ACCA GlobalBox .com

F2 - (MA) - Management Accounting - (2020/2021)

BPP - Workbook

(Association of Chartered Certified Accountants)

Credit: *Big Thanks to* ***Ahmed Sultan*** *for Sharing this document with us.*

ACCA

Management Accounting

MA/FMA

Integrated Workbook

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FORMULAE AND TABLES

Regression analysis

$y = a + bx$

$$a = \frac{\sum y}{n} - \frac{b\sum x}{n}$$

$$b = \frac{n\sum xy - \sum x \sum y}{n\sum x^2 - (\sum x)^2}$$

$$r = \frac{n\sum xy - \sum x \sum y}{\sqrt{\left(n\sum x^2 - (\sum x)^2\right)\left(n\sum y^2 - (\sum y)^2\right)}}$$

Economic order quantity

$$= \sqrt{\frac{2C_0D}{C_h}}$$

Economic batch quantity

$$= \sqrt{\frac{2C_0D}{C_h\left(1 - \frac{D}{R}\right)}}$$

Arithmetic mean

$$\bar{x} = \frac{\Sigma x}{n} \qquad \bar{x} = \frac{\Sigma fx}{\Sigma f}$$ (frequency distribution)

Standard deviation

$$\sigma = \sqrt{\frac{\Sigma(x - \bar{x})^2}{n}} \qquad \sigma = \sqrt{\frac{\Sigma fx^2}{\Sigma f} - \left(\frac{\Sigma fx}{\Sigma f}\right)^2}$$ (frequency distribution)

Variance

$$= \sigma^2$$

Co-efficient of variation

$$CV = \frac{\sigma}{\bar{x}}$$

Expected value

$EV = \sum px$

Present value table

Present value of 1, i.e. $(1 + r)^{-n}$

Where r = discount rate

n = number of periods until payment

Periods (n)	Discount rate (r) 1%	2%	3%	4%	5%	6%	7%	8%	9%	10%
1	0.990	0.980	0.971	0.962	0.952	0.943	0.935	0.926	0.917	0.909
2	0.980	0.961	0.943	0.925	0.907	0.890	0.873	0.857	0.842	0.826
3	0.971	0.942	0.915	0.889	0.864	0.840	0.816	0.794	0.772	0.751
4	0.961	0.924	0.888	0.855	0.823	0.792	0.763	0.735	0.708	0.683
5	0.951	0.906	0.863	0.822	0.784	0.747	0.713	0.681	0.650	0.621
6	0.942	0.888	0.837	0.790	0.746	0.705	0.666	0.630	0.596	0.564
7	0.933	0.871	0.813	0.760	0.711	0.665	0.623	0.583	0.547	0.513
8	0.923	0.853	0.789	0.731	0.677	0.627	0.582	0.540	0.502	0.467
9	0.914	0.837	0.766	0.703	0.645	0.592	0.544	0.500	0.460	0.424
10	0.905	0.820	0.744	0.676	0.614	0.558	0.508	0.463	0.422	0.386
11	0.896	0.804	0.722	0.650	0.585	0.527	0.475	0.429	0.388	0.350
12	0.887	0.788	0.701	0.625	0.557	0.497	0.444	0.397	0.356	0.319
13	0.879	0.773	0.681	0.601	0.530	0.469	0.415	0.368	0.326	0.290
14	0.870	0.758	0.661	0.577	0.505	0.442	0.388	0.340	0.299	0.263
15	0.861	0.743	0.642	0.555	0.481	0.417	0.362	0.315	0.275	0.239

(n)	11%	12%	13%	14%	15%	16%	17%	18%	19%	20%
1	0.901	0.893	0.885	0.877	0.870	0.862	0.855	0.847	0.840	0.833
2	0.812	0.797	0.783	0.769	0.756	0.743	0.731	0.718	0.706	0.694
3	0.731	0.712	0.693	0.675	0.658	0.641	0.624	0.609	0.593	0.579
4	0.659	0.636	0.613	0.592	0.572	0.552	0.534	0.516	0.499	0.482
5	0.593	0.567	0.543	0.519	0.497	0.476	0.456	0.437	0.419	0.402
6	0.535	0.507	0.480	0.456	0.432	0.410	0.390	0.370	0.352	0.335
7	0.482	0.452	0.425	0.400	0.376	0.354	0.333	0.314	0.296	0.279
8	0.434	0.404	0.376	0.351	0.327	0.305	0.285	0.266	0.249	0.233
9	0.391	0.361	0.333	0.308	0.284	0.263	0.243	0.225	0.209	0.194
10	0.352	0.322	0.295	0.270	0.247	0.227	0.208	0.191	0.176	0.162
11	0.317	0.287	0.261	0.237	0.215	0.195	0.178	0.162	0.148	0.135
12	0.286	0.257	0.231	0.208	0.187	0.168	0.152	0.137	0.124	0.112
13	0.258	0.229	0.204	0.182	0.163	0.145	0.130	0.116	0.104	0.093
14	0.232	0.205	0.181	0.160	0.141	0.125	0.111	0.099	0.088	0.078
15	0.209	0.183	0.160	0.140	0.123	0.108	0.095	0.084	0.074	0.065

Annuity table

Present value of an annuity of 1, i.e. $\frac{1-(1+r)^{-n}}{r}$

Where r = discount rate

n = number of periods

Periods (n)	Discount rate (r) 1%	2%	3%	4%	5%	6%	7%	8%	9%	10%
1	0.990	0.980	0.971	0.962	0.952	0.943	0.935	0.926	0.917	0.909
2	1.970	1.942	1.913	1.886	1.859	1.833	1.808	1.783	1.759	1.736
3	2.941	2.884	2.829	2.775	2.723	2.673	2.624	2.577	2.531	2.487
4	3.902	3.808	3.717	3.630	3.546	3.465	3.387	3.312	3.240	3.170
5	4.853	4.713	4.580	4.452	4.329	4.212	4.100	3.993	3.890	3.791
6	5.795	5.601	5.417	5.242	5.076	4.917	4.767	4.623	4.486	4.355
7	6.728	6.472	6.230	6.002	5.786	5.582	5.389	5.206	5.033	4.868
8	7.652	7.325	7.020	6.733	6.463	6.210	5.971	5.747	5.535	5.335
9	8.566	8.162	7.786	7.435	7.108	6.802	6.515	6.247	5.995	5.759
10	9.471	8.983	8.530	8.111	7.722	7.360	7.024	6.710	6.418	6.145
11	10.368	9.787	9.253	8.760	8.306	7.887	7.499	7.139	6.805	8.495
12	11.255	10.575	9.954	9.385	8.863	8.384	7.943	7.536	7.161	6.814
13	12.134	11.348	10.635	9.986	9.394	8.853	8.358	7.904	7.487	7.103
14	13.004	12.106	11.296	10.563	9.899	9.295	8.745	8.244	7.786	7.367
15	13.865	12.849	11.938	11.118	10.380	9.712	9.108	8.559	8.061	7.606

(n)	Discount rate (r) 11%	12%	13%	14%	15%	16%	17%	18%	19%	20%
1	0.901	0.893	0.885	0.877	0.870	0.862	0.855	0.847	0.840	0.833
2	1.713	1.690	1.668	1.647	1.626	1.605	1.585	1.566	1.547	1.528
3	2.444	2.402	2.361	2.322	2.283	2.246	2.210	2.174	2.140	2.106
4	3.102	3.037	2.974	2.914	2.855	2.798	2.743	2.690	2.639	2.589
5	3.696	3.605	3.517	3.433	3.352	3.274	3.199	3.127	3.058	2.991
6	4.231	4.111	3.998	3.889	3.784	3.685	3.589	3.498	3.410	3.326
7	4.712	4.564	4.423	4.288	4.160	4.039	3.922	3.812	3.706	3.605
8	5.146	4.968	4.799	4.639	4.487	4.344	4.207	4.078	3.954	3.837
9	5.537	5.328	5.132	4.946	4.772	4.607	4.451	4.303	4.163	4.031
10	5.889	5.650	5.426	5.216	5.019	4.833	4.659	4.494	4.339	4.192
11	6.207	5.938	5.687	5.453	5.234	5.029	4.836	4.656	4.486	4.327
12	6.492	6.194	5.918	5.660	5.421	5.197	4.968	4.793	4.611	4.439
13	6.750	6.424	6.122	5.842	5.583	5.342	5.118	4.910	4.715	4.533
14	6.982	6.628	6.302	6.002	5.724	5.468	5.229	5.008	4.802	4.611
15	7.191	6.811	6.462	6.142	5.847	5.575	5.324	5.092	4.876	4.675

STANDARD NORMAL DISTRIBUTION TABLE

$$z = \frac{x - \mu}{\sigma}$$

	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.0000	0.0040	0.0080	0.0120	0.0160	0.0199	0.0239	0.0279	0.0319	0.0359
0.1	0.0398	0.0438	0.0478	0.0517	0.0557	0.0596	0.0636	0.0675	0.0714	0.0753
0.2	0.0793	0.0832	0.0871	0.0910	0.0948	0.0987	0.1026	0.1064	0.1103	0.1141
0.3	0.1179	0.1217	0.1255	0.1293	0.1331	0.1368	0.1406	0.1443	0.1480	0.1517
0.4	0.1554	0.1591	0.1628	0.1664	0.1700	0.1736	0.1772	0.1808	0.1844	0.1879
0.5	0.1915	0.1950	0.1985	0.2019	0.2054	0.2088	0.2123	0.2157	0.2190	0.2224
0.6	0.2257	0.2291	0.2324	0.2357	0.2389	0.2422	0.2454	0.2486	0.2517	0.2549
0.7	0.2580	0.2611	0.2642	0.2673	0.2704	0.2734	0.2764	0.2794	0.2823	0.2852
0.8	0.2881	0.2910	0.2939	0.2967	0.2995	0.3023	0.3051	0.3078	0.3106	0.3133
0.9	0.3159	0.3186	0.3212	0.3238	0.3264	0.3289	0.3315	0.3340	0.3365	0.3389
1.0	0.3413	0.3438	0.3461	0.3485	0.3508	0.3531	0.3554	0.3577	0.3599	0.3621
1.1	0.3643	0.3665	0.3686	0.3708	0.3729	0.3749	0.3770	0.3790	0.3810	0.3830
1.2	0.3849	0.3869	0.3888	0.3907	0.3925	0.3944	0.3962	0.3980	0.3997	0.4015
1.3	0.4032	0.4049	0.4066	0.4082	0.4099	0.4115	0.4131	0.4147	0.4162	0.4177
1.4	0.4192	0.4207	0.4222	0.4236	0.4251	0.4265	0.4279	0.4292	0.4306	0.4319
1.5	0.4332	0.4345	0.4357	0.4370	0.4382	0.4394	0.4406	0.4418	0.4429	0.4441
1.6	0.4452	0.4463	0.4474	0.4484	0.4495	0.4505	0.4515	0.4525	0.4535	0.4545
1.7	0.4554	0.4564	0.4573	0.4582	0.4591	0.4599	0.4608	0.4616	0.4625	0.4633
1.8	0.4641	0.4649	0.4656	0.4664	0.4671	0.4678	0.4686	0.4693	0.4699	0.4706
1.9	0.4713	0.4719	0.4726	0.4732	0.4738	0.4744	0.4750	0.4756	0.4761	0.4767
2.0	0.4772	0.4778	0.4783	0.4788	0.4793	0.4798	0.4803	0.4808	0.4812	0.4817
2.1	0.4821	0.4826	0.4830	0.4834	0.4838	0.4842	0.4846	0.4850	0.4854	0.4857
2.2	0.4861	0.4864	0.4868	0.4871	0.4875	0.4878	0.4881	0.4884	0.4887	0.4890
2.3	0.4893	0.4896	0.4898	0.4901	0.4904	0.4906	0.4909	0.4911	0.4913	0.4916
2.4	0.4918	0.4920	0.4922	0.4925	0.4927	0.4929	0.4931	0.4932	0.4934	0.4936
2.5	0.4938	0.4940	0.4941	0.4943	0.4945	0.4946	0.4948	0.4949	0.4951	0.4952
2.6	0.4953	0.4955	0.4956	0.4957	0.4959	0.4960	0.4961	0.4962	0.4963	0.4964
2.7	0.4965	0.4966	0.4967	0.4968	0.4969	0.4970	0.4971	0.4972	0.4973	0.4974
2.8	0.4974	0.4975	0.4976	0.4977	0.4977	0.4978	0.4979	0.4979	0.4980	0.4981
2.9	0.4981	0.4982	0.4982	0.4983	0.4984	0.4984	0.4985	0.4985	0.4986	0.4986
3.0	0.4987	0.4987	0.4987	0.4988	0.4988	0.4989	0.4989	0.4989	0.4990	0.4990

Chapter 1

Accounting for management

Outcome

By the end of this session you should be able to:

- distinguish between data and information
- identify and explain the attributes of good information
- outline the managerial processes of planning, decision making and control
- explain the difference between strategic, tactical and operational planning
- distinguish between cost, profit, investment and revenue centres
- describe the differing needs for information of cost, profit, investment and revenue centre managers.
- describe the purpose and role of cost and management accounting within an organisation
- compare and contrast financial accounting with cost and management accounting
- explain the limitations of management information in providing guidance for management decision-making

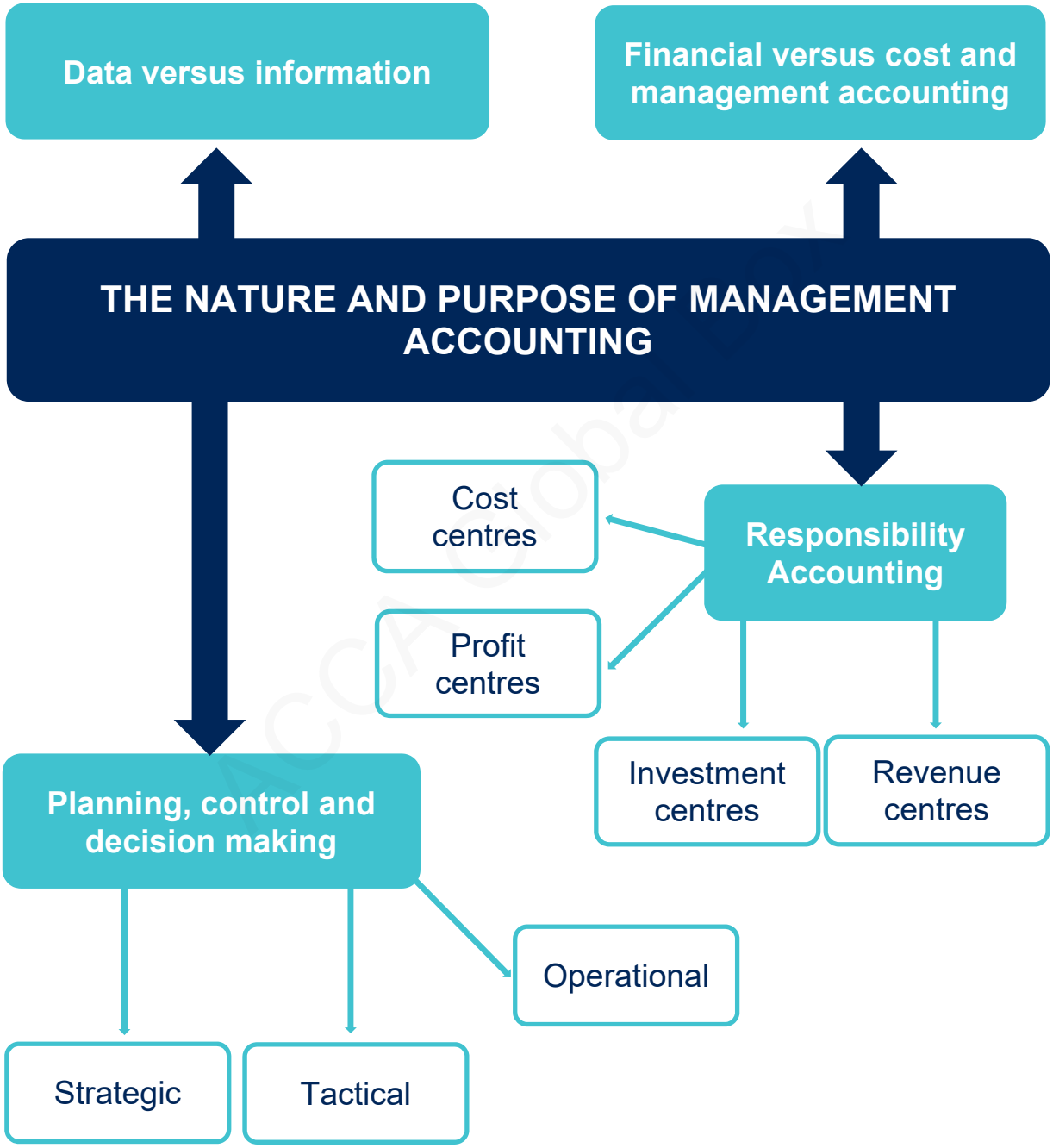
and answer questions relating to these areas.

PER

One of the PER performance objectives (PO1) is to take into account all relevant information and use professional judgement, your personal values and scepticism to evaluate data and make decisions. You should identify right from wrong and escalate anything of concern. You also need to make sure that your skills, knowledge and behaviour are up-to-date and allow you to be effective in you role. Working through this chapter should help you understand how to demonstrate that objective.

