many cost drivers are used

Criticisms of ABC

- ☒ More complex and so should only be introduced if provides additional information
- ☒ Can one cost driver explain the behaviour of all items in a cost pool?
- ☒ Cost drivers might be difficult to identify

The target costing process

Target costing

- Involves setting a target cost by subtracting a desired profit margin from a competitive market price
- The target cost may be less that the initial product cost but it is expected to be achieved by the time the product reaches maturity
- There is a focus on price-led costing, customer requirements and design

Life cycle costing

This method tracks and accumulates costs and revenues over a product's entire life.

1. Development
2. Introduction
3. Growth
4. Maturity
5. Decline

Advantages

- Cost visibility is increased
- Individual product profitability is better understood
- More accurate feedback information is provided on success or failure of new products

Maximising the return over the product life cycle

- Design costs out of products
- Minimise the time to market
- Minimise breakeven time
- Maximise the length of the life span
- Minimise product proliferation
- Manage the product's cashflows

Theory of constraints (TOC)

An approach to production management which aims to turn materials into sales as quickly as possible, thereby maximising the net cash generated from sales. It focuses on removing **bottlenecks** (binding constraints) to ensure evenness of production flow.

Throughput accounting

Developed from TOC as an alternative system of cost and management accounting in a JIT environment.

Principal concepts of throughput accounting

- In the short run, all costs except materials are fixed
- The ideal inventory level is zero and so unavoidable, idle capacity in some operations must be accepted
- WIP is valued at material cost only, as no value is added and no profit earned until a sale takes place

Throughput accounting ratio

$$= \frac{\text{Return per factory hour}}{\text{Total conversion cost per factory hour}}$$

Evironmental management accounting (EMA)

The generation and analysis of both financial and non-financial information in order to support environmental management processes.

Typical environmental costs

- Consumables and raw materials
- Transport and travel
- Waste and effluent disposal
- Water consumption
- Energy

Why environmental costs are important

- Identifying environmental costs associated with individual products and services can assist with pricing decisions
- Ensuring compliance with regulatory standards
- Potential for cost savings

Input / output analysis

Operates on the principal that what comes in must go out. Output is split across sold and stored goods and residual (waste). Measuring these categories in physical quantities and monetary terms forces businesses to focus on environmental costs.

Flow cost accounting

Material flows through an organisation are divided into three categories

- Material
- System and delivery
- Disposal

The values and costs of each material flow are calculated. This method focusses on reducing material, thus reducing costs and having a positive effect on the environment.

Environmental activity-based costing

Environment driven costs such as costs relating to a sewage plant or an incinerator are attributed to joint environmental cost centres.

Environmental related costs such as increased depreciation or higher staff wages are allocated to general overheads.

Life-cycle costing

Environmental costs are considered from the design stage right up to end-of-life costs such as decomissioning and removal.

This may influence the design of the product itself, saving on future costs.

3: Cost volume profit (CVP analysis)

Topic List

- Breakeven point
- C/S ratio
- Sales/product mix decisions
- Target profits and margin of safety
- Multi-product breakeven charts
- Further aspects of CVP analysis

You need to be completely confident of the aspects of breakeven analysis covered in your earlier studies.

It is vital to remember that for multi-product breakeven analysis, a ***constant product sales mix*** *(whenever x units of product A are sold, y units of product B and z units of product C are also sold) must be* ***assumed****.*

Example (J Co) used throughout this chapter (where appropriate)

J Co produces and sells two products

- The M sells for $7 per unit and has a total variable cost of $3 per unit.
- The N sells for $15 per unit an.d has a total variable cost of $5 per unit.

For every five units of M sold, one unit of N will be sold.

Fixed costs total $30,000.

How to calculate a multi-product breakeven point

1. Calculate the contribution per unit.
2. Calculate the contribution per mix.
3. Calculate the breakeven point in number of mixes.
4. Calculate the breakeven point in units and revenue.

Example (J Co)

1. M = $4 N = $10
2. ($4 × 5) + ($10 × 1) = $30
3. Fixed costs ÷ contribution per mix = $30,000 ÷ $30
   = 1,000 mixes
4. M 1,000 × 5 = 5,000 units
   5,000 × $7 = $35,000 revenue

   N 1,000 × 1 = 1,000 units
   1,000 × $15 = $15,000 revenue

   Total breakeven revenue = $50,000

How to calculate a multi-product C/S (or profit volume or P/V) ratio

Calculation of breakeven sales: approach 1

1. Calculate the revenue per mix.
2. Calculate the contribution per mix.
3. Calculate the average C/S ratio.
4. Calculate the total breakeven point.
5. Calculate the revenue ratio per mix.
6. Calculate the breakeven sales.

Example

1. ($7 × 5) + ($15 × 1) = $50
2. ($4 × 5) + ($10 × 1) = $30
3. ($30 ÷ $50) × 100% = 60%
4. Fixed costs ÷ C/S ratio = $30,000 ÷ 0.6 = $50,000
5. ($7 × 5) : ($15 × 1) = 35 : 15 or 7 : 3
6. M = $50,000 × 7/10 = $35,000
   N = $50,000 × 3/10 = $15,000
   $50,000

Calculation of breakeven sales: approach 2

You may just be provided with individual C/S ratios.

Example

C/S ratio of X = 45%

C/S ratio of Y = 35%

Ratio of sales = 3:4

$$\text{Average C/S ratio} = \frac{(45\% \times 3) + (35\% \times 4)}{7} = 39.3\%$$

You can then carry on from step **4** as earlier.

Target contributions

Example (J Co)

J Co wishes to earn contribution of $500,000.

Sales revenue = ($1 ÷ C/S ratio) × $500,000
= ($1 ÷ 0.6*) × $500,000 = $833,333

* from example on page 15

Any change in the proportions of products in the mix will change the contribution per mix and the average C/S ratio and hence the breakeven point.

Most profitable mix option

Suppose J Co (from our example) has the option of changing the sales ratio to 2M to 4N. Which is the optimal mix?

1 Calculate breakeven point in number of mixes.

2 Calculate breakeven point in units and revenue.

Example (J Co)

1 Mix 1: 1,000 mixes (calculated earlier)

Mix 2: Contribution per mix = ($4 × 2) + ($10 × 4)
= $48

Breakeven point = $30,000 ÷ $48
= 625 mixes

2 Mix 1: $50,000 (calculated earlier)

Mix 2: M 625 × 2 = 1,250 units
1,250 × $7 = $8,750 units

N 625 × 4 = 2,500 units
2,500 × $15 = $37,500 revenue

Total breakeven revenue = $46,250

Mix 2 is preferable because it requires a lower level of sales to break even (because it has a higher average contribution per unit sold of $48/6 = $8 (compared with $30/6 = $5 for mix 1).

Changing the product mix

ABC Co sells products Alpha and Beta in the ratio 5:1 at the same selling price per unit. Beta has a C/S ratio of 66.67% and the overall C/S ratio is 58.72%. How do we calculate the overall C/S ratio if the mix is changed to 2:5?

1 *Calculate the missing C/S ratio*

- Calculate original market share (Alpha 5/6, Beta 1/6).
- Calculate weighted C/S ratios.

  Beta: 0.6667 × 0.1667 = 0.1111

  Alpha: 0.5872 – 0.1111 = 0.4761
- Calculate the missing C/S ratio.

	Alpha	**Beta**	**Total**
C/S ratio	0.5713 *	0.6667	
Market share	× 0.8333	× 0.1667	
	0.4761	0.1111	0.5872

* 0.4761/0.8333

2 *Calculate the revised overall C/S ratio*

	Alpha	*Beta*	*Total*
C/S ratio (as in 1)	0.5713	0.6667	
Market share (2/7:5/7)	× 0.2857	× 0.7143	
	0.1632	0.4762	0.6394

The overall C/S ratio has increased because of the increase in the proportion of the mix of the Beta, which has the higher C/S ratio.

Target profits: approach 1

1. Calculate the contribution per mix.
2. Calculate the required number of mixes.
3. Calculate the required number of units and sales revenue of each product.

You should remember from your earlier studies that the contribution required to earn a target profit (P) = fixed costs + P.

Example (J Ltd)

Suppose J Co wishes to earn profit of $24,900.

1. $30 (as earlier)
2. (Fixed costs + required profit)/contribution per mix = $(30,000 + 24,900)/$30 = 1,830 mixes

3.

	$
M: (1,830 × 5) units for (× $7)	64,050
N: (1,830 × 1) units for (× $15)	27,450
Total revenue	91,500
Variable costs (9,150 × $3) + (1,830 × $5)	36,600
Fixed costs	30,000
Profit	24,900

Target profits: approach 2

1. Calculate the average C/S ratio.
2. Calculate the required total revenue.

Example (J Co)

1. 60% (from earlier)
2. Required contribution ÷ C/S ratio
   = (fixed costs + profit) ÷ C/S ratio
   = $54,900 ÷ 0.6 = $91,500

Margin of safety

1. Calculate the breakeven point in revenue.
2. Calculate the margin of safety.

Example (J Co)

Suppose J Co has budgeted sales of $62,000.

1. $50,000 (from earlier)
2. Budgeted sales – breakeven sales
   = $(62,000 – 50,000) = $12,000
   = 19.4% of budgeted sales

Breakeven chart

A multi-product breakeven chart can only be drawn on the assumption that the sales proportions are fixed.

There are three possible approaches to preparing multi-product breakeven charts.

1. Output in $ sales and a constant product mix
2. Products in sequence
3. Output in tems of % of forecast sales and a constant product mix

P/V chart

Suppose J's sales budget is 6,000 units of M and 1,200 units of N.

Revenue (6,000 × $7 + 1,200 × $15) = $60,000

Variable costs (6,000 × $3 + 1,200 × $5) = $24,000

On the chart, products are shown individually, from left to right, in order of size of decreasing C/S ratio.

	C/S ratio	*Cum sales* $'000	*Cum profit* $'000
N	66.67%	18	*(18)
M	57.14%	60	6

* (1,200 × $15) – (12,000 × $5) – $30,000

What the multi-product P/V chart highlights

- The overall company breakeven point
- Which products should be expanded in output (the most profitable in terms of C/S ratio) and which, if any, should be discontinued
- What effect changes in selling price and sales revenue would have on breakeven point and profit
- The average profit (the solid line which joins the two ends of the dotted line) earned from the sales of the products in the mix

Advantages of CVP analysis

- Graphical representation of cost and revenue data can be more easily understood by non-financial managers
- Highlighting the breakeven point and margin of safety gives managers an indication of the level of risk involved

Limitations of CVP analysis

- It is assumed that fixed costs are the same in total and variable costs are the same per unit at all levels of output
- It is assumed that sales prices will be constant at all levels of activity
- Production and sales are assumed to be the same
- Uncertainty in estimates of fixed costs and unit variable costs is often ignored

4: Limiting factor analysis

Topic List

- Formulating the problem
- Finding the solution
- Slack, surplus and shadow prices

Limiting factor analysis is a technique used to determine an optimum product mix which will maximise contribution and profit.

Linear programming is used where there is more than one resource constraint.

Example

A company makes two products, standard and deluxe.

Relevant data are as follows.

	Standard	*Deluxe*	*Availability per month*
Profit per unit	\$15	\$20	
Labour hours per unit	5	10	4,000
Kgs of material per unit	10	5	4,250

Step 1. **Define variables**

- Let x = number of standards produced each month
- Let y = number of deluxes produced each month

Step 2. **Establish constraints**

- Labour $5x + 10y \leq 4{,}000$
- Material $10x + 5y \leq 4{,}250$
- Non-negativity $x \geq 0,\ y \geq 0$

Step 3. **Construct objective function**

- Profit (P) = $15x + 20y$

There are two methods you need to know about when finding the solution to a linear programming problem.

- Graphical method
- Using equations

Graphical method

Step 1. Graph the constraints

Labour	5x + 10y = 4,000
if	x = 0, y = 400
if	y = 0, x = 800
Material	10x + 5y = 4,250
if	x = 0, y = 850
if	y = 0, x = 425

Step 2. Establish the feasible area/region

This is the area where all inequalities are satisfied (area above x axis and y axis ($x \geq 0$, $y \geq 0$), below material constraint ($\leq$) and below labour constraint ($\leq$)

Step 3. Add an iso-profit line

Suppose P = $3,000 so that if $P = 15x + 20y$ then if $x = 0$, $y = 150$ and if $y = 0$, $x = 200$ and (sliding your ruler across the page if necessary) find the point furthest from the origin but still in the feasible area

Step 4. Use simultaneous equations to find the x and y coordinates at the optimal solution, the intersection of the material and labour constraints ($x = 300$, $y = 250$)

Using equations

- Graph constraints and establish feasible area
- Determine all possible intersection points of constraints and axes using simultaneous equations
- Calculate profit at each intersection point to determine which is the optimal solution

Slack

Occurs when maximum availability of a resource is not used.

The resource is *not binding* at the optimal solution. Slack is associated with ≤ constraints.

Surplus

Occurs when more than a minimum requirement is used.

Surplus is associated with ≥ constraints eg a minimum production requirement.

Shadow price

It is the increase in contribution created by the availability of an extra unit of a limited resource at its original cost.

It is the maximum **premium** an organisation should be willing to pay for an extra unit of a resource.

It provides a measure of the **sensitivity** of the result.

It is only valid for a small range before the constraint becomes non-binding or different resources become critical.

Notes

5: Pricing decisions

Topic List

- Pricing policy and the market
- Demand
- Profit maximisation
- Price strategies

Pricing of an organisation's products or services is an essential part of its profitability and survival.

There are many factors influencing prices and organisations may have different price strategies.

1 Demand

- Most important factor ⟶ based on economic analysis of demand

2 Market in which the organisation operates

PERFECT COMPETITION Many buyers and sellers, one product	MONOPOLISTIC COMPETITION A large number of suppliers offer similar (not identical) products
MONOPOLY One seller who dominates many buyers	OLIGOPOLY Relatively few competitive companies dominate the market

3 Price sensitivity

- Varies amongst purchasers. If cost can be passed on – not price sensitive

4 Price perception

- How customers react to prices. If product price ↑, buy more before further rises

5 Compatibility with other products

- eg operating systems on computers. User wants wide range of software available

6 Competitors

- Prices may move in unison (eg petrol). Alternatively, price changes may start price war

7 Competition from substitute products
- eg train prices ↑, competition from coach or air travel

8 Suppliers
- If organisation's product price ↑, suppliers may seek price rise in supplies

9 Inflation
- Price changes to reflect increase in price of supplies

10 Quality
- Customers tend to judge quality by price

11 Incomes
- When household incomes rising, price not so important. When falling, important

12 Ethics
- Exploit short-term shortages through higher prices?

Demand is the most important factor influencing the price of a product

Demand increases as prices are lowered

Price elasticity of demand (η)

A measure of the extent of change in market demand for a good, in response to a change in its price

= change in quantity demanded, as a % of demand ÷ change in price, as a % of price

Inelastic demand

- $\eta < 1$
- Steep demand curve
- Demand falls by a smaller % than % rise in price
- Pricing decision: increase prices

Elastic demand

- $\eta > 1$
- Shallow demand curve
- Demand falls by a larger % than % rise in price
- Pricing decision: decide whether change in cost will be less than change in revenue

Variables which influence demand

- The price of the good
- The price of other goods
- The size and distribution of household incomes
- Tastes and fashion
- Expectations
- Obsolescence

Demand and the individual firm

Influenced by:

- Product life cycle
- Quality
- Marketing
  - price
  - product
  - place
  - promotion

The demand equation

The equation for the demand curve is

$P = a - bQ$

P is the price

Q is the quantity demanded

a is the price at which demand = 0

$$b \text{ is } \frac{\text{change in price}}{\text{change in quantity}}$$

The total cost function

Cost behaviour can be modelled using equations and linear regression analysis. A **volume-based discount** is a discount given for buying in bulk which reduces the variable cost per unit and therefore the **slope** of the cost function is less steep.