The underpinning detail for this Chapter in your Integrated Workbook can be found in Chapter 1 of your Study Text

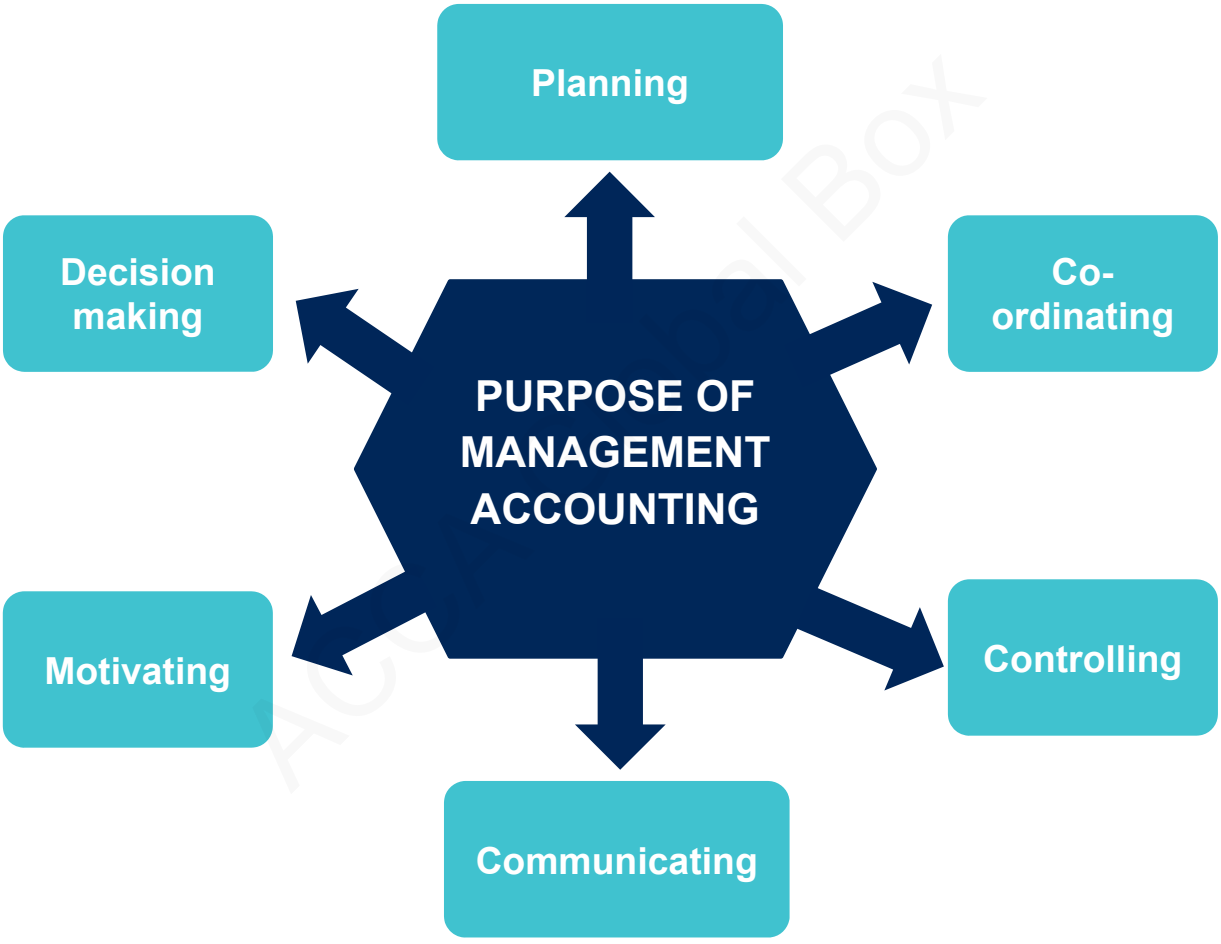
Overview



1 Management accounting

The purpose of management accounting is to provide information for use within an organisation. Internal users, such as the departmental managers, will require a variety of information to ensure the smooth running of their departments.

Management accounting information is produced as often as it is required and can be in any format that is useful to the end user of the information.



Notes

2 The nature of good information

The key to a successful business is good decision-making and the key to good decision-making is good, relevant information.

2.1 Data and information

Thanks to technological advances, the operations of organisations generate a huge quantity of **data**. Data consist of raw facts and statistics before they have been processed. Once data have been processed into a useful form, it can be called **information.**

Illustrations and further practice

Notes

2.2 Attributes of good information

A useful way to remember the characteristics of good information is:

A

C

C

U

R

A

T

E

Test your understanding 1

The management accountant of ABC has produced a monthly report for managers. Some of the managers have complained that the report is unhelpful as it misses out some key figures and that they are not always familiar with the terminology used in the report.

Which of the characteristics of good information are missing in this report?

A Accurate and relevant

B Complete and understandable

C Easy to use and accurate

D Understandable and authoritative

Notes

3 Mission statement

The mission statement is a statement in writing that describes the overall aims of an organisation, that is, what it is trying to accomplish. It sets out the whole purpose of the business

Mission statements will have some or all of the following characteristics:

- Usually a brief statement of no more than a page in length
- Very general statement of entity culture
- States the aims of the organisation
- States the business areas in which the organisation intends to operate
- Open-ended (not in quantifiable terms)
- Does not include commercial terms, such as profit
- Not time-assigned
- Forms a basis of communication to the people inside the organisation and to people outside the organisation
- Used to formulate goal statements, objectives and short term targets
- Guides the direction of the entity's strategy and as such is part of management information.

Notes

4 Planning, decision making and control

4.1 Planning

Planning involves establishing the objectives of an organisation and formulating relevant strategies that can be used to achieve those objectives

Aims and objectives should be:

S

M

A

R

T

Notes

4.2 Levels of planning

Organisations are generally split into three levels: strategic, managerial/tactical and operational/functional.

Managers at different levels make different types of plans:

At **strategic level**, planning:

-
-
-

At **tactical level**, planning:

-
-
-

At **operational level**, planning:

-
-
-

Test your understanding 2

RST operates in the health and fitness industry running a successful chain of fitness centres throughout their home country. A decision has been made to branch out into the fitness clothing industry. A range of clothing will be manufactured for RST which will be sold in their fitness centres.

Select the correct planning level for each scenario

	Strategic	Tactical	Operational
How much inventory of clothing to carry in each fitness centre			
The decision to move into the fitness clothing industry			
The decision on the range of clothing to sell and the pricing of the range			

Notes

4.3 Decision making

Decision making involves considering information that has been provided and making an informed decision. In most situations decision making involves making a choice between two or more alternatives

4.4 Control

Information relating to the actual results of an organisation helps managers to assess performance and re-assess and amend budgets or plans.

Illustrations and further practice

Notes

5 Responsibility accounting

Responsibility accounting is based on identifying individual parts of a business which are the responsibility of a single manager.

A **cost centre** is a production or service location, function, activity or item of equipment for which costs are accumulated.

A **revenue centre** is a responsibility centre that is devoted to raising revenue (or generating sales) without any link to the associated costs. Revenue centres might be encountered in the not-for-profit sector or in the marketing operation of a commercial organisation.

If a manager is responsible for revenue as well as costs, the responsibility centre is a **profit centre**, and the manager responsible is held accountable for the profitability of the operations in his or her charge.

If a manager is responsible for investment decisions as well as for revenue and costs, the responsibility centre is an **investment centre**, and the manager responsible is held accountable not only for profits, but also for the return on investment from the operations in his or her charge. There could be several profit centres within an investment centre.

Notes

6 Financial and management accounting

The main role of financial accounting is to produce the statutory financial statements, whereas management accountants provide any information needed by management.

	Financial accounting	Management accounting
Focus		
Law		
Role		
Governance		

Cost accounting is a system for recording data and producing information about costs for the products produced by an organisation and/or the services it provides. It is also used to establish costs for particular activities or responsibility centres.

Notes

Test your understanding 3

Decide whether the following statements are true or false.

	True	False
Management accounting information is internally focused		
Financial accounting is concerned with the production of statutory accounts		
Management accounting information is used for internal decision making		
Management accounting information is used by company shareholder		

Illustrations and further practice

Notes

Further practice

Exam kit questions

Test your understanding answers

Test your understanding 1

B

Complete means that managers should be given all information that they require although this should not be excessive and understandable suggests that jargon and technical language should be limited.

In this case it would appear that managers are not getting all the information they require and that jargon is being used limiting the usefulness of the report.

Test your understanding 2

	Strategic	Tactical	Operational
How much inventory of clothing to carry in each fitness centre			✓
The decision to move into the fitness clothing industry	✓		
The decision on the range of clothing to sell and the pricing of the range		✓	

Decisions on what industry to operate in would normally be made at the strategic level. Decisions on how to compete within that industry would normally be made at the tactical level and day-to-day decisions would normally be made at the operational level.

Test your understanding 3

	True	False
Management accounting information is internally focused	✓	
Financial accounting is concerned with the production of statutory accounts	✓	
Management accounting information is used for internal decision making	✓	
Management accounting information is used by company shareholder		✓

Notes

Chapter 2

Sources of data and analysing data

Outcome

By the end of this session you should be able to:

- describe sources of information from within and outside the organisation (including government statistics, financial press, professional or trade associations, quotations and price list)
- explain the uses and limitations of published information/data (including information from the internet)
- describe the impact of general economic environment on costs/revenue
- describe the main uses of big data and analytics for organisations
- explain sampling techniques (random, systematic, stratified, multistage, cluster and quota)
- choose an appropriate sampling method in a specific situation
- calculate the mean, mode, and median for grouped and ungrouped data
- calculate measures of dispersion including the variance, standard deviation and coefficient of variation both grouped and ungrouped data
- calculate expected values for use in decision-making
- explain the properties of a normal distribution
- interpret normal distribution graphs and tables

and answer questions relating to these areas.

Chapter 2

PER

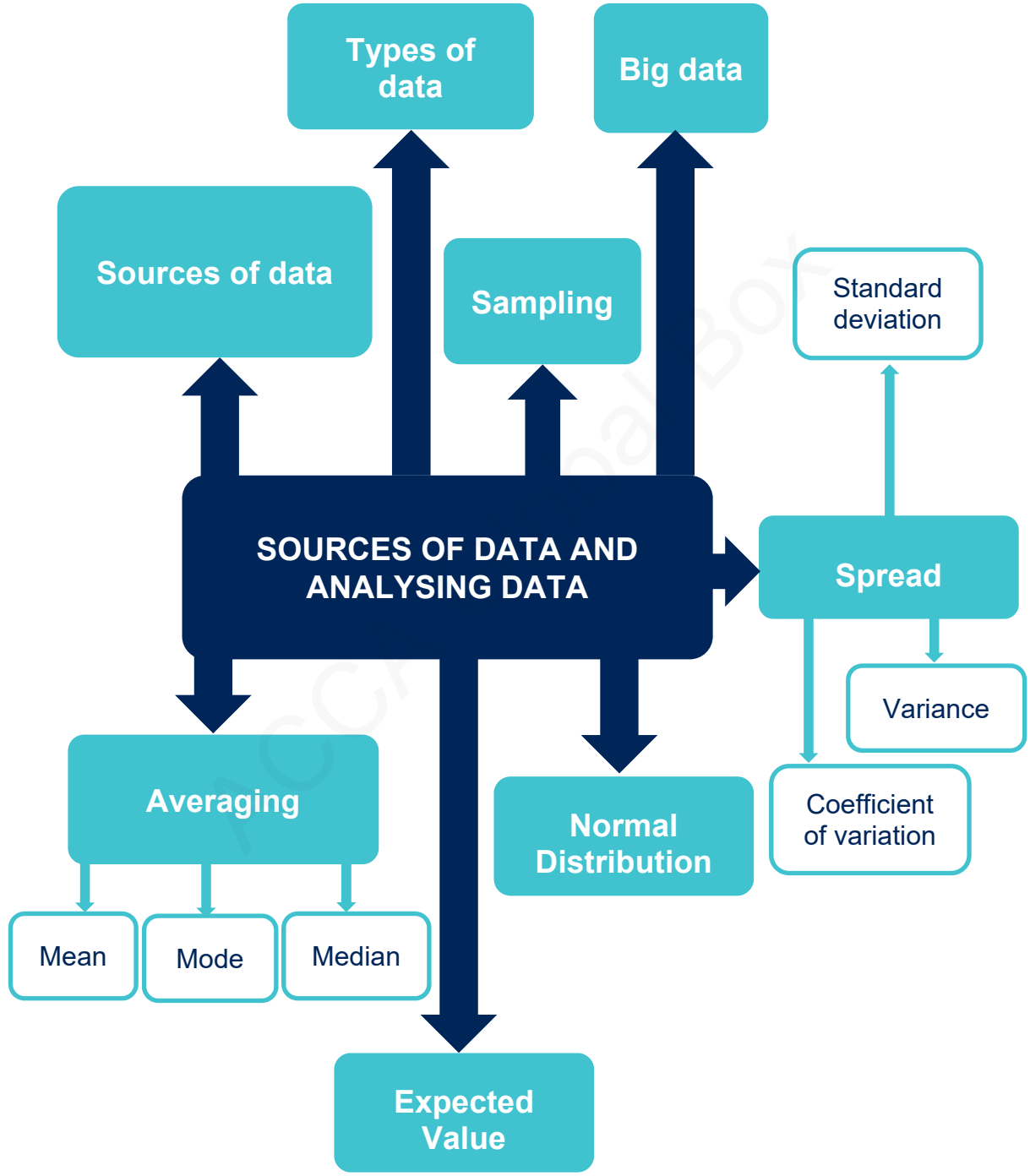
One of the PER performance objectives (PO1) is to take into account all relevant information and use professional judgement, your personal values and scepticism to evaluate data and make decisions. You should identify right from wrong and escalate anything of concern. You also need to make sure that your skills, knowledge and behaviour are up-to-date and allow you to be effective in you role. Working through this chapter should help you understand how to demonstrate that objective.

PER

One of the PER performance objectives (PO12) is to apply different management accounting techniques is different business contexts to effectively manage and use resources. Working through this chapter should help you understand how to demonstrate that objective.

The underpinning detail for this Chapter in your Integrated Workbook can be found in Chapter 2 of your Study Text

Overview



1 Types of data

Primary data is obtained directly from first-hand sources by means of surveys, observation or experimentation. Primary data is any data which is used solely for the purpose for which it was originally collected.

Secondary data is data that has been collected or researched recently. The data collected is useful as it allows the researcher to see the other opinions on their area of study

An important distinction is made here since information collected for one purpose by a business and then, at a later date, used again for another purpose would no longer be primary data.

Discrete data is non-continuous data. Discrete data can only take certain values for example the number of students taking a course (there wouldn't be half a student). Discrete data is counted.

Continuous data is unbroken data that has no gaps. Continuous data can take on any value (within a range) for example time or distance. Continuous data is measured.

Test your understanding 1

Primary data is data which has been expressly collected for a particular enquiry, for example, by observation or intervals.

True or false?

Notes

Test your understanding 2

Secondary data is:

A data that does not provide any information

B data collected for another purpose

C data collected specifically for the purpose of the survey being undertaken

D data collected by post or telephone, not by personal interview

Notes

2 Sources of data

2.1 Sources of data

When preparing for a budgeting exercise, management accountants must identify internal and external sources of information. It is important to understand the impact of the external environment on costs, prices, demand, availability of resources and availability and cost of finance.

The external environment has a direct impact on sales demand, prices, availability of resources and costs. Some costs, including taxes, are not within the organisation control. Even material and labour costs are subject to economic pressures that may not be quantifiable when budgets are constructed.

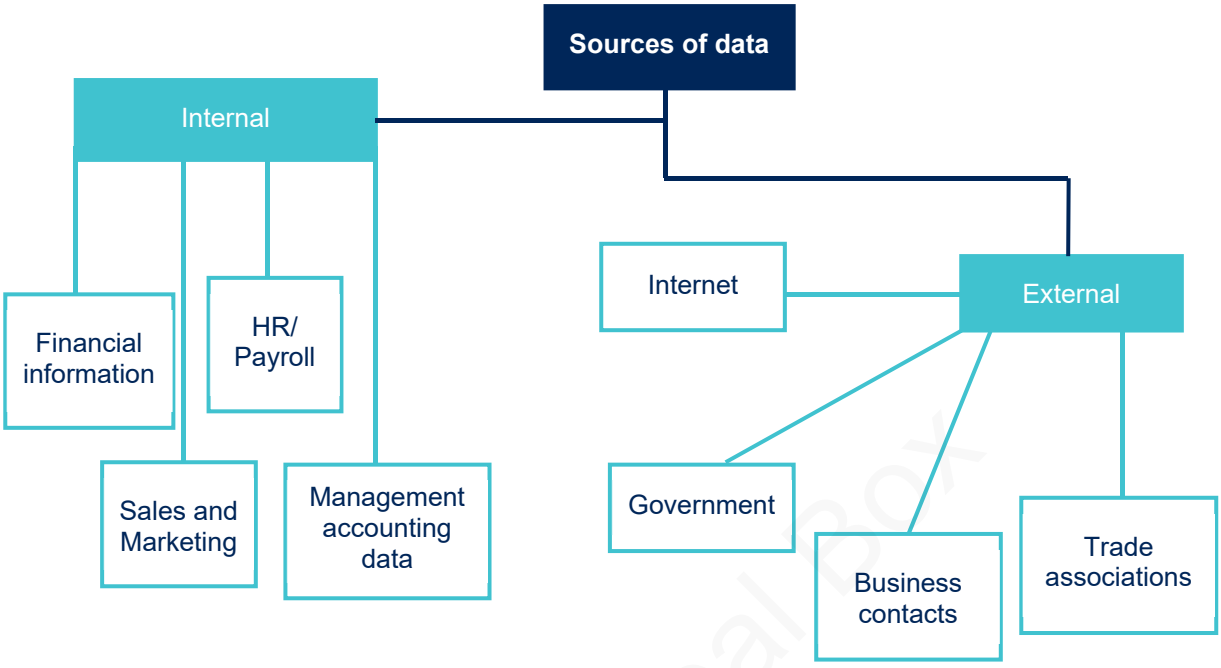
Management must monitor a wide range of external sources of information so that their decisions on managing costs and setting prices fit in with the prevailing environment.

Information may be **quantitative** or **qualitative** and financial or non-financial. It is mainly needed:

-
-
-

Notes

Sources of information can be split into INTERNAL and EXTERNAL sources:



Notes

2.2 Internal sources of information

You must be able to demonstrate that you know which internal source, or which member of the organisation to go to for any specified data.