Determining the profit-maximising selling price/output level

Method 1: using equations

Profits are maximised when MC = MR.

Example

MC = 320 – 0.2x
MR = 1,920 – 16.2x

∴ Profits are maximised when
320 – 0.2x = 1,920 – 16.2x
ie when x = 100

You could also be provided with/asked to determine the demand curve in order to calculate the price at this profit-maximising output level.

The marginal revenue equation

$MR = a - 2bQ$

Q is the quantity demanded

a is the price at which demand = 0

b is $\frac{\text{change in price}}{\text{change in quantity}}$

Method 2: visual inspection of tabulation of data

1. Work out the demand curve and hence the price and total revenue (PQ) at various levels of demand.
2. Calculate total cost and hence marginal cost at each level of demand.
3. Calculate profit at each level of demand, thereby determining the price and level of demand that maximises profit.

In practice, cost is one of the most important influences on price

- Full cost-plus
- Marginal cost-plus

Full cost-plus pricing

is a method of determining the sales price by calculating the full cost of the product and adding a percentage mark-up for profit.

Example

Variable cost of production
= $4 per unit
Fixed cost of production
= $3 per unit
Price is to be 40% higher than full cost

Full cost per unit = $(4 + 3) = $7

$$\text{Price} = \$7 \times \frac{140\%}{100}$$

$$= \$9.80$$

Advantages

- ☑ Quick, simple, cheap method
- ☑ Ensures company covers fixed costs

Disadvantages

- ☒ Doesn't recognise profit-maximising combination of price and demand
- ☒ Budgeted output needs to be established
- ☒ Suitable basis for overhead absorption needed

Marginal cost-plus pricing

is a method of determining the sales price by adding a profit margin onto either marginal cost of production or marginal cost of sales.

Example

Direct materials	=	\$15
Direct labour	=	\$3
Variable overhead	=	\$7
Price	=	\$40
Profit = \$40 – \$(15 + 3 + 7)	=	\$15
Profit margin = $\frac{\$15}{\$25} \times 100\%$	=	60%

Advantages

- ☑ Simple and easy method
- ☑ Mark-up percentage can be varied
- ☑ Draws management attention to contribution

Disadvantages

- ☒ Does not ensure that attention paid to demand conditions, competitors' prices and profit maximisation
- ☒ Ignores fixed overheads – so must make sure sales price high enough to make profit

Other pricing strategies

- New products
  - Market penetration → low prices when product launched
  - Market skimming → charge high prices when product launched
- Complementary product pricing → use a 'loss leader'
- Product-line pricing → prices reflect cost proportions or demand relationships
- Volume discounting → reduction in price for large purchases
- Relevant cost pricing → for special orders determine a minimum price
- Price discrimination → the practice of charging different prices for the same product for different groups of buyers

6: Short-term decisions

Topic List

Relevant costs

Make or buy decisions

Further processing and shutdown

The overriding requirement of information needed to make decisions is relevance. Decision-making questions require a discussion of non-quantifiable factors as well as calculations to support a particular option.

Relevant costs are

- future
- incremental
- cash flows

Relevant costs

Avoidable cost

is a cost which would not be incurred if the activity to which it related did not exist.

Opportunity cost

is the benefit which would have been earned but which has been given up, by choosing one option instead of another.

Differential cost

is the difference in the cost of alternatives.

Controllable cost

is an item of expenditure which can be directly influenced by a given manager within a given time span.

Relevant cost of materials

- Not owned
  - current replacement cost
- Owned
  - will be replaced
    - current replacement cost
  - will not be replaced
    - higher of current resale value and value if put to an alternative use

Relevant cost of labour

- Direct labour cost plus contribution lost by diverting labour to make another product

Non-relevant costs

Sunk cost

is a past (historical) cost which is not directly relevant in decision making.

Fixed costs

Unless given an indication to the contrary, assume fixed costs are irrelevant and variable costs are relevant.

Direct and indirect costs may be relevant or irrelevant depending on the situation.

A make or buy problem involves a decision by an organisation about whether it should make a product/carry out an activity with its own internal resources, or whether it should pay another organisation to make the product/carry out the activity.

No scarce resource

Relevant costs are the differential costs between the two options

With scarce resources

Where a company must subcontract work to make up a shortfall in its own production capacity, its total costs are minimised by subcontracting work which adds the least extra marginal cost per unit of scarce resource saved by subcontracting.

Example (limited labour time)

	A	B
Variable cost of making	$16	$14
Variable cost of buying	$20	$19
Extra variable cost of buying	$4	$5
Labour hours saved by buying	2	2
Extra variable cost of buying per hour saved	$2	$2.50
Priority for making in-house	2nd	1st

Outsourcing

is the use of external suppliers for finished products, components or services

Advantages

- ☑ Superior quality and efficiency
- ☑ Capital is freed up
- ☑ Greater capacity and flexibility to cope with changes in demand

Disadvantages

- ☒ Reliability of supplier
- ☒ Loss of control and flexibility
- ☒ Effect on existing workforce

Further processing decisions

A **joint product** should be processed further past the split-off point if sales revenue minus further processing costs exceeds its sales revenue at the split-off point.

The apportionment of joint processing costs is **irrelevant** to the decision.

Any short-term decision must consider qualitative factors related to the impact on employees, customers, competitors and suppliers

Shut down decisions

- Whether or not to shut down a factory/department/product line because it is making a loss or too expensive to run
- Whether closure should be permanent or temporary

1. Calculate what is earned by the process at present (perhaps in comparison with others).
2. Calculate what will be the financial consequences of closing down (selling machines, redundancy costs etc).
3. Compare the results and act accordingly.
4. Bear in mind that some fixed costs may no longer be incurred if the decision is to shut down and they are therefore relevant to the decision.

7: Risk and uncertainty

Topic List

Risk and uncertainty

Expected values

Decision rules

Decision trees

Value of information

Sensitivity analysis

Simulation models

This chapter covers some of the techniques that the management accountant can use to take account of any risk or uncertainty surrounding decisions.

Risk

Involves situations or events which may or may not occur, but whose probability of occurrence can be calculated statistically and the frequency of their occurrence predicted from past records

Uncertainty

Involves events whose outcome *cannot* be predicted with statistical confidence.

Market research can be used to reduce uncertainty.

Attitude to risk

Risk seeker	A decision maker interested in the best outcomes no matter how small the chance that they may occur
Risk neutral	A decision maker concerned with what will be the most likely outcome
Risk averse	A decision maker who acts on the assumption that the worst outcome might occur

Expected values (EV)

indicate what an outcome is likely to be in the long term with repetition.

The expected value will never actually occur.

Example

If contribution could be $10,000, $20,000 or $30,000 with respective probabilities of 0.3, 0.5 and 0.2, the EV of contribution =

	$
$10,000 × 0.3	3,000
$20,000 × 0.5	10,000
$30,000 × 0.2	6,000
EV of contribution	19,000

Maximin

The ‘play it safe’ basis for decision making.

Choose the least unattractive worst outcome.

- defensive and conservative
- ignores probability of each different outcome taking place

Maximax

Looks at the best possible result.

- ignores probabilities
- over optimistic

Minimax regret

The ‘opportunity loss’ basis for decision making. Minimise the regret from making the wrong decision.

Different people will reach different decisions on the same problem.

Preparation

1. Always work **chronologically** from **left to right**.

2. Start with a (labelled) **decision point.**

3. Add branches for each option/alternative.

4. If the outcome of an option is 100% certain, the branch for that alternative is complete.

5. If the outcome of an option is uncertain (because there are a number of possible outcomes), add an **outcome point.**

6. For each possible outcome, add a branch (with the relevant probability) to the outcome point.

Evaluating the decision

Work from **right to left** and calculate the EV of revenue/cost/contribution/profit at each outcome point (**rollback analysis**).

Example

As a result of an increase in demand for a town's car parking facilities, the owners of a car park are reviewing their business operations. A decision has to be made now to select one of the following three options for the next year.

Option 1: Make no change. Annual profit is $100,000. There is little likelihood that this will provoke new competition this year.

Option 2: Raise prices by 50%. If this occurs there is a 75% chance that an entrepreneur will set up in competition this year. The Board's estimate of its annual profit in this situation would be as follows.

2A WITH a new competitor		2B WITHOUT a new competitor	
Probability	Profit	Probability	Profit
0.3	$150,000	0.7	$200,000
0.7	$120,000	0.3	$150,000

Option 3: Expand the car park quickly, at a cost of $50,000, keeping prices the same. The profits are then estimated to be like 2B above, except that the probabilities would be 0.6 and 0.4 respectively.

Option	*Expected profit*
	$'000
1	100
2	143
3 (180 – 50)	130

At C, expected profit = (150 × 0.3) + (120 × 0.7) = $129,000
At D, expected profit = (200 × 0.7) + (150 × 0.3) = $185,000
At B, expected profit = (129 × 0.75) + (185 × 0.25) = $143,000
At E, expected profit = (200 × 0.6) + (150 × 0.4) = $180,000

The value of perfect information

1. Work out the EVs of all options and see which is best.

2. See what decision would be taken with perfect information (if all the outcomes were known in advance with certainty) and calculate the EV.

3. The value of perfect information (the amount you would be willing to pay to obtain it) = EV of the action you would take *with* the information – EV without the information.

Alternatively a decision tree can be used.

Example

	Profit if strong demand	*Profit/(loss) if weak demand*
Option A	\$4,000	\$(1,000)
Option B	\$1,500	\$600
Probability	0.3	0.7

EV of A = $4{,}000 \times 0.3 + (1{,}000) \times 0.7$ = \$500

EV of B = $1{,}500 \times 0.3 + 600 \times 0.7$ = \$870

∴ Choose B

With perfect information, if demand is strong choose A but if demand is weak choose B.

∴ EV with perfect information = $0.3 \times 4{,}000 + 0.7 \times 600$
= \$1,620

∴ Value of perfect information = \$(1,620 – 870)
= \$750

Example

X Co is trying to decide whether or not to build a shopping centre. The probability that the centre will be successful based on past experience is 0.6.

X Co could conduct market research to help with the decision.

- If the centre is going to be successful there is a 75% chance that the market research will say so.
- If the centre is not going to be successful there is a 95% chance that the survey will say so.

The information can be tabulated as follows.

		Actual			
		Success	Failure	Total	
Research	Success	** 45	2	47	* given
	Failure	*** 15	38	53	** 0.75 × 60
Total		* 60	40	100	*** balancing figure

The probabilities are as follows.

P (research says success) = 0.47
P (research says failure) = 0.53

If the survey says success

P (success) = 45/47 = 0.957
P (failure) = 2/47 = 0.043

If the survey says failure

P (success) = 15/53 = 0.283
P (failure) = 38/53 = 0.717

The essence of all approaches to sensitivity analysis is to carry out calculations with one set of values for the variables and then substitute other possible values for the variables to see how this effects the overall outcome.

Approach 1 Estimate by how much a variable would need to differ from its estimated value before the decision would change.

Approach 2 Estimate whether a decision would change if a variable was X% higher than expected.

Approach 3

Estimate by how much a variable would need to differ before a decision maker was indifferent between two options.

Sensitivity analysis is one form of 'what-if?' analysis

Example

Option 2 is $10,000 more expensive than option 1 and involves taking a discount of 10% from a supplier from whom you purchase $50,000 of goods (before discount) pa for 4 years. Ignore the time value of money. Discount needs to be $10,000 (difference) + $20,000 (current discount) if option 2 is as good as option 1.

$\therefore$ (4 × $50,000) × X% = $30,000

$\therefore$ X = 15% (rate at which you are indifferent between the two options)

Simulation models

can be used to deal with decision problems involving a number of uncertain variables.

Random numbers are used to assign values to the variables.

Example

Daily demand Units	*Probability*	*Numbers assigned*
17	0.15	00-14
18	0.45	15-59
19	0.40	60-99
	1.00	

Random numbers for a simulation over three days are 761301.

Day	*Random number*	*Demand*
1	76	19
2	13	17
3	01	17

Notes

8: Objectives of budgetary control

Topic List

Objectives

Planning and control

Behavioural aspects of budgeting

Budgeting is an important aspect of many accountants' lives and budgetary control and its behavioural implications are essential aspects to understand.

Corporate objectives

are set as part of the **corporate planning process** which is concerned with selecting **strategies** to achieve objectives.

Conflicting objectives

Corporate objectives may conflict with divisional objectives

Setting objectives is a **political process** using **bargaining**

Conflict is resolved using prioritisation, compromise, negotiation and satisfying

Goal congruence

exists when managers working in their own best interests also act in harmony with organisational goals.

The planning and control cycle

Objectives of a budgetary planning and control system

- Ensure the organisation's objectives are achieved
- Compel planning
- Communicate ideas and plans
- Co-ordinate activities
- Provide a framework for responsibility accounting
- Establish a system of control
- Motivate employees to improve their performance

Negative effects of budgets include

- **At the planning stage**
  - Managers may fail to co-ordinate plans with those of other budget centres.
  - They may build slack into expenditure estimates.
- **When putting plans into action**
  - Minimal co-operation and communication between managers.
  - Managers might try to achieve targets but not beat them.
- **Using control information**
  - Resentment, managers seeing the information as part of a system of trying to find fault with their work.
  - Scepticism of the value of information if it is inaccurate, too late or not understood.

Budgets as targets

Can budgets, as targets, motivate managers to achieve a high level of performance?

- *Ideal standards* are demotivating because adverse efficiency variances are always reported
- *Low standards* are demotivating because there is no sense of achievement in attainment, no impetus to try harder
- *Normal levels* of attainment can encourage **budgetary slack**

To ensure managers are properly motivated, two budgets can be used.

- One for planning and decision making, based on reasonable expectations **(expectations budget)**
- One for motivational purposes, with more difficult targets **(aspirations budget)**

Budgetary slack

the difference between the minimum necessary costs and the costs built into the budget or actually incurred → Managers might deliberately overestimate costs and underestimate sales so that they will not be blamed for overspending and poor results.

Participation

Budget-setting styles

- Imposed (from the top down)
- Participative (from the bottom up)
- Negotiated

In practice final budgets are likely to lie between what top managemetn would really like and what junior managers believe is feasible.

Advantages of participative approach include

- ☑ More realistic budgets
- ☑ Co-ordination, morale and motivation improved
- ☑ Increased management commitment to objectives

Disadvantages of participative approach include

- ☒ More time-consuming
- ☒ Budgetary slack may be introduced
- ☒ Does not suit some employees

If employees feel they do not have the necessary skills, think that the budget will be used against them or complain thet are too busy, participation could be an added pressure rather than an opportunity.

9: Budgetary systems

Topic List

Traditional budgetary systems

Zero based budgeting (ZBB)

Other systems

Budgeting issues

There are a range of budgetary systems and types which can be used. The traditional approach of incremental budgeting is not always appropriate or useful.