Examples of internal sources of information are:

-
-
-
-
-
-
-
-

Notes

2.3 External sources of information

Examples of external sources of information are:

-
-
-
-
-
-
-
-
-
-
-
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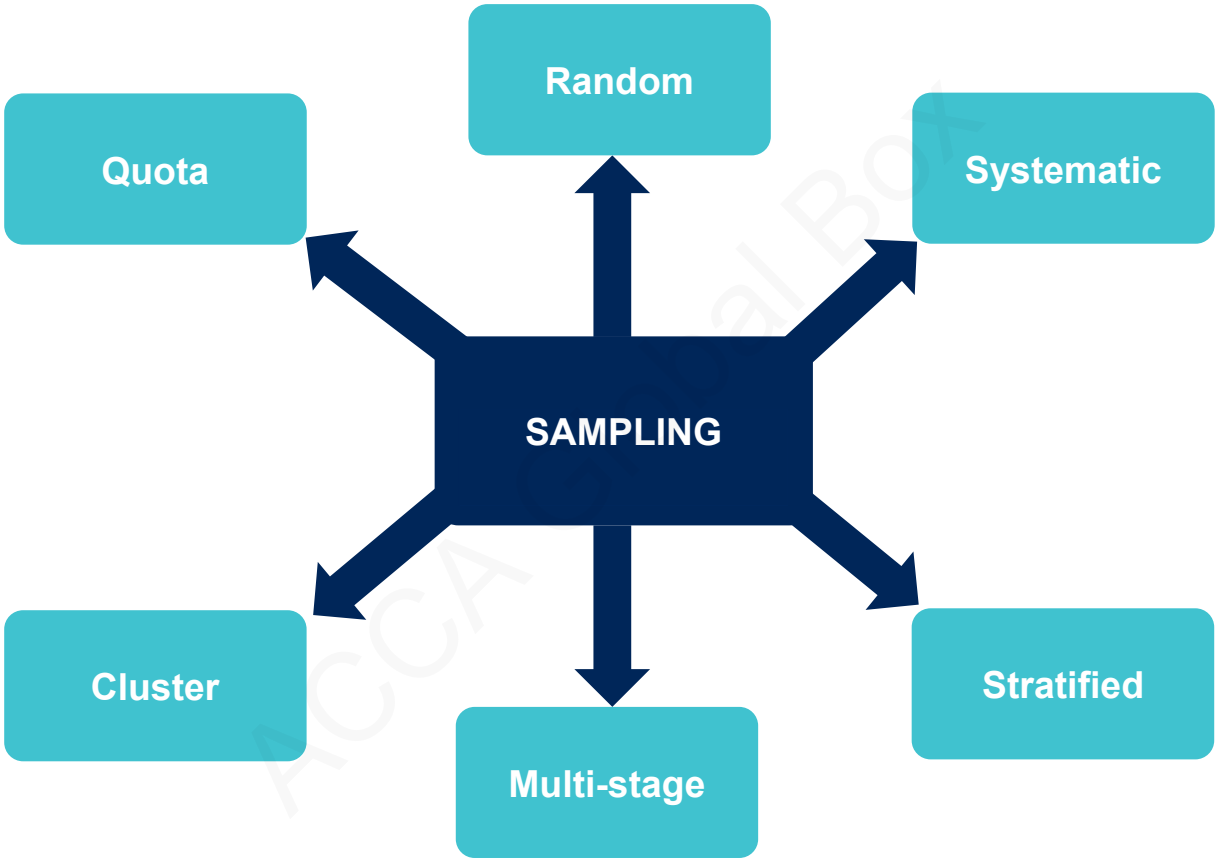
-
-
-
-
-

Notes

3 Sampling

3.1 Sampling methods

Sampling is appropriate when we can select units (e.g. people, organisations) from a population of interest; so that by studying the sample, we may fairly generalise our results back to the whole population.



A simple **random sample** is defined as a sample taken in such a way that every member of the population has an equal chance of being selected.

Systematic sampling is a technique for creating a random sample in which each piece of data is chosen at a fixed interval for inclusion in the sample

A **stratified sample** is made up of different 'layers' or ‘groups’ of the population. The sample size for each layer is proportional to the size of the 'layer' and is known as sampling with probability proportional to size (pps).

Multistage sampling is often applied if the population is particularly large, for example in selecting a sample for a national opinion poll of the type carried out prior to a general election. It involves a number of steps dividing the population into smaller sub populations until a suitable sample size is reached.

Cluster sampling is similar to the multistage sampling but the final step is to sample all the items as a 'cluster'.

With **quota sampling** the interviewer will be given a list comprising the different types of people to be questioned and the number or quota of each type

Test your understanding 3

The essence of systematic sampling is that:

A each element of the population has an equal chance of being chosen

B members of various strata are selected by the interviewers up to predetermined limits

C every nth member of the population is selected

D every element of one definable sub-section of the population is selected.

Notes

Test your understanding 4

An accountant has to check a sample of invoices. The invoices are divided into three groups, by value as follows: 'under $100, $100 – $500, and over $500. Samples are then selected randomly from each group.

Which one of the following sampling methods is involved?

A Cluster

B Multi-stage

C Quota

D Stratified

Illustrations and further practice

Notes

4 Big Data

4.1 What is Big Data?

Big Data is a term for extremely large collections of data that may be analysed to reveal patterns, trends and associations.

- The ability to harness these vast amounts of information could transform an organisation's performance management.
- However, many conventional methods of storing and processing data will not work.

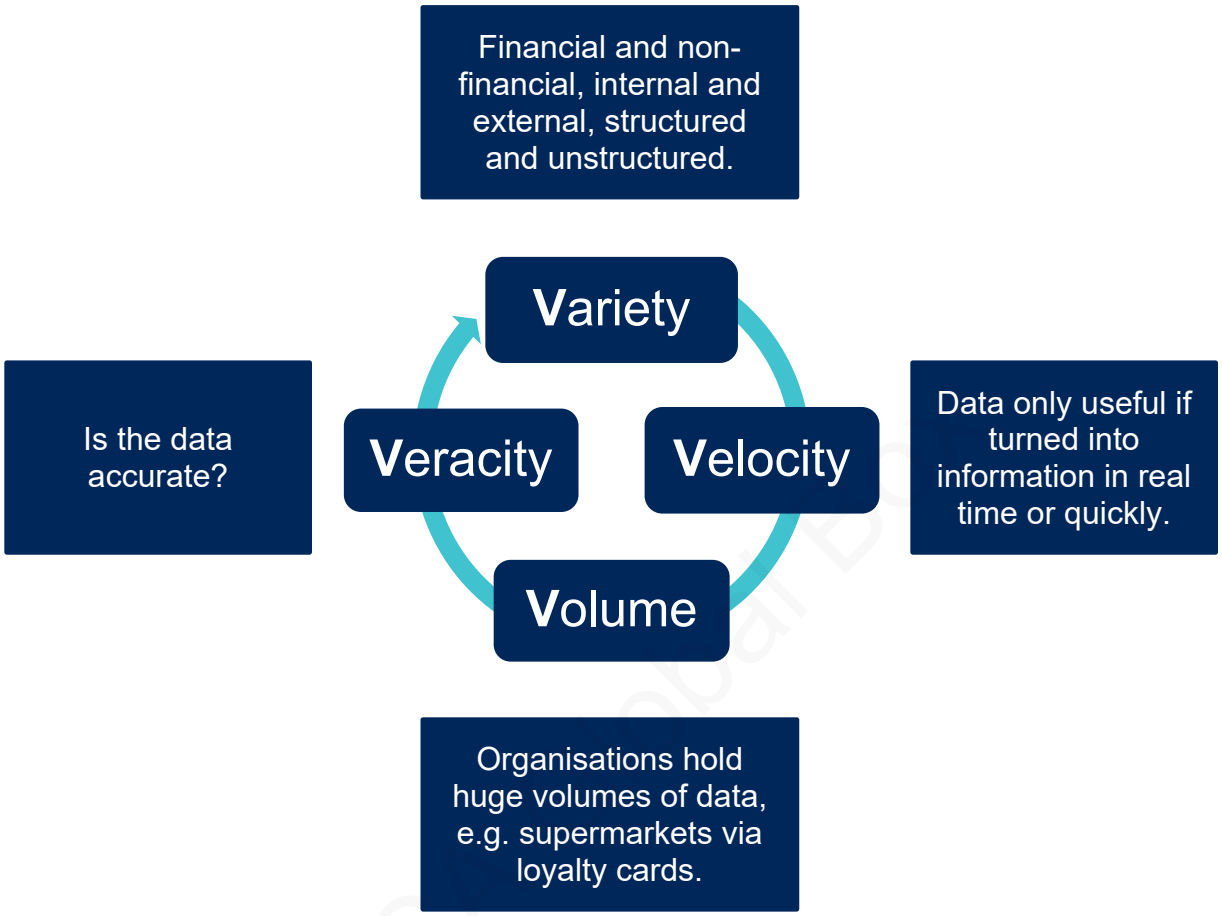
4.2 Processing Big Data

- The processing of Big Data is known as **Big Data analytics**. For example:

Illustrations and further practice

Notes

4.3 Characteristics of Big Data



Notes

4.4 Big Data and performance management

Big Data is relevant to performance management in a number of ways, such as:

- it can help the organisation to **understand its customers' needs and preferences**
- it can **improve forecasting** so that more appropriate decisions can be made
- it can help the organisation to **automate business processes**
- it can help to provide more **detailed, relevant and up to date performance measurement.**

Notes

4.5 How is Big Data used?

Customer facing organisations monitor social media to understand customers' behaviour and preferences and to gauge responses to promotions and advertising campaigns.

Sports teams use data from past fixtures to track tactics, player formations and injuries and to inform future strategies.

Manufacturing companies monitor data from equipment to determine usage and wear, allowing them to predict optimal replacement cycles.

Financial services organisations use data on customer activity to carefully segment their customer base and therefore accurately target individuals with relevant offers.

Politicians use social media to determine where they have to campaign the hardest to win the next election.

Notes

4.6 Risks associated with Big Data

- **Skills** to use Big Data systems not always available.
- **Security** of data.
- **Time** spent measuring relationships that have no organisational value.
- Poor **veracity** leading to incorrect conclusions.
- **Cost** of establishing hardware and analytics software.
- Technical difficulties **integrating** Big Data systems with current systems.

Notes

5 Averaging data

5.1 Mean

Most people would understand an 'average' to be the value obtained by dividing the sum of the values in question by the number of values.

The formula for the mean can be given as:

$$\bar{x} = \frac{\sum x}{n}$$

$\sum x$ is the sum of the values of the variable x and n is the number of values of x.

This measure is the arithmetic mean, or, where there is no possibility of confusion, simply the mean.

This formula is very easy to apply it will, however, need some modification before it can be used to determine the mean from groups of data or a frequency distribution:

$$\bar{x} = \frac{\sum fx}{\sum f}$$

$\sum x$ is the sum of the values of the variable x, f is the number of frequency of x.

Note: The mean is denoted as $\bar{x}$, or the mathematical symbol μ.

Test your understanding 5

Consider the following data:

7 6 8 9 5 6 7 12 9 4 5 6

Calculate the mean value of the ungrouped data.

Consider the following data and using the table and formula calculate the mean value of the grouped data:

No of car drivers (x)	No. of accidents in a month (f)	fx
2	6	
3	5	
4	7	
5	2	
6	4	
7	3	
8	1	
	∑f =	∑fx =

Illustrations and further practice

Notes

5.2 Median

The median is defined as the middle of a set of values, when arranged in ascending (or descending) order. This overcomes the above problem of **skewed distributions** which can have unrepresentative mean values. The median will have half the distribution above it, and half below.

The median is also unaffected by any particularly large or unusual individual measurements whereas the mean would be.

In the case of an odd number of values, the determination of the median is even easier, as there is a clear single middle item in an odd number of values. In general, if there are n observations, the position of the median is given by (n + 1) ÷ 2.

Test your understanding 6

Consider the following data:

7 6 8 9 5 6 7 12 9 4 5 6

Calculate the median value of the data provided.

Illustrations and further practice

Notes

5.3 Mode

The mode or modal value of a data set is that value that occurs most often, and it is the remaining most widely used average. The determination of this value, when you have raw data to deal with, consists simply of a counting process to find the most frequently occurring value.

Test your understanding 7

Consider the following data:

7 6 8 9 5 6 7 12 9 4 5 6

Calculate the mode of the data provided.

Illustrations and further practice

Notes

6 Measures of spread

Having obtained an average value to represent a set of data, it is natural to question the extent to which the single value is representative of the whole set. To do this we have to consider how 'spread out' the individual values are around the average.

6.1 Standard deviation and variance

The standard deviation is a way of measuring how far away on average the data points are from the mean. In other words, they measure average variability about the mean. As such standard deviation is often used with the mean when describing a data set.

For example, suppose a data set has just two observations: 10 and 30. The mean here is 20 and the standard deviation will be 10 as both observations are 10 units away from the mean.

Calculating the standard deviation involves the following steps:

1 Look at the difference between each data value and the mean

2 To get rid of the problem of negative differences cancelling out positive ones, square the results

3 Work out the average squared difference (this calculates the **variance**)

4 Take the square root to get the standard deviation

The formula for the standard deviation is:

$$\sigma = \sqrt{\frac{\sum(x - \bar{x})^2}{n}}$$

or when data is grouped

$$\sigma = \sqrt{\frac{\sum fx^2}{\sum f} - \left(\frac{\sum fx}{\sum f}\right)^2}$$

The variance is simply the standard deviation squared

Note: the mathematical symbol used to denote standard deviation is σ.

Test your understanding 8

The following shows the number of orders placed by customers in the last period.

Number of orders	Frequency
1	3
2	5
3	12
4	14
5	6

Calculate the standard deviation.

Illustrations and further practice

Notes

6.2 Coefficient of variation

The coefficient of variation is a statistical measure of the dispersion of data points in a data series around the mean. It is calculated as follows:

$$\text{Coefficient of variation} = \frac{\text{Standard deviation}}{\text{mean}}$$

The coefficient of variation is the ratio of the standard deviation to the mean, and is useful when comparing the degree of variation from one data series to another, even if the means are quite different from each other. Dividing by the mean gives a sense of scale to the standard deviation, so the coefficient of variation is often given as a percentage to aid comparison.

In a financial setting, the coefficient of variation allows you to determine how much risk you are assuming in comparison to the amount of return you can expect from an investment.

The lower the coefficient of variation, the better the risk-return trade-off will be.

Notes

Test your understanding 9

The following shows the number of orders placed by customers in the last period.

Number of orders	Frequency
1	3
2	5
3	12
4	14
5	6

The standard deviation of the above data is 1.11

Calculate the coefficient of variation

Illustrations and further practice

Notes

7 Expected values

7.1 Calculation of expected values

Many business situations require a choice between numerous courses of action. Given that these choices relate to future outcomes, the results will be uncertain. Clearly, the decision-maker's experience and judgement are important in making 'good' choices in such instances.

One technique which can help judge the financial outcomes of various options is **expected value** (EV). An expected value is a **long run average**.

Expected value is calculated as follows:

$$EV = \sum PX$$

Where X is the outcome and P is the probability of the outcome.

Test your understanding 10

A company has recorded the following daily sales over the last 40 days:

Daily sales (units)	Number of days
10	5
20	12
30	15
40	8

- Calculate the probability for each level of daily sales.
- Use this data to determine the expected value of sales.

Illustrations and further practice

Notes

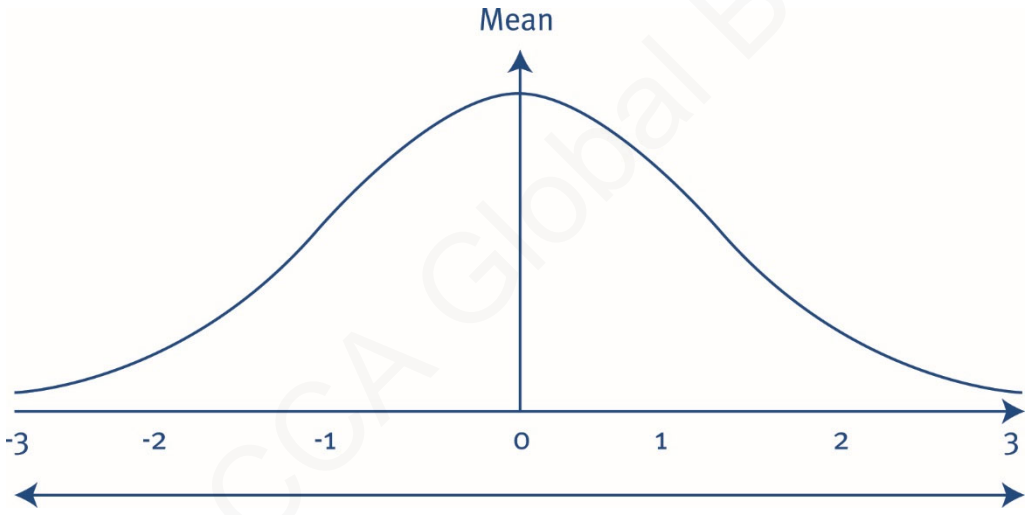
8 Normal distribution

We will now combine what we have learned about probability with what we learned about mean and standard deviation and look at normal distributions. Distribution refers to the way data is spread out.

Mean (μ) and standard deviation (σ) will be used in normal distribution.

8.1 Characteristics of the normal distribution

In the case of normal distribution the data is **symmetrical** and **peaks in the centre**. We can draw a line around this distribution to show the shape. This is called a **bell curve**.



- The mean is shown in the centre of the diagram.
- The curve is symmetrical about the mean. This means that 50% of the values will be below the mean and 50% of the values will be above the mean.
- The mean, median and mode will all be the same for a normal distribution.
- The total area under the curve equals 1.
- The standard deviation shows how far the values spread out from the mean.

If we look at a set of data which fits a normal distribution the majority of values will occur closer to the mean, with fewer and fewer occurring the further from the mean we move.

If we think of a standard normal distribution curve with three standard deviations, the following will be true:

In general 68% of values are within one standard deviation (between –1 and 1), 95% of values are within two standard deviations (between –2 and 2) and 99.7% of values are within three standard deviations (between –3 and 3).