Incremental budgeting

This involves adding a certain percentage to last year's budget to allow for growth and inflation. It encourages slack and wasteful spending to creep into budgets.

Fixed budgets

These are prepared on the basis of an estimated volume of production and an estimated volume of sales. No variants of the budget are made to cover the event that actual and budgeted activity levels differ and they are not adjusted (in retrospect) to reflect actual activity levels.

Flexible budgets

These are budgets which, by recognising different cost behaviour patterns, change as activity levels change.

- At the planning stage, flexible budgets can be drawn up to show the effect of the actual volumes of output and sales differing from budgeted volumes.
- At the end of a period, actual results can be compared to a flexed budget *(what results should have been at actual output and sales volumes)* as a control procedure.

ZBB

This approach treats the preparation of the budget for each period as an independent planning exercise: the initial budget is zero and every item of expenditure has to be justified in its entirety to be included.

Three-step approach to ZBB

1. Define **decision packages** (description of a specific activity so that it can be evaluated and ranked).

   Mutually exclusive packages | **Incremental packages**

2. Evaluate and rank packages on the basis of their benefit to the organisation.

3. Allocate resources according to the funds available and the ranking of packages.

Advantages of ZBB

- ☑ Identifies and removes inefficient and/or obsolete operations
- ☑ Provides a psychological impetus to employees to avoid wasteful expenditure
- ☑ Leads to a more efficient allocation of resources

Disadvantages of ZBB

- ☒ Involves time and effort
- ☒ Can cause suspicion when introduced
- ☒ Costs and benefits of different alternative courses of action can be difficult to quantity
- ☒ Ranking can prove problematic

Activity based budgeting (ABB)

At its simplest, ABB involves the use of costs determined using ABC in budgets. More formally, it involves defining the activities that underlie the figures in each function and using the level of activity to decide how much resource should be allocated, how well it is being managed and to explain variances from budget.

Continuous/rolling budgets

Continuous/rolling budgets are continuously updated by adding a further accounting period (month or quarter) when the earlier accounting period has expired.

Dynamic conditions making original budget inappropriate

- Organisational changes
- Environmental considerations
- New technology
- Inflation

Advantages of rolling budgets

- ☑ Reduce uncertainty
- ☑ Up-to-date budget always available
- ☑ Realistic budgets are better motivators

Disadvantages of rolling budgets

- ☒ Involve more time, effort and money

Sources of budget information

- Past data
- Sales forecasts
- Production department costing information

Allowing for uncertainty

- Flexible budgeting
- Rolling budgets
- Probabilistic budgeting
- Sensitivity analysis

Difficulties of changing budgetary practices

- Resistance by employees
- Loss of control
- Time consuming and expensive training
- Cost of implementation
- Lack of accounting information and systems in place

10: Quantitative analysis in budgeting

Topic List

- Analysing fixed and variable costs
- Forecasting techniques
- Learning curves
- Expected values and spreadsheets

This chapter looks at where the figures which go into budgets come from. There are a number of quantitative techniques which are used in budgeting.

The fixed and variable elements of semi-variable costs can be determined by the **high-low method.**

Step 1. Review past records of costs
- Select period with **highest** activity level
- Select period with **lowest** activity level

Step 2. Determine
- Total cost at high activity level (TCH)
- Total cost at low activity level (TCL)
- Total units at high activity level (TUH)
- Total units at low activity level (TUL)

Step 3. Calculate variable cost per unit = $\frac{TCH - TCL}{TUH - TUL}$

Step 4. Determine fixed costs by substituting variable cost per unit = TCH – (TUH x VC per unit)

The high-low method may give inaccurate cost estimations as it assumes costs at the extremes of activity are representative.

Linear regression analysis finds the equation of the straight line **(line of best fit)** which has the general form **y = a +bx**

where **y = dependent variable = total cost**
x = independent variable = level of activity
a = intercept of line on y axis = fixed cost
b = gradient of line = variable cost per unit

Historical data (adjusted for inflation) provide readings for x and y. These readings are then substituted into formulae for a and b.

$$b = \frac{n\Sigma xy - \Sigma x \Sigma y}{n\Sigma x^2 - (\Sigma x)^2} \quad \text{and } a = \frac{\Sigma y}{n} - \frac{b\Sigma x}{n}$$

where n = number of pairs of data for x and y.

Once the equation has been determined, a value for x (activity level) can be substituted into the equation and a value for y (total cost at that activity level) forecast.

The formulae for a and b will be provided in the exam.

Conditions necessary for the use of linear regression analysis

- A linear cost function is assumed
- Historical cost data is accurately recorded
- There are 10+ pairs of data
- The activity levels in the historical data cover the full normal range of activity
- Data is adjusted to account for inflation
- Past conditions are indicative of future conditions
- The value of y can be predicted from the value of x

Forecasting techniques

1. Estimate using judgement and experience
2. Simple average growth models → $(1 + g)^4 = \frac{\text{Sales in 20X5}}{\text{Sales in 20X1}}$
3. Time series →
   1. Find the trend using **linear regression analysis** or **moving averages**
   2. Use the trend to forecast future values
   3. Find the seasonal variations and adjust the forecast values
      - additive model
      - proportional model

Forecasting problems

- Political, economic, environmental, technological and social changes make forecasting difficult
- The further into the future the forecast is made, the more unreliable it is
- The less data available for the forecast, the less reliable it is
- The pattern of trend and seasonal variations may not continue

Theory

As **cumulative output doubles**, the **cumulative average time per unit** produced **falls** to a fixed percentage of the previous cumulative average time per unit.

Note that cumulative average time = average time per unit for all units produced so far, back to and including the first unit made.

When does learning curve theory apply?

- Product made largely by labour effort
- Brand new or relatively short-lived product
- Complex product made in small quantities for special orders

Example

Assume a 90% learning effect applies.

Cumulative output Units		*Cumulative average time per unit* Hours		*Total time required* Hours	*Incremental time taken* Total hours		Hours/unit
1		50.00	(× 1)	50.0			
2*	(× 90%)	45.00	(× 2)	90.0	40.0	(÷ 1)	40.0
4*	(× 90%)	40.50	(× 4)	162.0	72.0	(÷ 2)	36.0
8*	(× 90%)	36.45	(× 8)	291.6	129.6	(÷ 4)	32.4

* Output doubled each time

Formula for the learning curve

The learning effect can be shown as a learning curve.

The formula for learning curve (a) shown above is
$Y = aX^b$

where Y = average cost per unit
X = the number of units made so far
a = the cost of the first unit
b = the learning coefficient or index
= log of learning rate / log of 2

This formula will be provided in the exam if it is needed.

Costs affected

- As the learning effect is a function of labour, only labour costs and other variable costs directly dependent on labour are affected
- Materials should not be affected unless early on in the learning process they are used inefficiently
- Fixed overhead expenditure should be unaffected (but some problems might be caused in an organisation that uses absorption costing)

Where learning curve theory can be used

- To calculate the marginal (incremental) cost of making extra units of a product
- To quote selling prices for a contract, where prices are calculated at a cost plus a percentage mark-up for profit
- To prepare realistic production budgets and more efficient production schedules
- To prepare realistic standard costs for cost control purposes

Limitations of learning curve theory

- Learning curve effect is not always present
- It assumes stable conditions which allow learning to take place
- It assumes a certain degree of motivation amongst employees
- Breaks between repeating production of an item must not be too long or workers will forget and learning will have to begin again
- It may be difficult to obtain enough accurate data to decide what the learning factor is
- Learning will eventually cease

Expected values

can be used in budgeting to determine the best combination of expected profit and risk.

Probabilistic budgeting

Assigns probabilities to different conditions

Most likely | Worst possible | Best possible

Expected value of profits

Spreadsheet packages

are used to build business models and conduct 'what if' analysis.