- If we know the mean and the standard deviation for a distribution we can work out the percentage chance (probability) of a certain value occurring.
- As the curve is symmetrical, the values on the positive side will be exactly the same as the values on the negative side.
- The percentage figures can be obtained using normal distribution tables, which are given in your exam, and can be found at the front of the study text.

Notes

8.2 Standard normal distribution

To use the normal distribution we first have to convert our normal distribution to a **standard normal distribution**.

A standard normal distribution has:

- **a mean of 0**
- **a standard deviation of 1**

This special distribution is denoted by z and can be calculated as:

$$z = \frac{x - \mu}{\sigma}$$

Where:

z is the z score

x is the value being considered

μ is the mean

σ is the standard deviation

Test your understanding 11

The returns from a project are normally distributed with a mean of $800,000 and a standard deviation of $400,000. If the project returns less than $500,000, the company will be in financial difficulties. The directors have decided that they will not accept the project if there is more than a 25% chance that the return will be below $500,000

Calculate the z score

Notes

8.3 Normal distribution tables

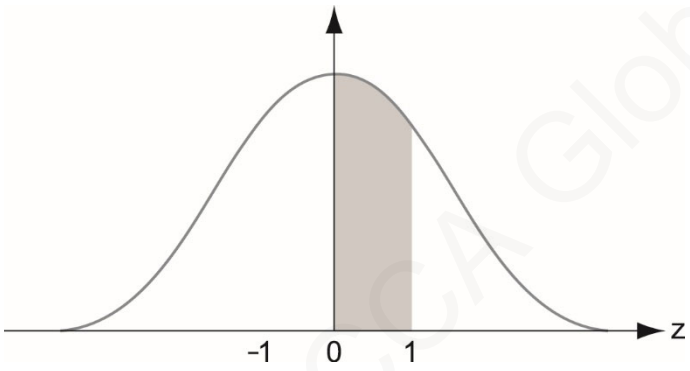
Once we have calculated the 'z score' we can look this up on the normal distribution table to find the area under the curve, which equates to the percentage chance (probability) of that value occurring.

Note: the tables only show the positive values.

So if we have calculated a z score of 1.00. From the table the value is 0.3413.

	0·00	0·01	0·02	0·03
0·8	0·2881	0·2910	0·2939	0·2967
0·9	0·3159	0·3186	0·3212	0·3238
1·0	0·3413	0·3438	0·3461	0·3485
1·1	0·3643	0·3665	0·3686	0·3708

This means that 34.13% is the area shown from 0 – 1 on the diagram.



Notes

Test your understanding 12

The returns from a project are normally distributed with a mean of $800,000 and a standard deviation of $400,000. If the project returns less than $500,000, the company will be in financial difficulties. The director have decided that they will not accept the project if there is more than a 25% chance that the return will be below $500,000

Calculate the probability of the project returns being less than $500,000 (round to 1 decimal place)

Illustrations and further practice

Notes

Further practice

Exam kit questions

Test your understanding answers

Test your understanding 1

True

Test your understanding 2

B

Test your understanding 3

C

Test your understanding 4

D

Accountant first stratifies the invoices according to value and then selects randomly. Sampling method is stratified.

Test your understanding 5

The mean would be (7 + 6 + 8 + 9 + 5 + 6 + 7 + 12 + 9 + 4 + 5 + 6) ÷ 12 = 7

No of car drivers (x)	No. of accidents in a month (f)	fx
2	6	12
3	5	15
4	7	28
5	2	10
6	4	24
7	3	21
8	1	8
	∑f 28 =	∑fx = 118

$$\bar{x} = \frac{118}{28} = 4.2 = 4 \text{ accidents to nearest whole number}$$

Test your understanding 6

If we rearrange our example in ascending order:

4 5 5 6 6 6 7 7 8 9 9 12

What is the middle number of a list of 12? With a little thought, you can see that there are two 'middle' values, the sixth and seventh. The median is thus taken to be the mean of these two values:

(6 + 7) ÷ 2 = 6.5

Test your understanding 7

The most frequently occurring value is 6.

Test your understanding 8

Order (x)	Frequency (f)	fx	fx^2
1	3	3	3
2	5	10	20
3	12	36	108
4	14	56	224
5	6	30	150
	$\sum f = 40$	$\sum fx = 135$	$\sum fx^2 = 505$

$$\sigma = \sqrt{\frac{\sum fx^2}{\sum f} - \left(\frac{\sum fx}{\sum f}\right)^2}$$

$$\sigma = \sqrt{\frac{505}{40} - \left(\frac{135}{40}\right)^2}$$

$$\sigma = 1.11$$

Test your understanding 9

Number of orders (x)	Frequency (f)	fx
1	3	3
2	5	10
3	12	36
4	14	56
5	6	30
∑x = 15	∑f = 40	∑fx = 135

Mean = 135 / 40 = 3.375

Coefficient of variation = 1.11 / 3.375 × 100 = 32.89%

Test your understanding 10

Daily sales (units) (X)		Probability (P)
10	5 ÷ 40 =	0.125
20	12 ÷ 40 =	0.30
30	15 ÷ 40 =	0.375
40	8 ÷ 40 =	0.20
		1.00

Note: always check that the probabilities add up to one.

Expected value = (10 × 0.125) + (20 × 0.3) + (30 × 0.375) + (40 × 0.2) = 26.5

On average daily sales will be 26.5 units.

Test your understanding 11

Z = (500 – 800)/400 = –0.75

Test your understanding 12

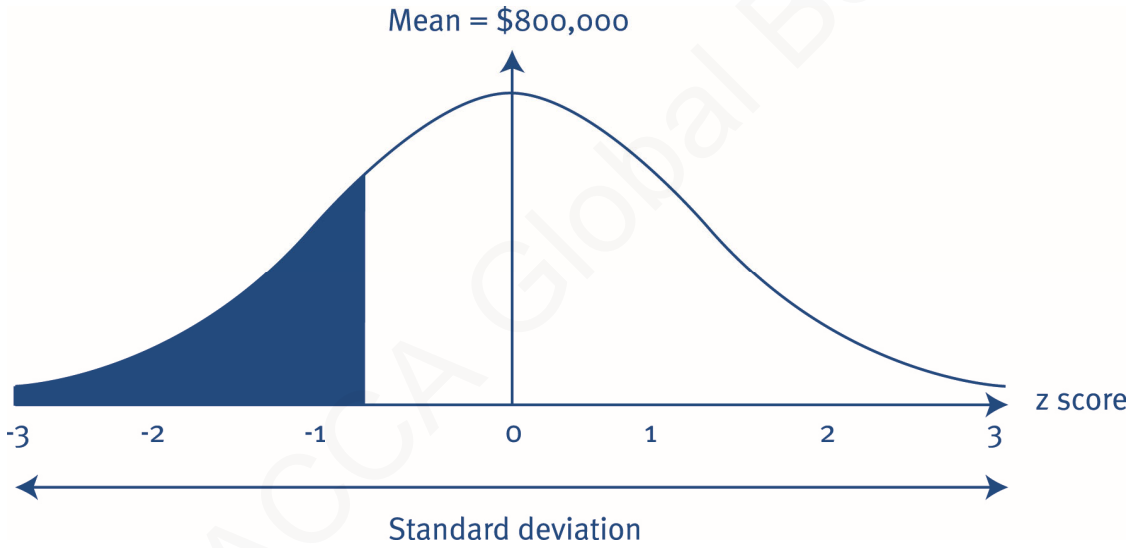
Z = (500 – 800)/400 = –0.75

From the normal distribution tables = 0.2734

Probability of the returns being less than $500,000 = 0.5 – 0.2734 = 0.2266

(The area under the graph = 1 therefore half the area = 0.5)

To 1 decimal place = 22.7%



The area filled in on the graph above shows approximately the 22.7% of the returns being less than $500,000

Chapter 3

Presenting information

Outcome

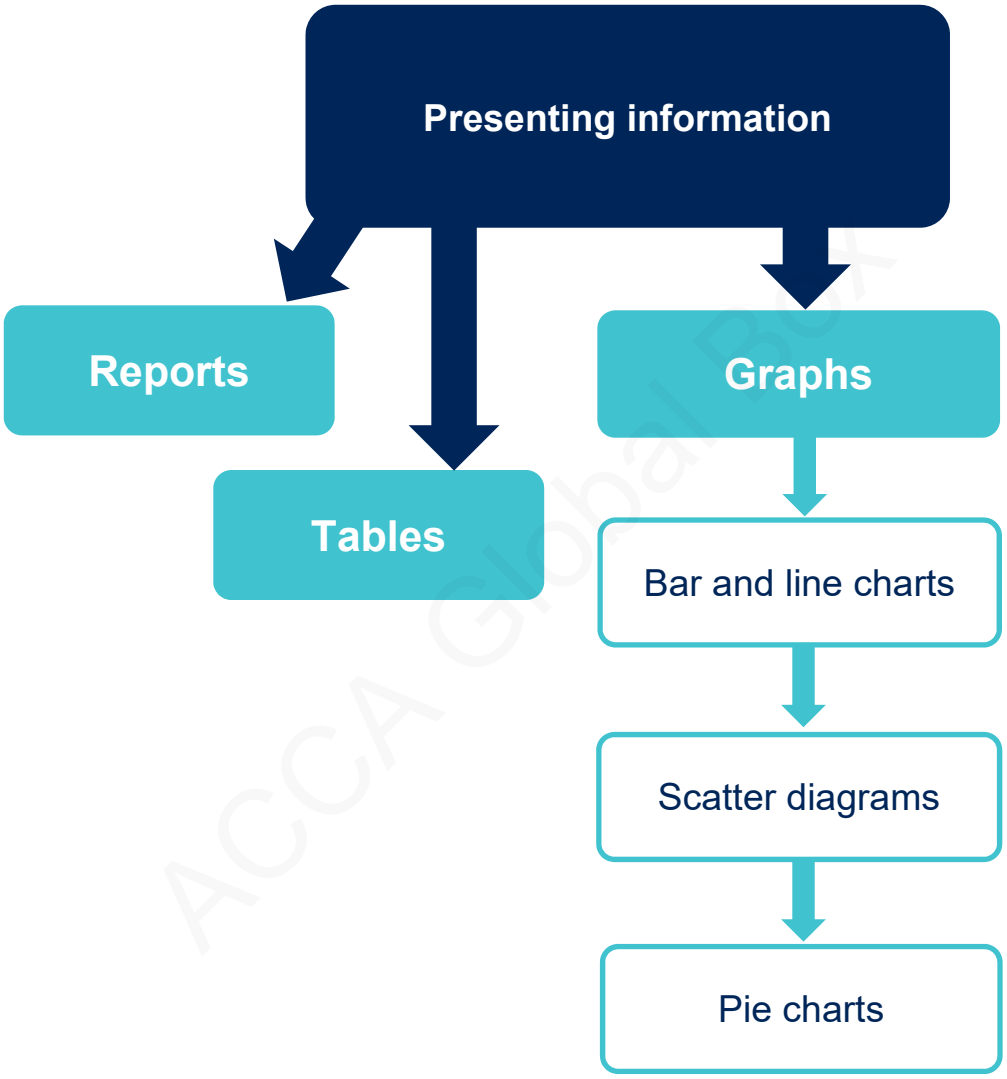
By the end of this session you should be able to:

- prepare written reports representing management information in suitable formats according to purpose
- present information using tables, charts and graphs (bar charts, line graphs, pie charts and scatter graphs)
- Construct scatter diagrams and lines of best fit
- interpret information (including the above tables, charts and graphs) presented in management reports.

and answer questions relating to these areas.

The underpinning detail for this Chapter in your Integrated Workbook can be found in Chapter 3 of your Study Text

Overview



1 Reports

When producing written reports, the management accountant needs to carry out four steps:

- Prepare
- Plan
- Write
- Review

The structure of a report:

- Title
- Introduction
- Analysis
- Conclusion
- Appendices

Notes

2 Tables

The following rules or principles of tabulation should be considered when preparing tables:

- Title: the table must have a clear and self-explanatory title.
- Source: the source of the material used in drawing up the table should be stated (usually by way of a footnote).
- Units: the units of measurement that have been used must be stated e.g. 000s means that the units are in thousands.
- Headings: all column and row headings should be clear and concise.
- Totals: these should be shown where appropriate, and also any subtotals that may be applicable to the calculations.
- Percentages and ratios: these should be shown, if meaningful, with an indication of how they were calculated.

Notes

3 Graphs and Charts

A graph or chart should be clear and unambiguous. In order to help to achieve this aim a number of rules should be followed:

- give each graph or chart a name or a title
- state the source of any data that has been used
- state the units of measurement that have been used
- give a scale so that the graph or chart can be properly interpreted
- ensure that the presentation is neat
- use a key to explain the contents
- if axes are used, they should be properly labelled.

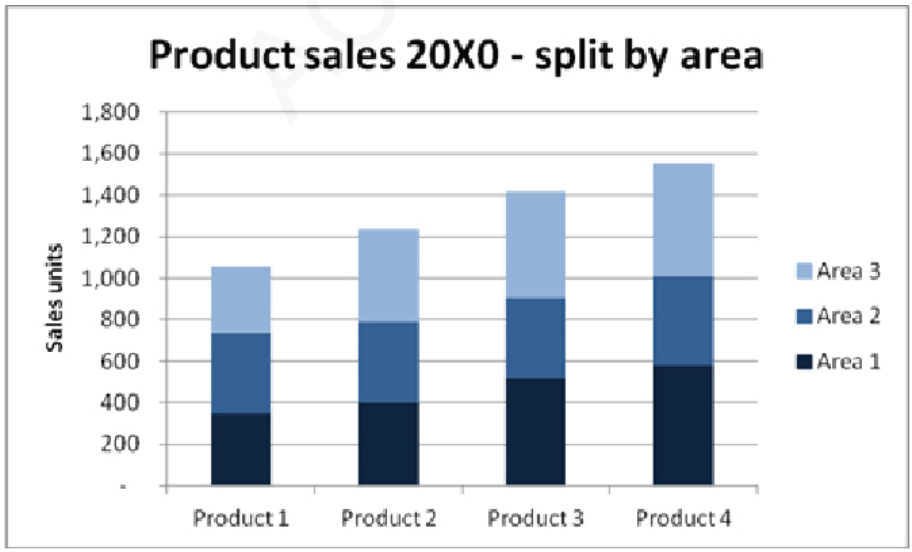
Notes

4 Bar charts

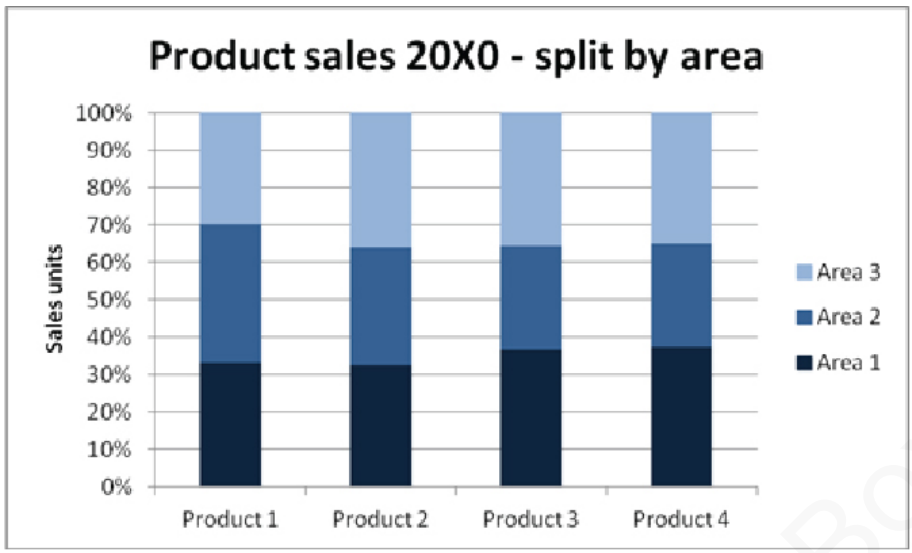
Bar charts are a type of graph that are used to display and compare the number, frequency or other measure, for different discrete categories of data. Bar charts are one of the most commonly used types of graph because they are simple to create and very easy to interpret.

4.1 Simple bar chart

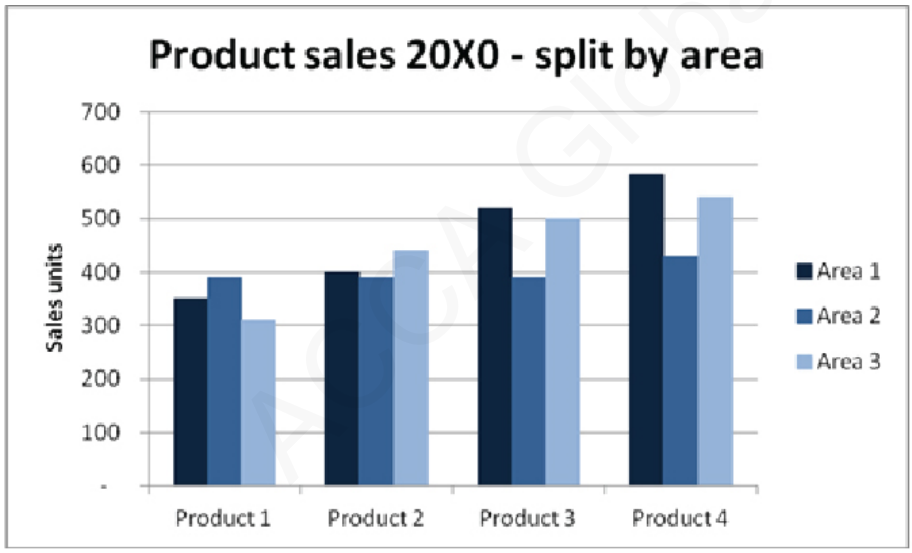
4.2 Component bar chart



4.3 Percentage component bar chart



4.4 Compound (multiple) bar chart

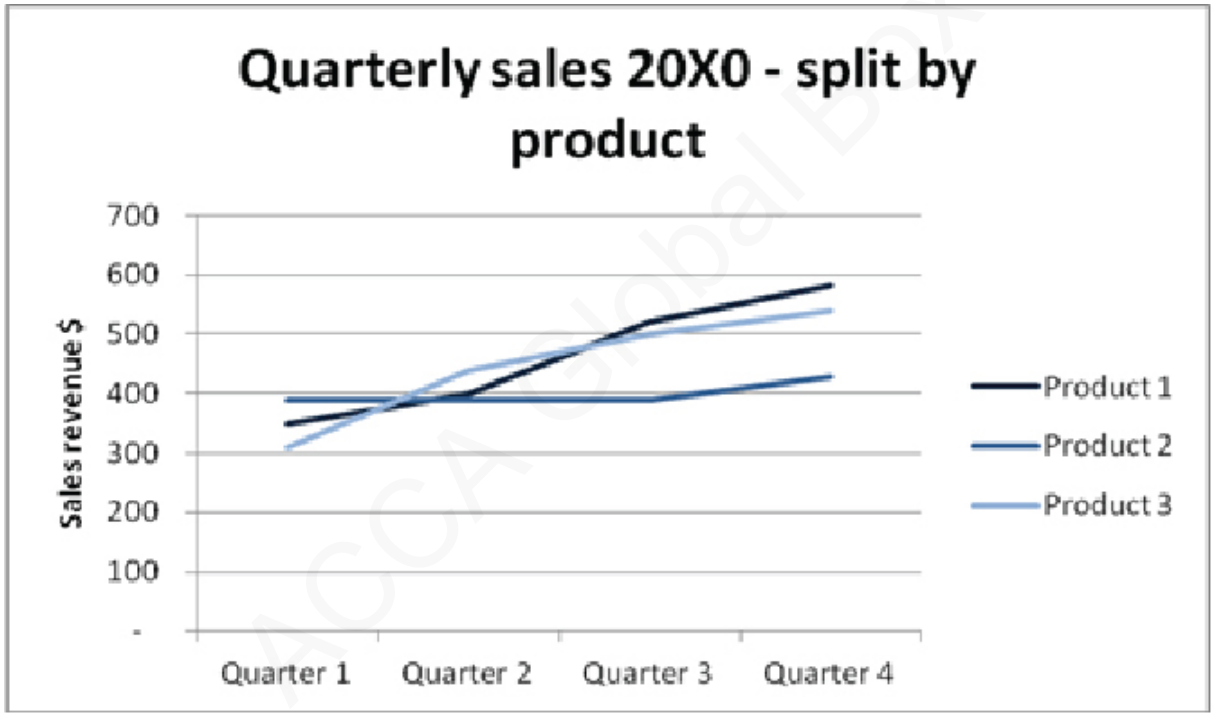


Notes

5 Line graphs

Line graphs are usually used to show time series data, how one or more variables vary over a continuous period of time.

In a line graph the x-axis (independent variable) represents the continuous variable (for example year or distance from the initial measurement) whilst the y-axis (dependent variable) has a scale and indicates the measurement. Several data series can be plotted on the same line chart and this is particularly useful for analysing and comparing the trends in different datasets.

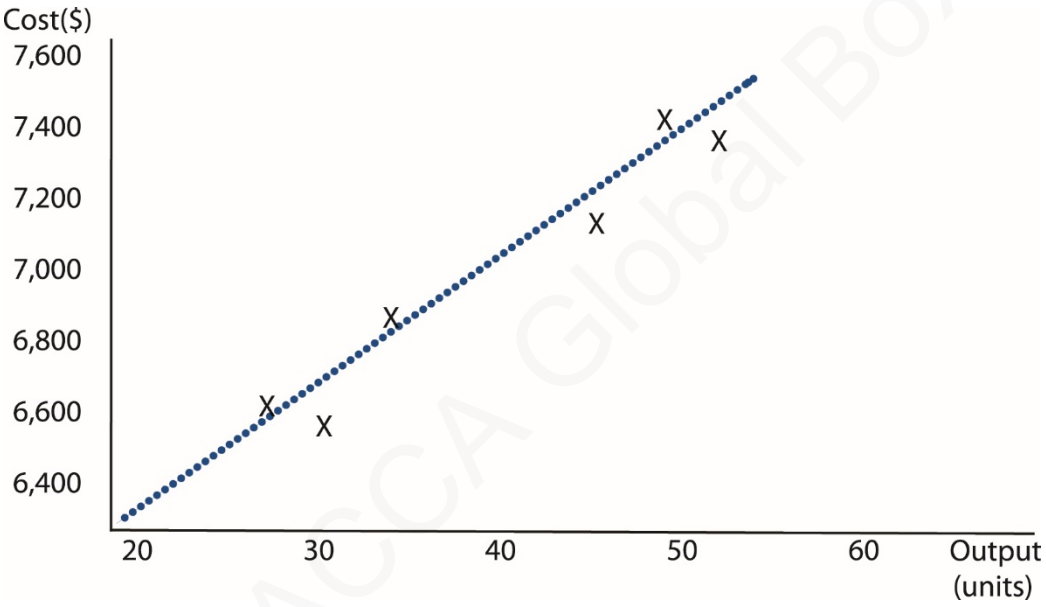


Notes

6 Scatter diagrams

Scatter diagrams are used to show the relationship between pairs of quantitative measurements made for the same object or individual. For example, a scatter diagram could be used to present information about the production levels and costs.

By analysing the pattern of dots that make up a scatter diagram it is possible to identify whether there is any relationship (correlation) between the two measurements. Regression lines, lines of best fit, can also be added to the graph and used to decide whether the relationship between the two sets of measurements can be explained or if it is due to chance.

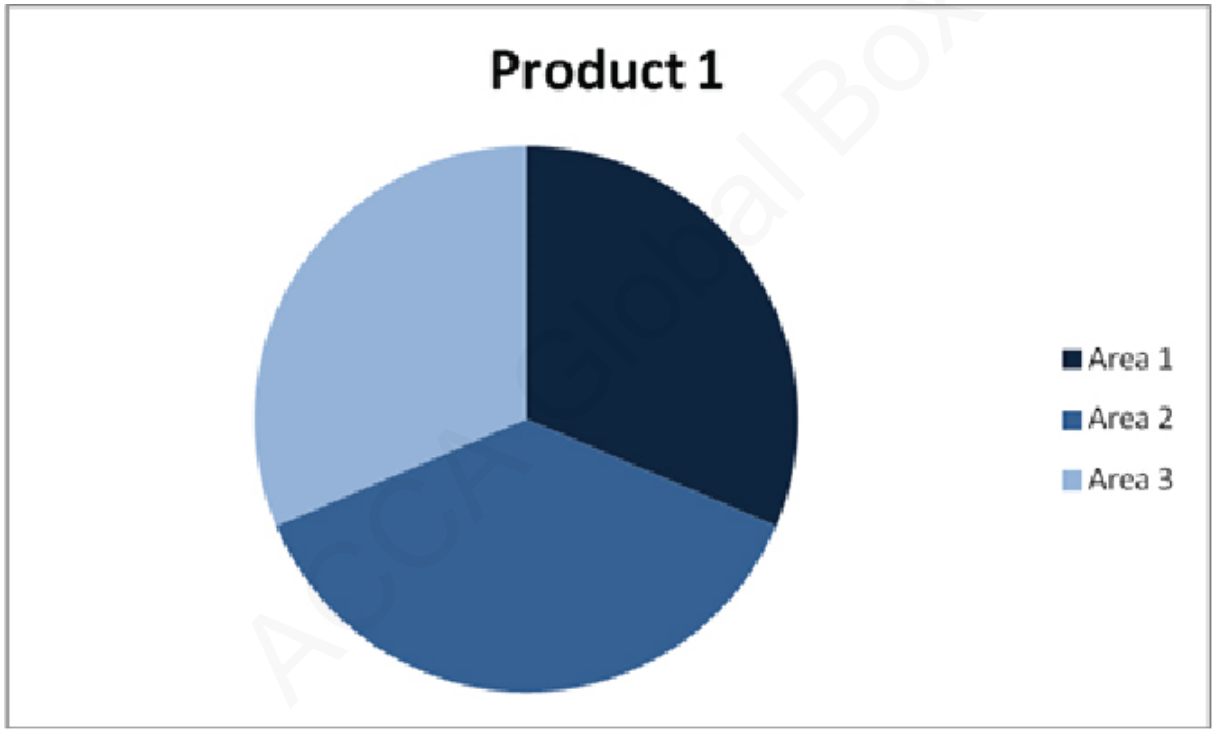


Notes

7 Pie charts

A pie chart is a circular graph that shows the relative contribution that different subgroups contribute to an overall category. A wedge of the circle represents each subgroups contribution. Every 1% contribution that a subgroup contributes to the total corresponds to an angle of 3.6 degrees.

Pie charts are good for displaying data for around 6 subgroups or fewer. When there are more subgroups it is difficult for the eye to distinguish between the relative sizes of the different sectors and so the chart becomes difficult to interpret.



Notes

Test your understanding 1

The following table shows that the typical salary of part qualified management accountants in five different regions of England.

Area	Typical salary
	$
South-east	21,500
Midlands	20,800
North-east	18,200
North-west	17,500
South-west	16,700

The best diagram to draw to highlight the differences between areas is:

A a pie diagram

B a multiple bar chart

C a percentage component bar chart

D a simple bar chart

Notes

Illustrations and further practice

Notes

Further practice

Exam kit questions

Test your understanding answers

Test your understanding 1

D

A simple bar chart would show five bars illustrating the different salaries in different regions.

Chapter 4

Cost classification

Outcome

By the end of this session you should be able to:

- explain and illustrate production and non-production costs
- describe the different elements of non-production cost – administrative, selling, distribution and finance
- describe the different elements of production cost – materials, labour and overheads
- explain the importance of the distinction between production and non-production costs when valuing output and inventories
- explain and illustrate with examples classifications used in the analysis of the product/service costs including by function, direct and indirect, fixed and variable, stepped fixed and semi variable costs
- describe and illustrate, graphically, different types of cost behaviour
- use high/low analysis to separate the fixed and variable elements of total costs including situations involving semi variable and stepped fixed costs and changes in the variable cost per unit
- explain the advantages and disadvantages of using the high low method to estimate the fixed and variable element of costing
- explain the structure of linear functions and equations
- explain and illustrate the concepts of cost objects, cost units and cost centres
- explain and illustrate the use of codes in categorising transactions

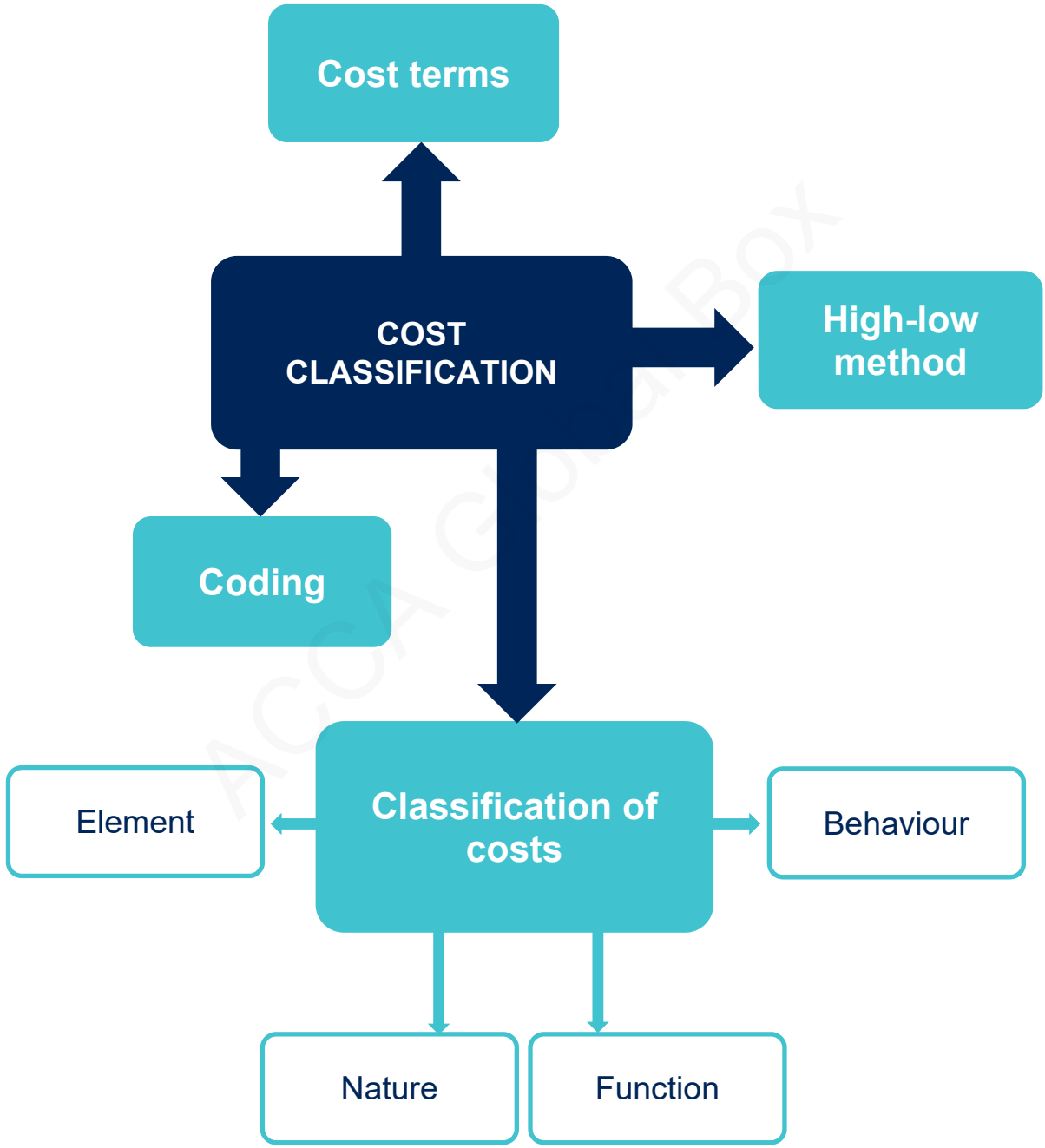
and answer questions relating to these areas.

Chapter 4

PER

One of the PER performance objectives (PO12) is to apply different management accounting techniques is different business contexts to effectively manage and use resources. Working through this chapter should help you understand how to demonstrate that objective.

Overview



1 Analysing costs

The word ‘cost’ can be used in two contexts. It can be used as a noun, for example when we are referring to the cost of an item. Alternatively, it can be used as a verb, for example we can say that we are attempting to cost an activity, when we are undertaking the tasks necessary to determine the costs of carrying out the activity.

1.1 Why we need to understand costs

- the cost to manufacture products
- the selling price we should change for our products
- the products we should produce
- the cost to run a particular department or function, and much more.

1.2 Cost terms

There are some important terms that you will need to understand when studying cost.

A **cost object** is anything for which a cost can be ascertained. Examples for cost objects: a product, service, centre, activity, customer or distribution channel.

A **cost unit** is a unit of product or service in relation to which costs are ascertained. The cost unit will depend on a number of factors, including the amount of information available and the purpose for which the cost unit will be used.

Notes

Example 1

Sector/activity	Cost unit
Accountancy practice	
Call centre	
Baker	
University	

Notes

A **cost centre** is ‘a production or service location, function, activity or item of equipment for which costs can be ascertained’. A cost centre is used as a ‘collecting place’ for costs. There are many types of cost centres.

Example 2

Examples of cost centres in relation to a hotel:

Type	Example
Service location	
Function	
Activity	

Notes

Test your understanding 1

In a hotel, which of the following would be suitable cost units and cost centres?

	Cost centre	Cost unit
Restaurant		
Guest-night		
Meal served		
Fitness suite		
Bar		

Notes

1.3 The cost card

A cost card is used to show the breakdown of the costs of producing output based on the classification of each cost. A cost card can be produced for one unit or a planned level of production.

Example 3

The following shows the calculation of the cost for one unit of product X

	$
Direct material	20
Direct labour	10
Direct expenses	15
PRIME COST	45
Variable production overheads	10
TOTAL VARIABLE (MARGINAL) PRODUCTION COST	55
Fixed production overheads	23
TOTAL PRODUCTION (ABSORPTION) COST	78
Non-production cost	22
TOTAL COST	100

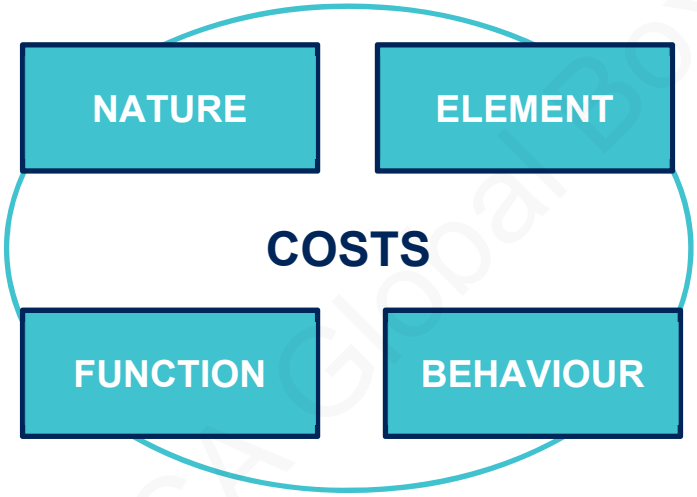
Notes

2 Classifying costs

Costs can be classified in many different ways.

It is necessary to be able to classify all costs, that is, to be able to arrange them into logical groups. The classifications selected and the level of detail used in the classification groupings will depend on the purpose of the classification exercise.

There are four main classifications:



2.1 Classifying cost by element

- Materials are the components bought in by the company which are used in manufacturing the product.
- Labour costs are the costs of the people working for the organisation. These costs include wages and salaries, together with related employment costs.
- Expense costs are other costs such as rent, business rates, electricity, gas, postage, telephone and similar items.