Disadvantages

- ☒ A minor error in design can affect the validity of data
- ☒ Very easy to corrupt
- ☒ Can become over-dependent on them and lose sight of original intention
- ☒ Cannot take account of qualitative factors

11: Budgeting and standard costing

Topic List

Standard costs

Setting standards

Flexible budgets

This chapter revises standard costing and looks at how standards are set.

Flexible budgets are vital for planning and control.

Uses of standard costing

- **To act as a control device (variance analysis)**
- **To value inventories and cost production**
- To assist in setting budgets and evaluating managerial performance
- To enable the principle of 'management by exception' to be practiced
- To provide a prediction of future costs for use in decision-making situations
- To motivate staff and management by providing challenging targets
- To provide guidance on possible ways of improving efficiency

It is most suited to **mass production** and repetitive assembly work.

The responsibility for **deriving** standards should be shared between managers able to provide the necessary information about levels of expected efficiency, prices and overhead costs.

Types of performance standard

Ideal

- Perfect operating conditions
- Unfavourable motivational impact

Attainable

- Allowances made for inefficiencies and wastage
- Incentive to work harder (realistic but challenging)

Current

- Based on current working conditions
- No motivational impact

Basic

- Unaltered over a long period of time
- Unfavourable impact on performance

Wastage

Build into an attainable materials standard
eg 20% normal loss 2kg x 100/80 = 2.5kg

Adjust materials budget

Idle time

Build into an attainable labour hours standard

eg 20% idle time
1hr x 100/80 = 1.25 hrs

Adjust labour budget

Flexible budgets

These are budgets which, by recognising different cost behaviour patterns, change as activity levels change.

- At the planning stage, flexible budgets can be drawn up to show the effect of the actual volumes of output and sales differing from budgeted volumes.
- At the end of a period, actual results can be compared to a flexed budget *(what results should have been at actual output and sales volumes)* as a control procedure.

1. Decide whether costs are fixed, variable or semi-variable.
2. Split semi-variable costs into their fixed and variable components using the high-low method.
3. Flex the budget to the required activity level.

Many cost items in modern industry are **fixed costs** so the **value** of flexible budgets is dwindling.

Principle of controllability

Managers of responsibility centres should only be held accountable for costs over which they have some influence.

12: Variance analysis

Topic List

Basic variances

Idle time and waste

Operating statements

Investigating variances

Materials mix and yield variances

Sales mix and quantity variances

Variance analysis is a key technique in management accounting which you will have covered in your earlier studies.

F5 will examine the more complicated variances such as materials mix and yield.

Example to be used throughout this chapter

Standard cost of product A	$
Materials (5 kgs × $10 per kg)	50
Labour (4 hrs × $5 per hour)	20
Variable o/hds (4 hrs × $2 per hour)	8
Fixed o/hds (4 hrs × $6 per hour)	24
	102

Budgeted results	
Production	1,200 units
Sales	1,000 units
Selling price	$150 per unit

Actual results	
Production	1,000 units
Sales	900 units
Materials	4,850 kgs, $46,075
Labour	4,200 hrs, $21,210
Variable o/hds	$9,450
Fixed o/hds	$25,000
Selling price	$140 per unit

Material total variance

The difference between what the output actually cost, and what it should have cost, in terms of material

This can be divided into two sub-variances.

Material price variance

The difference between what the material used did cost and what it should have cost

Material usage variance

The difference between the standard cost of the material that should have been used and the standard cost of the material that was used

Example

	$	
1,000 units should have cost (× $50)	50,000	
but did cost	46,075	
Material total variance	3,925	(F)
	$	
4,850 kgs should have cost (× $10)	48,500	
but did cost	46,075	
Material price variance	2,425	(F)
1,000 units should have used	5,000	kgs
but did use	4,850	kgs
Variance in kgs	150	kgs (F)
× standard cost per kg	× $10	
Material usage variance	$1,500	(F)

Labour total variance

The difference between what the output actually cost and what it should have cost, in terms of labour

Again this can be divided into two sub-variances.

Labour rate variance

The difference between what the labour used did cost and what it should have cost

Labour efficiency variance

The difference between the standard cost of the hours that should have been worked and that standard cost of the hours that were worked. When idle time occurs, the efficiency variance is based on hours actually worked (not hours paid for) and an **idle time variance** (hours of idle time × standard rate per hour) is calculated.

Example

	$	
1,000 units should have cost (× $20)	20,000	
but did cost	21,210	
Labour total variance	1,210	(A)

	$	
4,200 hrs should have cost (× $5)	21,000	
but did cost	21,210	
Labour rate variance	210	(A)

1,000 units should have used	4,000 hrs	
but did use	4,200 hrs	
Variance in hours	200 hrs	(A)
× standard rate per hour	× $5	
Labour efficiency variance	$1,000	(A)

Variable production overhead total variance

The difference between what the output should have cost and what it did cost, in terms of variable production overhead

Variable production o/hd expenditure variance

The difference between the actual variable production overhead incurred and the amount that should have been incurred in the hours actively worked

Variable production o/hd efficiency variance

The difference between the standard cost of the hours that should have been worked and the standard cost of the hours that were worked

Example

	$
1,000 units should have cost (× $8)	8,000
but did cost	9,450
Variable prod o/hd total variance	1,450 (A)

	$
4,200 hrs should have cost (× $2)	8,400
but did cost	9,450
Variable prod o/hd exp'd variance	1,050 (A)

Labour efficiency variance in hrs	200 hrs (A)
× standard rate per hour	× $2
Variable prod o/hd efficiency variance	$400 (A)

The **total variance** is the difference between fixed production overhead incurred and fixed production overhead absorbed (= under- or over-absorbed fixed production overhead).

Causes of under/over absorption

- Actual expenditure ≠ budgeted expenditure ⇒ expenditure variance
- Actual prod'n (units or hrs) ≠ budgeted prod'n ⇒ volume variance

Expenditure variance

The difference between budgeted and actual fixed production overhead expenditure

Example

	$
Budgeted o/hd (1,200 × $24)	28,800
Actual overhead	25,000
Expenditure variance	3,800 (F)

Example

	$
Overhead incurred	25,000
Overhead absorbed (1,000 × $24)	24,000
Under-absorbed overhead/total variance	1,000 (A)*

Volume variance

The difference between actual and budgeted production units × standard absorption rate per unit

Example

	$
Actual prod'n at std rate (1,000 × $24)	24,000
Budgeted prod'n at std rate (1,200 × $24)	28,800
Volume variance	4,800 (A)*

*(A) because actual output less than budgeted output

Volume efficiency variance

Shows how much of the under/over absorption is due to efficiency of labour/plant

The difference between the number of hours that production should have taken and the number of hours worked × standard absorption rate per hour

Example

Labour efficiency variance in hrs	200 hrs (A)
× standard rate per hr	× $6
Efficiency variance	$1,200 (A)

This is usually the labour efficiency variance in hours and so is also similar to the variable production overhead efficiency variance.

In a marginal costing system there is no volume variance.

Volume capacity variance

Shows how much of the under/over absorption is due to hours worked being more or less than budgeted

The difference between budgeted hours of work and actual hours worked × standard absorption rate per hour

Example

Budgeted hours (1,200 × 4)	4,800 hrs
Actual hours	4,200 hrs
Variance in hrs	600 hrs(A)
× std rate per hr	× $6
Capacity variance	$3,600 (A)

Selling price variance

A measure of the effect on expected profit of a different selling price to standard

The difference between what the sales revenue should have been for the actual quantity sold, and what it was

Example

	$	
Revenue from 900 units should have been (× $150)	135,000	
but was (× $140)	126,000	
Selling price variance	9,000	(A)

Don't forget to value the sales volume variance at standard contribution margin if marginal costing is in use.

Sales volume variance

A measure of the effect on expected profit of a different sales volume to that budgeted

The difference between the actual units sold and the budgeted quantity, valued at the standard profit per unit

Example

Budgeted sales volume	1,000 units	
Actual sales volume	900 units	
Variance in units	100 units	(A)
× std profit margin per unit (× $(150 – 102))	× $48	
Sales volume variance	$4,800	(A)

Idle time variance

is the number of hours that were idle, over and above those expected, valued at the standard rate per hour.

Wastage

Calculate a variance that compares actual material usage with a standard that has been **adjusted** for expected wastage.

Example

Budgeted machine time = 5,000 hrs
Budgeted output = 18,525 units
Idle time of 5% is allowed.
Total budgeted costs = $44,460
Actual machine hours = 6,000
Actual idle time = 800 hours

Excess idle time = 800 - (5% x 6,000) = 500
Budgeted cost of labour per hour = $44,460/5,000 x 100/95 = $9.36
Idle time variance = 500 x $9.36 = $4,680

Most common presentation (absorption costing)

		$	$
Budgeted profit			X
Sales variances – price		X	
– volume		X	
			X
Actual sales minus standard cost of sales			X
Cost variances	$ (F)	$ (A)	
Material price etc	X		
Fixed o/hd volume etc		X	
	X	X	X
Actual profit			X

Most common presentation (marginal costing)

	$	$
Budgeted profit		X
Budgeted fixed production overhead		X
Budgeted contribution		X
Sales variances (price and volume)		X
Actual sales minus std variable cost of sales		X
Variable cost variances		X
Actual contribution		X
Budgeted fixed production overhead	X	
Expenditure variance	X	
Actual fixed production overhead		X
Actual profit		X

Within an **ABC system** efficiency variances for longer-term variable overheads are the difference between the level of activity that should have been needed and the actual activity level, valued at the standard rate per activity.

Reasons for variances

Material price (F) – unforeseen discounts received
(A) – price increase, careless purchasing

Material usage (F) – material used higher quality than standard
(A) – defective material, waste, theft

Labour rate (F) – use of less skilled (lower paid) workers
(A) – rate increase

Idle time (always (A)) – machine breakdown, illness

Labour efficiency (F) – better quality materials
(A) – lack of training

Overhead expenditure (F) – cost savings
(A) – excessive use of services

Overhead volume - production greater or less than budgeted

Factors affecting the significance of variances

- Materiality
- Controllability
- Costs v benefits
- Interdependence (eg material price (F) and material usage (A))
- Type of standard used
- Variance trend

Causes of variances

- Efficient/inefficient operations
- Measurement errors
- Out of date standards
- Random/chance fluctuations

Rule of thumb method

Deciding a limit and if variance is within limit not investigated, if outside limit action is taken.

Drawbacks of method

- ☒ Limits set randomly
- ☒ Limits different for unfavourable
- ☒ Fixed percentage limits hide significant absolute losses
- ☒ Unimportant/expected fluctuations highlighted unnecessarily
- ☒ Costs/benefits of investigations not highlighted
- ☒ Past history of variances ignored

Statistical significance model

Use of historical data to calculate expected average and standard deviation. Variance investigated only if greater distance from average than normal distribution suggests is likely if process is in control.

Advantages of method

- ☑ Important costs with small variations highlighted if variances rise significantly
- ☑ Costs with normal large variations not highlighted unless variations excessive

BUT

How do you ascertain standard deviations of expenditure?

If a product requires two or more raw materials, and the proportions of the materials are changeable and controllable, the materials usage variance can be split into a mix variance and a yield variance.

Materials mix variance

A measure of whether the actual mix is cheaper or more expensive that the standard and calculated as the difference between the actual total quantity used in the standard mix and the actual quantity used in the actual mix, valued at standard costs.

- Find the standard proportions of the mix
- Calculate the standard mix of the actual material used
- Find (in kgs, litres etc for each input) the difference between what should have been used (as calculated above) and what was used
- Value at **standard costs**

Example

	Material A	*Material B*
Mix should have been (say 600 kgs split 2:3)	240 kgs	360 kgs
But was (say)	250 kgs	350 kgs
Mix variance in kgs	10 kgs (A)	10 kgs (F)
× std cost per kg (say)	× $10	× $5
	$100 (A)	$50 (F)

The mix variance in quantity is always zero.

Materials yield variance in total

- A measure of the effect on costs of inputs yielding more or less than expected
- Calculated as the difference between the expected output from the actual input and the actual output, valued at the **standard cost** per unit of output

Example

Std input to produce 1 unit of X:

A	20 kgs × $10	$200
B	30 kgs × $5	$150
	50 kgs	$350

In May, 13 units of X were produced from 250 kgs of A and 350 kgs of B.

Materials yield variance for individual materials

- Arises because there is a difference between what the inputs should have been for the output achieved and the actual inputs
- Calculated as the differences between std inputs for actual output and std mix of actual total input, valued at std costs

(250 + 350)kgs should have yielded (÷ 50kgs)	12X
but did yield	13X
Yield variance in units	1X (F)
× standard cost per unit of output	× $350
Yield variance in $	$350 (F)

	A	B
Std usage for actual output	260 kgs	390 kgs
Actual usage in std mix	240 kgs	360 kgs
Yield variance in kgs	20 kgs(F)	30 kgs(F)
× std cost per kg	× $10	× $5
Yield variance in $	$200 (F)	$150 (F)

If a company sells more than one product, it is possible to analyse the overall **sales volume variance** into a sales mix variance and a sales quantity variance.

Sales mix variance

- Occurs when the proportions of the various products sold are different from those in the budget.

	Units
Actual sales (standard mix)	X
Standard sales (standard mix)	X
Difference	X
Difference × standard profit	$X (A)/(F)

Sales quantity variance

- Shows the difference in contribution / profit because of a change in sales volume from the budgeted volume of sales.

	Units
'Should' mix (actual quantity, standard mix)	X
'Did'mix (actual quantity, actual mix)	X
Difference	X
Difference × standard margin	$X (A)/(F)

Notes

13: Behavioural aspects of standard costing

Topic List

Planning and operational variances

Behavioural aspects

Standard costs and variances affect staff motivation and action. Motivation will be improved if staff are only held responsible for controllable variances.

Planning variances

Arise because of inaccurate planning/faulty standards and so not controllable by operational managers but by senior management

Calculated by comparing an original standard with a revised standard

Operational variances

Caused by adverse/favourable operational performance

Calculated by comparing actual results with a realistic, revised standard/budget

Disadvantages

- ☒ Difficulty in determining realistic standards
- ☒ Danger of managers attempting to explain all variances as planning errors
- ☒ Time-consuming preparation
- ☒ Do not provide an overall picture of the total variance

Advantages

- ☑ Highlight controllable and uncontrollable variances
- ☑ Increase both managers' acceptance of the use of variances for performance measurement and managers' motivation
- ☑ Improve planning and standard-setting processes as standards are more accurate, relevant and appropriate
- ☑ Operational variances provide a fairer reflection of actual performance

Revised budget

A **revised budget** can be calculated using revised standards so that only **operational variances** are highlighted when actual results are compared to the revised budget.

Total planning and operational variances

Example

The standard material cost of a product is $3 (3 kgs × $1). Actual material costs were $250,000 when 70,000 units were made and 200,000 kgs of material were used. With the benefit of hindsight, management realises that a more realistic standard material cost for current conditions would be $4.20 (3.5 kgs × $1.20).

	$	
Revised standard cost (70,000 × $4.20)	294,000	
Original standard cost (70,000 × $3)	210,000	
Total planning variance	84,000	(A)

	$	
70,000 units should have cost (using revised std of $4.20)	294,000	
but did cost	250,000	
Total operational variance	44,000	(F)

Total quality management (TQM)

is the process of applying a zero defects philosophy.