Notes

2.2 Classifying cost according to their function

In manufacturing companies the important functional classification is:

- **Production costs** which would be incurred in the manufacture of the product.
- **Non-production costs** which, while not directly involved in the manufacture of the product, are required to support the overall activity of the company. For example selling, administration, distribution and finance costs.

Production costs are included in the valuation of inventory whereas non-production costs are not included.

2.3 Classifying cost according to their nature

- Direct costs can be clearly identified with the cost object we are trying to cost.

The total of all direct costs is known as PRIME COST.

- Indirect costs cannot be directly attributed to a particular cost unit, although it is clear that they have been incurred in the production of the product.

These indirect costs are often referred to as OVERHEADS.

Notes

Test your understanding 2

QRS is an office cleaning business which employs a team of part-time cleaners who are paid an hourly wage. The business provides cleaning services for a number of clients, ranging from small offices to high-street shops and large open-plan offices.

In determining the cost of providing a cleaning service to a particular client, which of the following costs would be a direct cost of cleaning that client's office and which would be an indirect cost?

	Direct	Indirect
The wages paid to the cleaner who is sent to the client's premises		
The cost of carpet shampoo used by the cleaner		
The salaries of QRS's accounts clerks		
Rent of the premises where QRS stores its cleaning materials and equipment		
Travelling expenses paid to the cleaner to reach the client's premises		
Advertising expenses incurred in attracting more clients to QRS business		

Test your understanding 3

A manufacturing company is about to start manufacturing a new product, the FX200.

The management accountant has provided the following information about the unit cost of the FX200

Direct labour	3 hours @ $10/hr
Indirect labour	2 hours @ $9/hr
Direct material	4 kg @ $5/kg
Indirect material	$10
Direct expenses	$4
Indirect expenses	$7
Selling and distribution overhead	$5

What is the prime cost of one unit of FX200?

Test your understanding 4

Prime cost is:

A all costs incurred in manufacturing a product

B the total of direct costs

C the material cost of a product

D the cost of producing one additional unit

Test your understanding 5

Put each of the following costs under the correct heading depending on whether they would be a direct cost or an indirect cost of the quality control activity which is undertaken in a company's factory.

The salary of the quality control supervisor

The rent of the factory

The depreciation of the quality testing machine

The cost of the samples destroyed during testing

The insurance of the factory

Direct cost	Indirect cost

Test your understanding 6

BCD is a car manufacturer.

Identify the correct classification for each of the costs below by writing one of the following in the box provided (each cost is intended to belong to only one classification)

1 Direct materials

2 Direct labour

3 Production overhead

4 Administration costs

5 Selling and distribution costs

	Classification
Cost of advertising the car on television	
Wages of the workers moving raw materials from stores	
Cost of metal used for the bodywork of the car	
Cost of materials used to clean production equipment	
Assembly worker's wages	
Wages of office workers	
Wages of storekeepers in material store	

Illustrations and further practice

Notes

3 Cost behaviour

Cost behaviour refers to the way in which costs are affected by fluctuations in the level of activity.

Activity can be, for example:

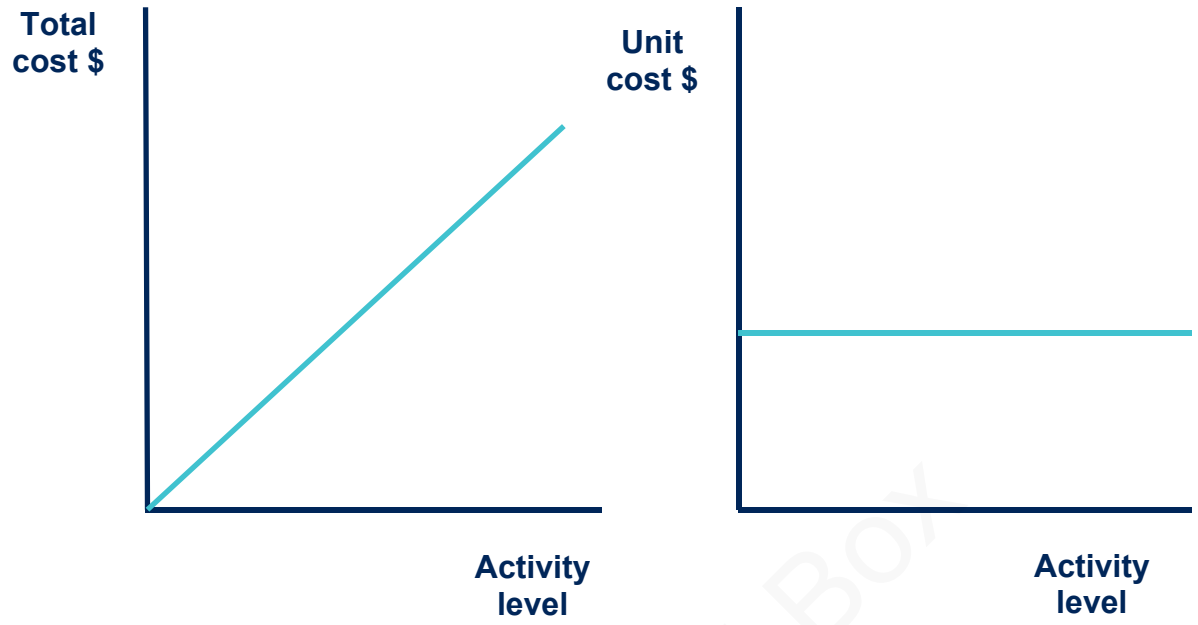
- the number of units produced or sold
- miles travelled
- hours worked
- the number of parcels delivered.

3.1 Variable costs

A **variable cost** is a 'cost that varies in direct proportion with a measure of activity'.

Examples of variable costs:

Notes



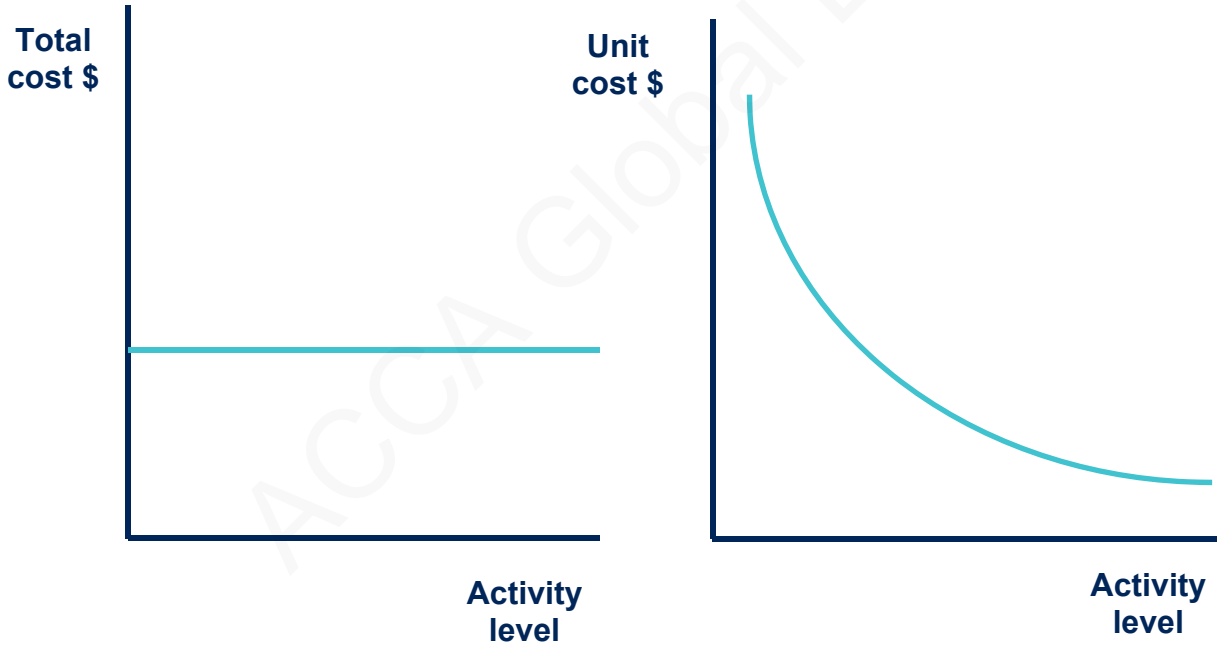
Notes

3.2 Fixed cost

A **fixed cost** is a 'cost incurred for an accounting period, that, within certain output or turnover limits, tends to be unaffected by fluctuations in the levels of activity (output or turnover)'.

Fixed costs can also be known as period costs.

Examples of fixed costs:



Notes

Test your understanding 7

An entity carries out repairs on customers' electrical items. Consider the following costs and decide if it is a direct or indirect cost and if it is fixed or variable.

	Direct/Indirect	Fixed/Variable
Business rates for repair shop		
Salary of repair shop supervisor		
Repair person paid per repair carried out		
Electricity for recharging repair tools		

Test your understanding 8

A company increase its activity with the relevant range. Tick the correct boxes below to indicate the effects on costs.

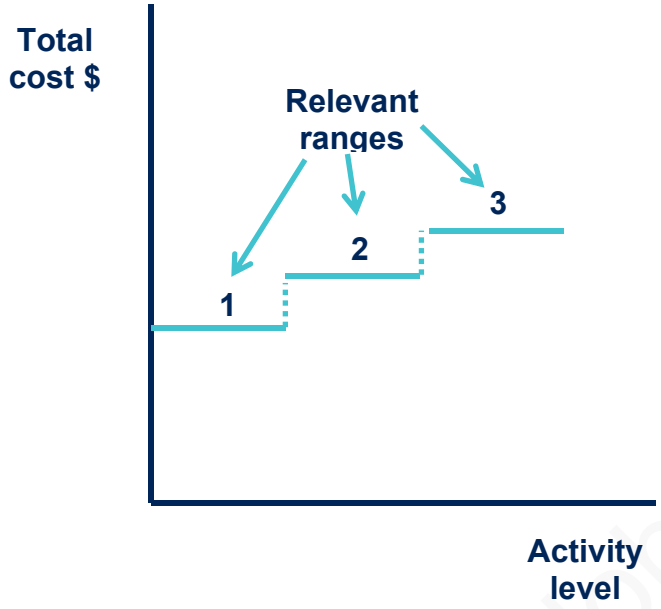
	Increase	Decrease	Remains the same
Total variable costs			
Total fixed costs			
Variable cost per unit			
Fixed cost per unit			

Illustrations and further practice

Notes

3.3 Stepped fixed costs

This is a type of fixed cost that is only fixed within certain levels of activity. Once the upper limit of an activity level is reached then a new higher level of fixed cost becomes relevant.



Test your understanding 9

Consider the following costs. Which would be classified as stepped costs? Select all that apply.

(a) The cost of materials is $3 per kg for purchases up to 10,000 kg. From 10,001 kg to 15,000 kg the cost is $2.80 per kg. Thereafter the cost is $2.60 per kg.

(b) The cost of supervisory labour is $18,000 per period for output up to 10,000 units. From 10,001 units to 15,000 units the cost is $37,000 per period. Thereafter the cost is $58,000 per period.

(c) The cost of machine rental is $4,500 per period for output up to 3,000 units. From 3,001 units to 6,000 units the cost is $8,700 per period. Thereafter the cost is $12,200 per period.

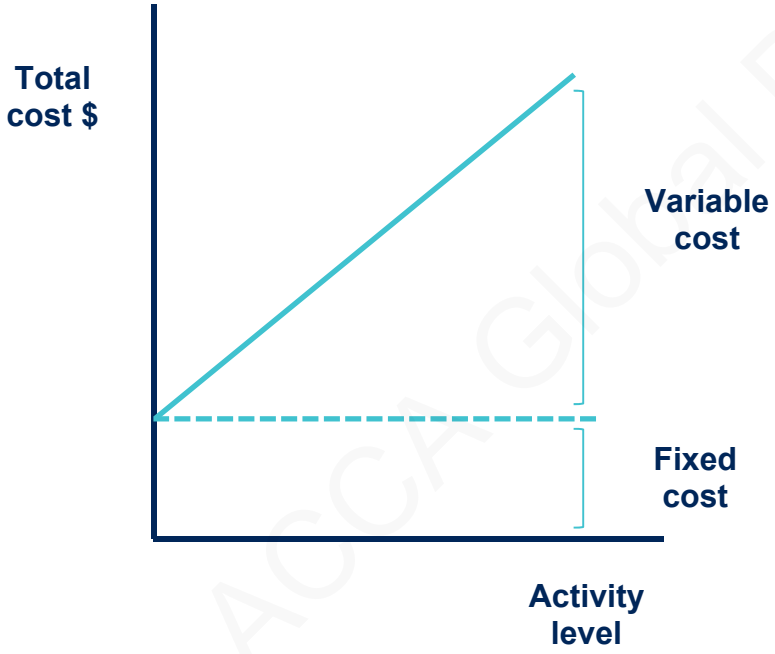
(d) The mileage charge for a rental car is $0.05 per miles up to 400 miles. From 401 miles to 700 miles the charge is $0.07 per mile. Thereafter the cost is $0.08 per mile.

Notes

3.4 Semi-variable cost

A **semi-variable cost** is a 'cost containing both fixed and variable components and therefore partly affected by a change in the level of activity'.

Examples of semi-variable costs:



Test your understanding 10

The variable production cost per unit of product B is $2 and the fixed production overhead for a period is $4,000.

Calculate the total cost of producing 3,000 units of B in a period

Illustrations and further practice

Notes

4 Identifying cost behaviour

Understanding costs and cost behaviour is important. Managers must be able to identify if costs are fixed, variable, stepped or semi-variable. If this cost behaviour is understood then managers are able to estimate or predict costs going forward.

Example 4

Consider the following costs for a t-shirt printer:

Number of t-shirts printed	**100**	**200**
Material	$220	$440
Labour	$120	$240
Rent	$550	$550
Electricity	$250	$300

Test your understanding 11

The following data have been collected for four costs types, W, X, Y and Z, at two activity levels:

Cost type	Cost 100 units $	Cost 140 units $
W	8,000	10,560
X	5,000	5,000
Y	6,500	9,100
Z	6,700	8,580

Where V = variable, SV = semi-variable and F = fixed identify the cost behaviours of the four costs above:

	W	X	Y	Z
A	V	F	SV	V
B	SV	F	V	SV
C	V	F	V	V
D	SV	F	SV	SV

Notes

5 High-Low method

We need to be able to split semi-variable cost into their fixed and variable components.

Note: Total cost = Total fixed cost + Total variable cost

Where: Total variable cost = Variable cost per unit × Activity level (units)

5.1 Using the high-low method

This method picks out the highest and lowest **activity levels** from the available data and investigates the change in cost which has occurred between them.

From this, the variable cost per unit and the fixed cost element can be calculated.

Example 5

Consider the following data for a semi-variable cost:

Month	Activity level (units)	Cost incurred ($)
Quarter 1	10,000	38,300
Quarter 2	12,000	42,700
Quarter 3	9,000	35,700
Quarter 4	14,000	47,200

Calculate the variable cost per unit by selecting the highest and lowest activity levels.

Calculate the variable cost per unit:

So, variable cost =

Substituting this back in to the data for Quarter 3, we can calculate the fixed cost:

	$
Total cost	
Variable cost	

Therefore, fixed cost

The total cost at different activity levels can then be estimated:

Total cost = total fixed cost + total variable cost

Total cost for 11,000 units =

Notes

Test your understanding 12

The finance manager of DFG is preparing the production budget for the next period. Using the following information and the high-low method estimate the production cost if 2,700 units were produced.

Volume (units)	Cost $
1,600	23,200
2,500	25,000

A $5,400

B $25,400

C $27,000

D $39,150

Illustrations and further practice

Notes

5.2 High-low method with stepped fixed costs

The high/low method can still be used to estimate fixed and variable costs.

- Choose the two activity levels where the fixed costs remain unchanged and calculate the variable cost per unit and the total fixed cost using the high/low technique.
- Adjustments may need to be made to the fixed costs when calculating the total cost for a new activity level.

5.3 High-low method with changes in variable cost per unit

Sometimes there may be changes in the variable cost per unit; the high/low method can still be used to determine the fixed and variable elements of semi-variable costs. Choose activity levels where the variable costs per unit remain unchanged as calculate as per with stepped fixed costs.

Illustrations and further practice

Notes

6 Cost equations

6.1 Equation of a straight line

Cost equations are derived from historical cost data. Once a cost equation has been established, for example distinguishing the fixed and variable costs using the high/low method, it can be used to estimate future costs. Cost equations are assumed to have a linear function and therefore the equation of a straight line can be applied

y = a + bx

where: y = dependent variable

x = independent variable

a = intercept on y-axis

b = gradient of the line

Illustrations and further practice

Notes

7 Cost coding

A code is a system of symbols designed to be applied to a classified set of items, to give a brief accurate reference, which helps entry into the records, collation and analysis.

7.1 Sequential code

This is the most basic type of code. It simply means that each code follows a numerical or alphabetical sequence. Planning is needed to determine how many codes might be needed in total.

7.2 Block code

Block codes are often used to categorise sequential codes together. For example, an accounting system might have the following block codes:

Code	Item
0000	Expenses
1000	Revenue
2000	Non-current assets
3000	Current assets
4000	Long term liability

7.3 Hierarchical code

Each digit in the code represents a classification. As the code progresses from left to right each digit represents a smaller subset. For example, codes for sales for an international electronics retailer could have the hierarchy:

1 represents revenue

1.1 Revenue from the UK (.1)

1.2 Revenue from the USA (.2)

1.3 Revenue from China (.3)

This allows for infinite expandability.

7.4 Significant digit code

A significant digit code is a code that contains individual digits and letters that are used to represent features of the coded item. The example given is one used to describe packs of paper file dividers. 2000 is the code for the dividers and then the 10, 20, 30 represents the number of dividers in a pack.

Code	Item
2000	Paper file dividers
2010	10 pack of paper file dividers
2020	20 pack of paper file dividers
2030	30 pack of paper file dividers

7.5 Faceted code

A faceted code is one that is broken down into a number of facets or fields, each of which signifies a unit of information.