- Emphasis on **quality** not quantity contrasts with standard costing.
- Requires continual improvement which alters methods of working etc.
- Conflict with attainable standards, waste must be eliminated.
- **All** personnel responsible for quality rather than individual managers responsible for variances.
- Efficiency variances may focus attention on the wrong problems.

Problems with standard costing

- Concentrates on a narrow range of costs
- Too much emphasis on direct labour costs and other short-term variable costs
- Relies on repetitive operation and homogenous output
- Business environment is increasingly dynamic and unstable
- Information produced is not sufficient timely

Why is it still used?

- Organisations still need to plan and quantify budgets
- Cost and mix changes from plan still relevant
- Use standards as a starting point in cost construction for a new product
- Used for product pricing
- Trends can be monitored over time
- Accounting valuations

14: Performance measurement

Topic List

Performance measurement

Balanced scorecard

Building Block model

Performance measurement aims to establish how well something or someone is doing in relation to a planned activity. It is a vital part of the control process and can be done using financial and non-financial performance indicators. Remember that different performance measures are appropriate for different organisations.

Performance indicators

FINANCIAL (FPIs)

Profitability

- Profit margin
- ROCE
- Asset turnover

Liquidity

- Current ratio
- Quick ratio
- Accounts receivable days
- Inventory days
- Accounts payable days

Risk

- Gearing
- Interest cover

Non-financial (NFPIs)

- Look at a wider range of variables
- Provide information on quality and customer satisfaction
- Better indicator of future prospects
- Can be provided quickly and tailored to circumstances

Factors to consider

- Cost versus benefit
- Performance must be measured in relation to something
- Must be relevant and fair
- Need responses
- Must be monitored on a regular basis
- Use a variety of measures

Short-termism

is where there is a bias towards short-term rather than long-term performance.

Examples

- Protecting short-term cash flow and profit by abandoning capital expenditure
- Saving costs by cutting R&D
- Reducing quality control, customer service or training to cut costs

Methods to encourage a long term view

- Make short-term targets realistic
- Provide sufficient management information
- Link managers' rewards to share price
- Set quality based and multiple targets

Managers are required to focus on **four** different perspectives and use financial and non-financial indicators.

Perspective	**Question**	**Explanation**
Customer	What do existing and new customers value from us?	Gives rise to targets that matter to customers: cost, quality, delivery, inspection, handling and so on.
Internal	What processes must we excel at to achieve our financial and customer objectives?	Aims to improve internal processes and decision making.
Innovation and learning	Can we continue to improve and create future value?	Considers the business's capacity to maintain its competitive position through the acquisition of new skills and the development of new products.
Financial	How do we create value for our shareholders?	Covers traditional measures such as growth, profitability and shareholder value but set through talking to the shareholder or shareholders direct.

The Building Block model attempts to overcome the problems associated with performance measurement of service businesses.

Building Blocks

Service characteristics

- Intangibility
- Inseparability
- Perishability
- Variability
- No transfer of ownership

Standards

- Participation ensures ownership
- Achievable
- Equity applies

Rewards

- Clearly understood
- Motivate individuals
- Managers can control their areas of responsibility

Dimensions

- Competitive performance
- Financial performance
- Quality of service
- Flexibility
- Resource utilisation
- Innovation

Notes

15: Divisional performance measures

Topic List

Divisionalisation

Performance measures

Transfer pricing

When organisations have a divisional structure, divisional performance measures will be required and transfer pricing may be used.

There are two common ways of structuring organisations.
- Functionally
- Divisionally

In general, a divisional structure will lead to decentralisation of the decision-making process.

Advantages of divisionalisation

- ☑ It can improve the decision-making process in two ways
  - Quality
  - Speed
- ☑ The authority to act to improve performance should motivate divisional managers
- ☑ Top management are freed from detailed involvement in day-to-day operations and can devote more time to strategic planning
- ☑ Divisions provide valuable training grounds for future members of top management

Disadvantages of divisionalisation

- ☒ **Dysfunctional decision making** (a balance has to be kept between decentralisation of authority to provide incentives and motivation, and retaining centralised authority to ensure **goal congruence**)
- ☒ Increase in costs of activities common to all divisions
- ☒ Loss of control by top management

Responsibility accounting

is where authority is decentralised

TYPES OF RESPONSIBILITY CENTRE	**Cost centre**	**Profit centre**	**Investment centre**
PRINCIPAL PERFORMANCE MEASURES	■ Variance analysis ■ Efficiency measures	■ Profitability	■ Return on investment ■ Residual income

$$\text{Return on investment (ROI)} = \frac{\text{Profit before interest}}{\text{Capital employed}} \times 100\%$$

Residual income = Profit – notional interest cost

RI and ROI

- RI will increase when investments earning above the cost of capital are undertaken
- Under ROI a marginally profitable investment is less likely to be undertaken
- RI is more flexible as different costs of capital can be used to reflect different risk
- RI does not facilitate comparisons between investment centres
- RI does not relate the size of a centre's income to the size of the investment

Aims

- Promote divisional autonomy
- Equitable divisional performance measurement
- Overall corporate profit maximisation

Transfer price

is the price at which goods and services are transferred from one division to another.

MINIMUM

Marginal cost plus opportunity cost of item transferred

↓

Opportunity cost is the maximum contribution foregone by transferring internally

MAXIMUM

Lowest external market price minus internal cost saving on packaging and delivery

↓

Disadvantages

- ☒ Market price may be temporary
- ☒ Disincentive to use up spare capacity
- ☒ No market price available
- ☒ Imperfect external market

Transfer prices based on cost

If there is **no external market**, the transfer price has to be based on cost.

1. **Standard or actual?** The use of standard costs is fairer because if actual costs are used the transferring division has no incentive to control its costs – it can pass on its inefficiencies to the receiving division.
2. **Variable cost?** The transferring division does not cover its fixed costs (although this problem can be overcome by central decisions or by some form of **dual pricing** or **two-part charging** system).
3. **Full cost?** The transferring division makes no profit.
4. **Full cost plus?** What margin will all parties perceive as fair?

Optimal transfer price

reflects opportunity costs and where there is a perfect external market this will be the market price. If not, the ideal transfer price will be found by negotiation and careful analysis.

16: Further performance management

Topic List

- Not-for-profit organisations
- External considerations
- Behaviour aspects

Not-for-profit organisations and the public sector have non-quantifiable and multiple objectives which causes problems in performance measurement.

Organisations must also consider external influences on performance.

Not-for-profit organisations

have a range of multiple objectives which are difficult to define.

Value for money

- **Efficiency:** Relationship between inputs and outputs (getting out as much as possible for what goes in)
- **Effectiveness:** Relationship between outputs and objectives (getting done what was supposed to be done)
- **Economy:** Obtaining the right quality and quantity of inputs at lowest cost (being frugal)

Problem with performance measurement

- Multiple objectives
- Measuring outputs
- Lack of profit measure
- Nature of service provided
- Financial constraints
- Political, social and legal considerations

Solutions

- Judge performance in terms of inputs
- Use experts' subjective judgement
- Use benchmarking
- Use unit cost quantitative measures

Performance measurement needs to allow for external considerations.

Market conditions

- Economic growth
- Local economic trends
- Inflation
- Interest rates
- Exchange rates
- Government fisal policy
- Government spending

Competitors

- Pricing strategies
- Information on competitors' prices and cost structures
- React quickly to changing market conditions

Management performance measures should only include those items that are directly controllable by the manager.

- Danger people will concentrate only on what is being measured.
- Conflict between individual and corporate goals.
- Difficult to devise performance measures relating specifically to a manager's performance as a manager.
- Reward schemes can encourage dysfunctional behaviour.

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