7.6 Mnemonic code

Mnemonic means something that aids the memory or understanding. This uses an alphabetical coding rather than a numerical coding system. It is often used to abbreviate or simplify information.

Notes

Further practice

Exam kit questions

Test your understanding answers

Test your understanding 1

In a hotel, which of the following would be suitable cost units and cost centres?

	Cost centre	Cost unit
Restaurant	✓	
Guest-night		✓
Meal served		✓
Fitness suite	✓	
Bar	✓	

Test your understanding 2

QRS is an office cleaning business which employs a team of part-time cleaners who are paid an hourly wage. The business provides cleaning services for a number of clients, ranging from small offices to high-street shops and large open-plan offices.

In determining the cost of providing a cleaning service to a particular client, which of the following costs would be a direct cost of cleaning that client's office and which would be an indirect cost?

	Direct	Indirect
The wages paid to the cleaner who is sent to the client's premises	✓	
The cost of carpet shampoo used by the cleaner	✓	
The salaries of QRS's accounts clerks		✓
Rent of the premises where QRS stores its cleaning materials and equipment		✓
Travelling expenses paid to the cleaner to reach the client's premises	✓	
Advertising expenses incurred in attracting more clients to QRS business		✓

Test your understanding 3

Direct labour 3 × 10 = $30

Direct material 4 × 5 = $20

Direct expenses = $4

Prime cost = $54

Test your understanding 4

Prime cost is:

B the total of direct costs

Test your understanding 5

Direct cost	Indirect cost
The salary of the quality control supervisor	The rent of the factory
The depreciation of the quality testing machine	The insurance of the factory
The cost of the samples destroyed during testing	

Test your understanding 6

	Classification
Cost of advertising the car on television	5
Wages of the workers moving raw materials from stores	3
Cost of metal used for the bodywork of the car	1
Cost of materials used to clean production equipment	3
Assembly worker's wages	2
Wages of office workers	4
Wages of storekeepers in material store	3

Test your understanding 7

	Direct/Indirect	Fixed/Variable
Business rates for repair shop	Indirect	Fixed
Salary of repair shop supervisor	Indirect	Fixed
Repair person paid per repair carried out	Direct	Variable
Electricity for recharging repair tools	Indirect	Variable

Test your understanding 8

A company increase its activity with the relevant range. Tick the correct boxes below to indicate the effects on costs.

	Increase	Decrease	Remains the same
Total variable costs	✓		
Total fixed costs			✓
Variable cost per unit			✓
Fixed cost per unit		✓	

Test your understanding 9

(b) and (c) are stepped costs – the total expenditure on these costs remains constant for a range of activity levels until a critical activity level is reached. At this point, the cost increase to a new level and then remains constant for a further range of activity levels.

Test your understanding 10

$10,000

$4,000 + ($2 × 3,000) = $10,000

Test your understanding 11

B

X is clearly a fixed cost as it does not change over the different activity levels. For W, Y and Z it is not so clear so calculate the cost per unit at each activity level

Cost type	Cost per unit @ 100 units $	Cost per unit @ 140 units $
W	8,000/100 = 80.00	10560/140 = 75.43
Y	6,500/100 = 65.00	9,100/140 = 65.00
Z	6,700/100 = 67.00	8,580/140 = 61.29

The unit cost of Y is constant which suggests that Y is a variable cost

The total cost and the cost per unit of W and Z very at the different levels which suggests that W and Z are semi-variable costs

Test your understanding 12

B

Variable cost per unit = $(25,000 – 23,200)/(2,500 – 1,600) = $2

Total fixed costs = $25,000 – (2,500 × 2) = $20,000

Forecast for 2,700 units = $20,000 + (2,700 × $2) = $25,400

Chapter 5

Accounting for materials

Outcome

By the end of this session you should be able to:

- describe the different procedures and documents necessary for the ordering, receiving and issuing of materials from inventory
- identify, explain and calculate the costs of ordering and holding inventory (including buffer inventory)
- describe and apply appropriate methods for establishing reorder levels where demand in the lead time is constant
- calculate and interpret the optimal reorder quantities
- calculate and interpret the optimal reorder quantities when quantity discounts are available
- produce calculations to minimise inventory costs when inventory is gradually replenished
- calculate the value of closing inventory and material issues using LIFO, FIFO and average methods
- describe the control procedures used to monitor physical and 'book' inventory and to minimise discrepancies and losses
- interpret the entries and balances in the material inventory account

and answer questions relating to these areas.

PER

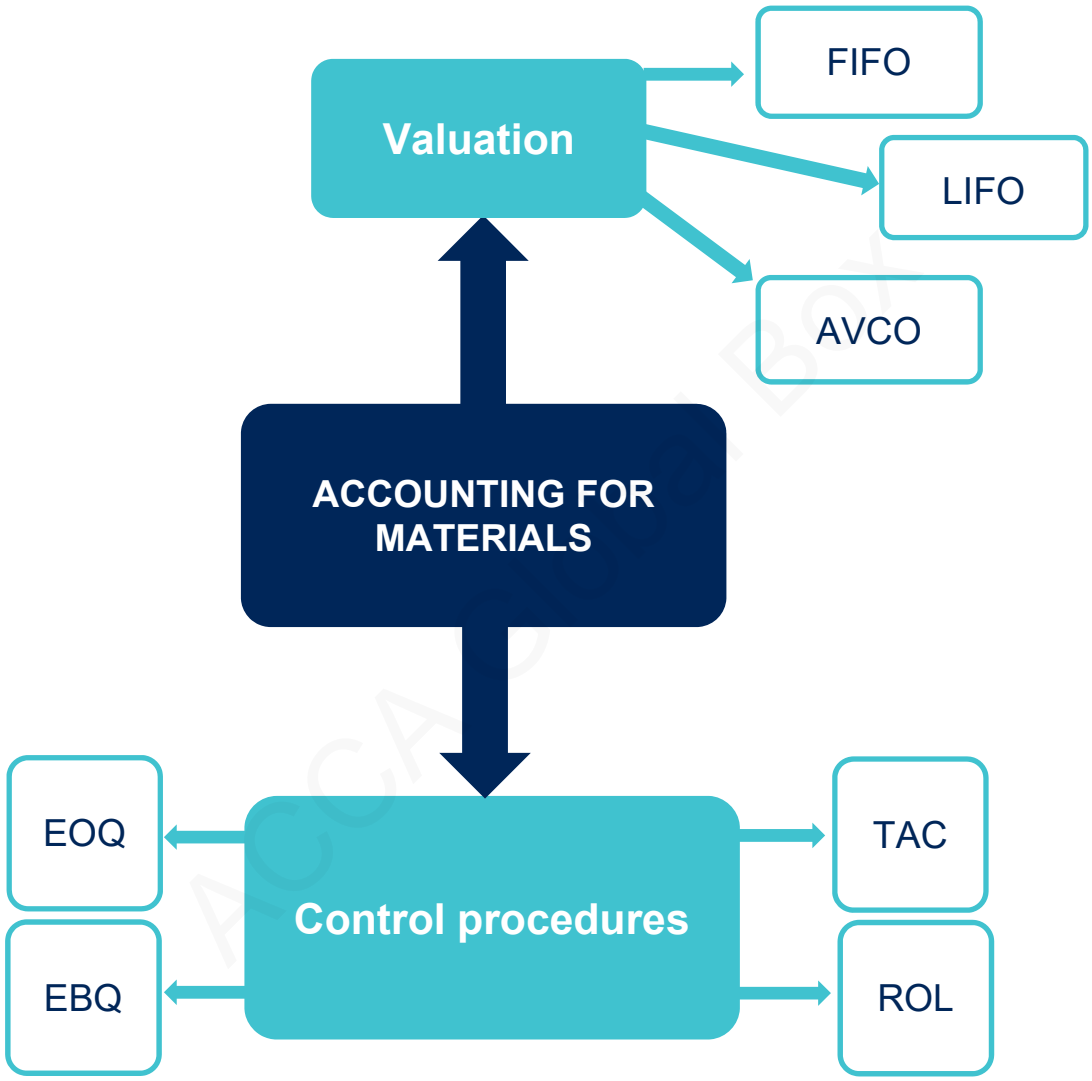
One of the PER performance objectives (PO1) is to take into account all relevant information and use professional judgement, your personal values and scepticism to evaluate data and make decisions. You should identify right from wrong and escalate anything of concern. You also need to make sure that your skills, knowledge and behaviour are up-to-date and allow you to be effective in you role. Working through this chapter should help you understand how to demonstrate that objective.

PER

One of the PER performance objectives (PO12) is to apply different management accounting techniques is different business contexts to effectively manage and use resources. Working through this chapter should help you understand how to demonstrate that objective.

The underpinning detail for this Chapter in your Integrated Workbook can be found in Chapter 5 of your Study Text

Overview

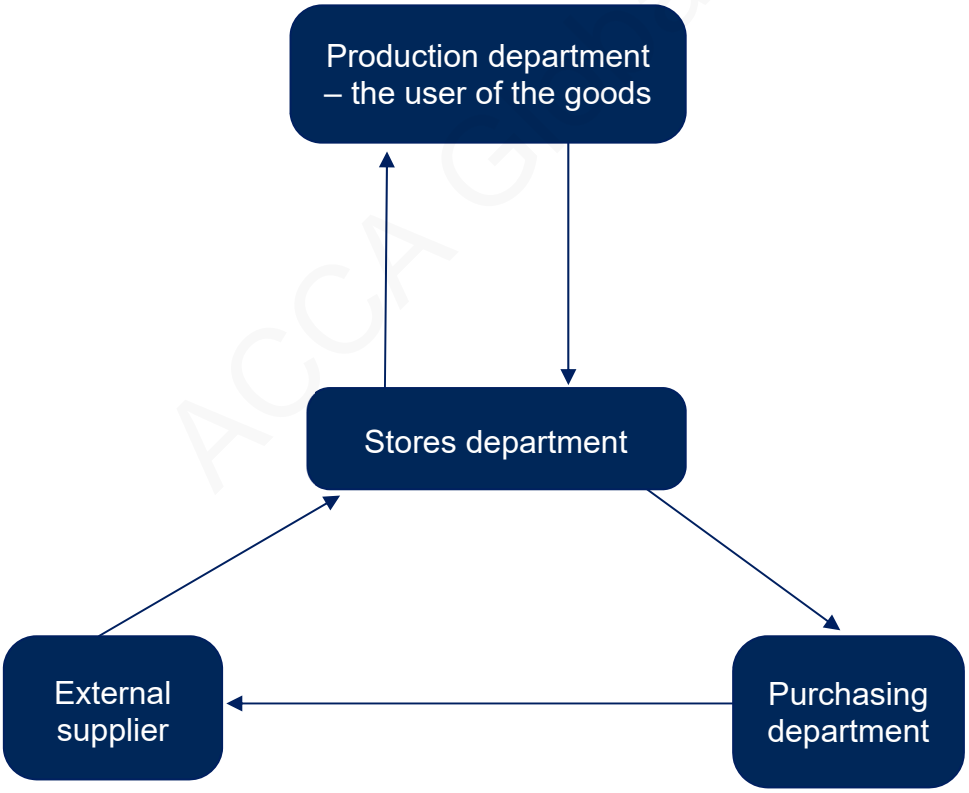


1 Inventory control cycle

Inventory often forms the largest single item of cost for a business so it is essential that the inventory purchased is the most suitable for the intended purpose. Inventory includes:

-
-
-
-
-

It is useful to have an overview of the purchasing process:



Notes

2 Costs of carrying inventory

- Purchase price
- Holding costs (Ch)
  -
  -
  -
  -
  -

  Total annual holding cost = Ch × Q/2
- Ordering costs (Co)
  -
  -

  Total annual ordering cost = Co × D/Q

Total annual cost = PD + (Co × D/Q) + (Ch × Q/2)

- Stock-out costs
  -
  -
  -
  -

Notes

Test your understanding 1

The following information relates to the forthcoming period:

Order costs = $20 per order

Holding costs = 10% of purchase price

Annual demand = 10,000 units

Purchase price = $20 per unit

Order quantity = 250 units

What are the total annual costs of inventory?

A $201,050

B $201,300

C $220,000

D $420,000

Illustrations and further practice

Notes

3 Systems of inventory control

3.1 Re-order level

This level will be determined with reference to the time it will take to receive an order and the possible inventory requirements during that time. When this level of inventory is reached a new order must be placed to prevent stock outs.

Re-order level = maximum usage × maximum lead time

Re-order level = (maximum usage × maximum lead time) + buffer

Example 1

A business uses 5,000 units of raw material per week and it takes 3 weeks to receive the goods after the order has been placed. The business also keeps additional inventory of 2,500 units in reserve.

Calculate the re-order level.

Test your understanding 2

The demand for a particular product is expected to vary between 10 and 50 units per day. Lead time is, on average, 5 days, although it has been as short as 3 days and as long as 10 days. The company orders 1,500 units a time. The company operates a 300-day year.

Calculate the re-order level

Illustrations and further practice

Notes

3.2 Economic order quantity (EOQ)

This is the order size that minimises the total costs of holding and ordering inventory.

$$EOQ = \sqrt{\frac{2 \times C_o \times D}{C_h}}$$

C_o = cost of place an order

D = annual demand

C_h – cost of holding one unit of inventory for one year

Example 2

A business uses 3,125 units of raw material per annum. It costs $20 to place an order and $0.50 to hold one unit of inventory for one year.

Calculate the EOQ.

Test your understanding 3

The demand for a particular product is expected be 25 units a day. Each time an order is placed, administrative costs of $15 are incurred and one unit of inventory held for one year incurs $0.10 of holding costs.

The company operates a 300-day year.

Calculate the economic order quantity.

Illustrations and further practice

Notes

3.3 EOQ with discounts

If a quantity discount is accepted this will have the following effects:

- The annual purchase price will decrease.
- The annual holding cost will increase.
- The annual ordering cost will decrease.

Example 3

A company has been approached by their supplier who would be willing to offer a discount of 5% on orders over 500 units.

Information regarding current inventory costs is as follows:

Holding cost per unit per annum = 10% of purchase price

Ordering costs = $2 per order

Annual demand = 15,000 units

Purchase price = $15 per unit

Current EOQ quantity = 200 units

The new optimal order quantity is:

Order quantity	**200**	**500**
Purchase costs		
Ordering costs		
Holding costs		
Total annual cost		

The new optimal order quantity is

Illustrations and further practice

Notes

3.4 Economic batch quantity (EBQ)

The EBQ model is primarily concerned with determining the number of items that should be produced in a batch.

$$EBQ = \sqrt{\frac{2C_o D}{C_h (1 - \frac{D}{R})}}$$

Q = Batch size

D = Demand per annum

C_h = Cost of holding one unit for one year

C_o = Cost of setting up one batch ready to be produced

R = Annual replenishment rate

Test your understanding 4

A company makes a component for one of its products in-house. It uses an average of 4,000 of these throughout the year. The production rate for these components is 400 per week and the cost of holding one item for the year is $1.50. The factory is open for 50 weeks per year. The company has calculated that the economic batch quantity is 2,000. What is the production setup cost per batch?

A $213

B $240

C $600

D $860

Illustrations and further practice

4 Valuing inventory

The cost of materials will normally be derived from suppliers' invoices but the value of internal issues from stores to the user (production) department need to be calculated.

The methods looked at here are:

-
-
-

The data being used to demonstrate these techniques is:

Date	Receipts			Issues			Balance	
	Qty	Per unit	Value	Qty	Per unit	Value	Qty	Value
01/08							150	$150
03/08	200	$1.20						
09/08				250				
13/08	250	$1.30						
16/08				200				

Notes

4.1 First In, first out

Example 4

Date	Receipts			Issues			Balance	
	Qty	Per unit	Value	Qty	Per unit	Value	Qty	Value
01/08							150	$150
03/08	200	$1.20	$240				350	$390
09/08								
13/08	250	$1.30	$325					
16/08								

	Advantages	Disadvantages
FIFO		

Notes

4.2 Last in, first out

Example 5

Date	Receipts			Issues			Balance	
	Qty	Per unit	Value	Qty	Per unit	Value	Qty	Value
01/08							150	$150
03/08	200	$1.20	$240				350	$390
09/08								
13/08	250	$1.30	$325					
16/08								

	Advantages	Disadvantages
LIFO		

Notes

4.3 Cumulative weighted average

Example 6

Date	Receipts			Issues			Balance	
	Qty	Per unit	Value	Qty	Per unit	Value	Qty	Value
01/08							150	$150
03/08	200	$1.20	$240				350	$390
09/08								
13/08	250	$1.30	$325					
16/08								

	Advantages	Disadvantages
AVCO		

Notes

Test your understanding 5

Dennis has the following KG of raw material in inventory:

Date purchased	Quantity	Cost per kg $	Total cost $
April 24	500	1.20	600
April 26	450	1.30	585
April 30	600	1.50	900

Calculate the cost of issuing 1,000 kg on 1 May and the value of the closing inventory (to the nearest $) using:

FIFO

LIFO

AVCO

Illustrations and further practice

Notes

5 The material inventory account

Materials cost account

	$		$
Opening balance	(1)	Issues to production	(4)
Purchases	(2)	Returns to suppliers	(5)
Returns to stores	(3)	Production overheads	(6)
		Statement of profit or loss	(7)
		Closing balance	(8)

1 The opening balance of materials at the beginning of a period

2 Dr Materials, Cr Payables or Bank

3 Dr Materials, Cr Production or WIP

4 Direct materials used in production Dr Production, or WIP Cr Materials

5 Dr Payables or Bank, Cr Materials

6 Indirect materials are treated as overheads. Dr Overheads, Cr Materials

7 Material write-offs Dr statement of profit or loss, Cr Materials

8 The closing balance of material inventory, it will become the opening balance at the beginning of the next period.

Notes

Test your understanding 6

An entity operates an integrated accounting system. It is issuing $40,000 worth of direct materials to production. The accounting entries for this would be:

	Debit	Credit
A	Work in progress	Material
B	Finished goods	Material
C	Material	Work in progress
D	Cost of sales	Work in progress

Notes

Further practice

Exam kit questions

Test your understanding answers

Test your understanding 1

A

		$
Purchase costs	10,000 units × $20	200,000
Holding costs	$2 × 250/2	250
Order costs	$20 × 10,000/250	800
Total costs		**201,050**

Test your understanding 2

The re-order level = Maximum usage × maximum lead time

= 50 per day × 10 days = **500 units**

Test your understanding 3

$$EOQ = \sqrt{\frac{2 \times C_o \times D}{C_h}}$$

$$EOQ = \sqrt{\frac{[2 \times \$15 \times 300 \times 25]}{\$0.10}} = \textbf{1,500 units}$$

Test your understanding 4

C

Annual production rate = 400 × 50 = 20,000

Using the economic batch quantity formula:

2,000 = √{(2 × setup cost × 4,000)/(1.5 × (1 – 4,000/20,000))}

$2{,}000^2$ = 2 × setup cost × 4,000/1.5 × 0.8

Setup cost = $2{,}000^2$ × 1.5 × 0.8 /2 × 4,000

Setup cost = **$600**

Test your understanding 5

FIFO

Issue = (500 × 1.20) + (450 × 1.30) + (50 × 1.50) = **$1,260**

Closing inventory = (600 + 585 + 900) – $1260 = **$825**

LIFO

Issue = (600 × 1.5) + (400 × 1.3) = **$1,420**

Closing inventory = (600 + 585 + 900) – $1,420 = **$665**

AVCO

Issue = (600 + 585 + 900) / (500 + 450 + 600) × 1,000 = **$1,345**

Closing inventory = (600 + 585 + 900) – $1,345 = **$740**

Test your understanding 6

A

Notes

Chapter 6

Accounting for labour

Outcome

By the end of this session you should be able to:

- calculate direct and indirect costs of labour
- explain the methods used to relate input labour costs to work done
- prepare the journal and ledger entries to record labour costs inputs and outputs
- interpret entries in the labour account
- describe different remuneration methods: time-based systems; piecework systems and individual and group incentive schemes
- calculate the level, and analyse the costs and causes of labour turnover
- explain and calculate labour efficiency, capacity and production volume ratios

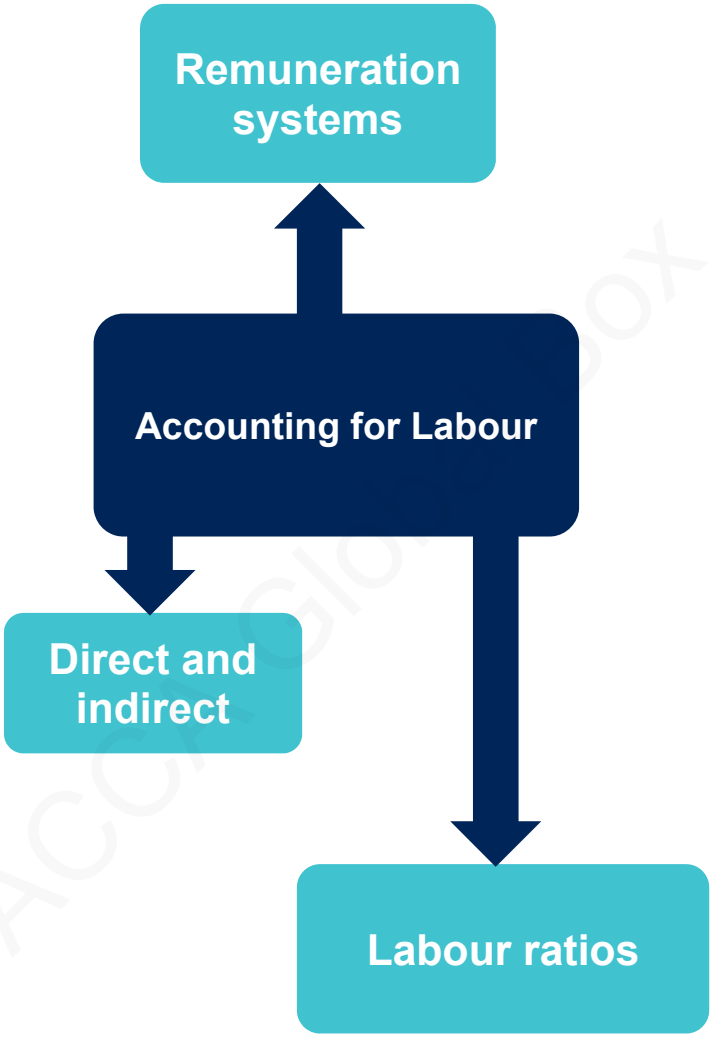
and answer questions relating to these areas.

PER

One of the PER performance objectives (PO12) is to apply different management accounting techniques is different business contexts to effectively manage and use resources. Working through this chapter should help you understand how to demonstrate that objective.

The underpinning detail for this Chapter in your Integrated Workbook can be found in Chapter 6 of your Study Text

Overview



1 Remuneration systems

1.1 Annual salaries

Tend to be paid to management and non-production staff.

1.2 Hourly rates of pay

Many production and manual workers will be paid for every hour that they work.

1.3 Overtime

If normal hours are exceeded it may be possible to claim a higher rate of pay for the extra hours worked.

1.4 Overtime payment

The total amount paid for the hours worked above the normal number of hours.

1.5 Overtime premium

The extra paid above the normal rate for the overtime hours. The premium will be a direct labour cost if the time has been worked at a specific request of a customer. If the extra hours are due to general pressures, the premium will be indirect.

Notes

1.6 Piecework payments

Employees are paid per unit of output produced. This is method of 'payment by results'.

1.7 Guaranteed minimum payment

A minimum take home wage which is not determined by hours worked or units produced.

1.8 Incentive (bonus) schemes

Incentive schemes can be based on an individual's achievement or a group of workers meeting and exceeding targets.

Illustrations and further practice

Notes

2 Direct and indirect labour

2.1 Direct labour

- basic pay of direct workers (including the basic pay for any overtime)
- overtime premiums when worked at a customer's specific request
- part of the prime cost of a product

2.2 Indirect labour

- basic pay of indirect workers (for example, maintenance staff, factory supervisors and canteen staff).
- indirect labour costs make up part of the overheads (indirect costs)
- indirect labour costs also include the following:
  - overtime premiums when due to general pressures
  - bonus payments
  - benefit contributions
  - idle time
  - sick pay
  - time spent by direct workers doing 'indirect jobs'

Notes

Test your understanding 1

Gross wages incurred in department 1 in June were $54,000. The wages analysis shows the following summary breakdown of the gross pay:

	Paid to direct labour $	Paid to indirect labour $
Ordinary time	25,185	11,900
Overtime basic pay	5,440	3,500
Overtime premium	1,360	875
Shift allowance	2,700	1,360
Sick pay	1,380	300
	36,065	17,935

What is the direct wages cost for department 1 in June?

A $25,185

B $30,625

C $34,685

D $36,065

Notes

Test your understanding 2

HWI has two production departments, A and B. Workers in department A are considered direct workers and workers in department B are considered indirect workers.

In the last week department A worked 40 hours of overtime, 30 at the specific request of a customer and the remaining at the request of management. Department B worked 15 hours of overtime.

All the workers in department A are paid at a rate of $12 per hour and working in department B are paid at a rate of $10 per hour. All overtime is paid at time and a half.

Calculate the total overtime pay for the week, split between direct and indirect cost.

	$
Direct overtime cost	
Indirect overtime cost	
Total overtime cost	

Illustrations and further practice

Notes

3 Accounting for labour costs

Wages control account

	$		$
Bank	(1)	Production	(2)
		Production overheads	(3)

1 Dr Wages, Cr Bank – Labour costs incurred are paid out of the bank before they are analysed further in the wages control account.

2 Dr Production/WIP, Cr Wages with direct labour costs

3 Dr Overheads, Cr Wages with Indirect labour costs.

Test your understanding 3

During a period $40,250 was incurred for direct labour.

The correct entries to record this would be:

	Debit	Credit
A	Wages	Overheads
B	Work in progress	Wages
C	Overhead	Wages
D	Wages	Work in progress

Notes

4 Labour ratios

4.1 Labour turnover

Labour turnover is a measure of the proportion of people leaving relative to the average number of people employed.

Number of leavers who required replacement ÷ average number of employee's × 100

Test your understanding 4

At 1 January a company employed 5,500 employees. Due to expansion the number of employees increased to 5,800 by 31 December. During the year 400 staff left the company and were replaced. What was the labour turnover rate?

A 4.8%

B 7.3%

C 6.9%

D 7.1%

4.2 Labour efficiency

The labour efficiency ratio measures the performance of the workforce by comparing the actual time taken to do a job with the expected or standard time.

Standard hours for actual output ÷ actual hours worked to produce output × 100

4.3 Labour capacity

The labour capacity ratio measures the number of hours spent actively working as a percentage of the total hours available for work (full capacity or budgeted hours).

Actual hours worked to produce output ÷ total budgeted hours × 100

4.4 Labour production/volume

The labour production volume ratio compares the number of hours expected to be worked to produce actual output with the total hours available for work (full capacity or budgeted hours).

Standard hours for actual output ÷ total budgeted hours × 100

Test your understanding 5

During a period, the actual hours worked by employees totalled 31,630. Budgeted hours were 29,470 hours. The standard hours for the work totalled 30,502.

Calculate the following (each to one decimal place):

Efficiency	%
Capacity	%
Production/volume	%

Illustrations and further practice

Notes

Further practice

Exam kit questions

Test your understanding answers

Test your understanding 1

B

$25,185 + $5,440 = $30,625. The only direct costs are the wages paid to direct workers for ordinary time, plus the basic pay for overtime.

Test your understanding 2

	$
Direct overtime cost	Department A specific overtime 30 × $18 = 540 Department A general overtime 10 × $12 = 120 Total = $660
Indirect overtime cost	Department A general overtime 10 × $6 = 60 Department B general overtime 15 × $15 = 225 Total = $285
Total overtime cost	660 + 285 = $945

Department A overtime payment = $12 × 1.5 = $18

Department A overtime premium = $12 × 0.5 = $6

Department B overtime payment = $10 × 1.5 = $15

Department B overtime premium = $10 × 0.5 = $5

Test your understanding 3

C

Test your understanding 4

D

400 / [(5,500 + 5,800) / 2] × 100 = 7.1%

Test your understanding 5

Efficiency	30,502/31,630 × 100 = 96.4%
Capacity	31,630/29,470 × 100 = 107.3%
Production/volume	30,502/29,470 × 100 = 103.5%

Notes

Chapter 7

Accounting for overheads

Outcome

By the end of this session you should be able to:

- explain the different treatment of direct and indirect expenses
- describe the procedures involved in determining production overhead absorption rates
- allocate and apportion production overheads to cost centres using an appropriate basis
- reapportion service cost centre costs to production cost centres (using the reciprocal method where service cost centres work for each other)
- select, apply and discuss appropriate bases for absorption rates
- prepare journal and ledger entries for manufacturing overheads incurred and absorbed
- calculate and explain the under- and over-absorption of overheads.

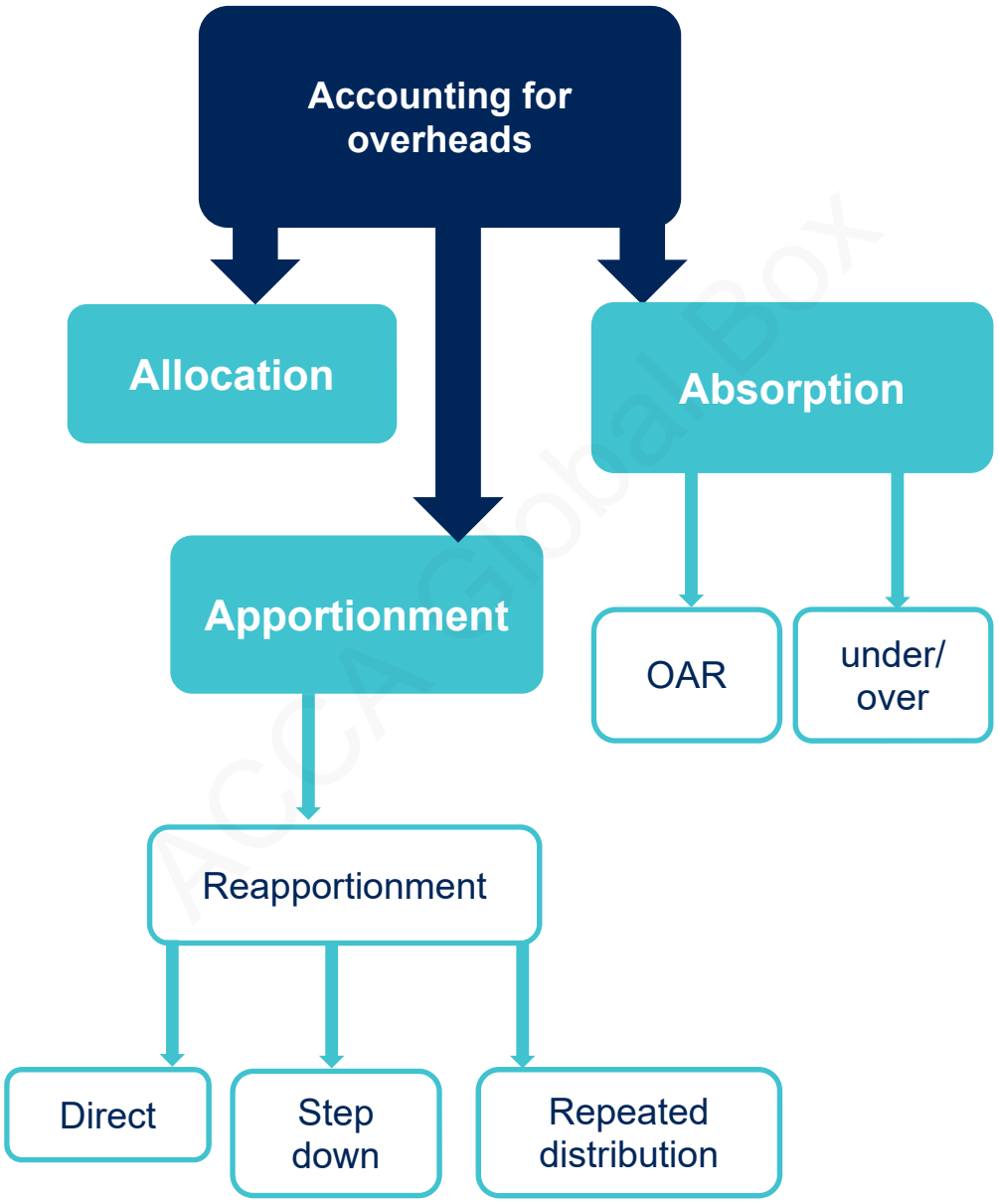
and answer questions relating to these areas.

PER

One of the PER performance objectives (PO12) is to apply different management accounting techniques is different business contexts to effectively manage and use resources. Working through this chapter should help you understand how to demonstrate that objective.

The underpinning detail for this Chapter in your Integrated Workbook can be found in Chapter 7 of your Study Text

Overview



1 What are overheads?

Overheads (also referred to as indirect costs) comprise indirect material, indirect labour and indirect expenses.

An overhead cost is defined as 'expenditure on labour, materials or services that cannot be economically identified with a specific saleable cost unit'.

1.1 Types of overhead

Overhead costs may be classified according to the function within the organisation responsible for incurring the cost. Examples of overhead cost classifications include

- **production overhead**
- **selling and distribution overhead**
- **administration overhead**

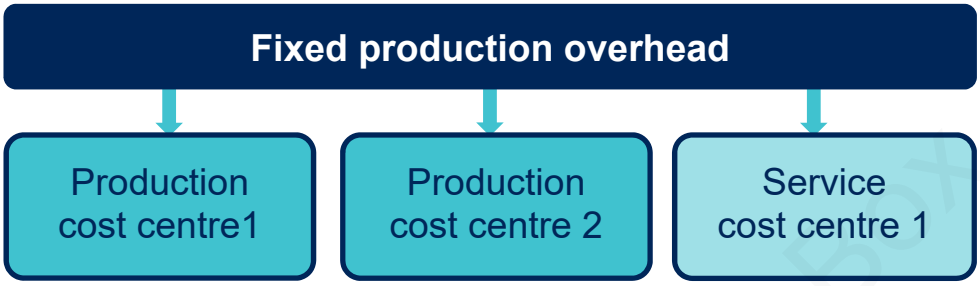
It is usually possible to classify the majority of overhead costs in this way, but some overhead costs relate to the organisation generally and may be referred to as **general overhead**.

Notes

1.2 Production overheads

The production function is usually divided into a number of departments or cost centres. Some of these cost centres are directly involved with the production process. These are called **production cost centres.**

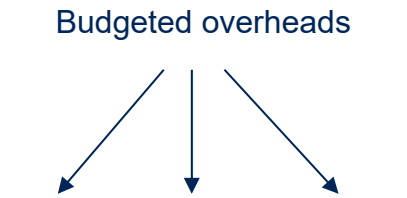
Other cost centres which are part of the production department are not directly involved with the production process but provide support services for the production cost centres. These are called **service cost centres.**



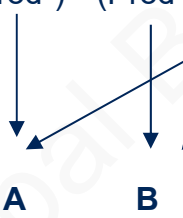
Notes

2 Allocation and apportionment

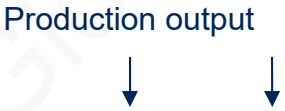
Step 1: Allocation or Apportionment



Step 2: Reapportion



Step 3: Absorb



Allocation – when an overhead relates entirely to one production or service centre it can be wholly attributed to that single production or service centre. This is allocation.

Apportionment – when an overhead relates to more than one production and/or service centre it is shared over these centres on a fair or suitable basis. This is apportionment.

Notes

Example 1

SB Ltd has four departments – Assembly, Finishing, Maintenance and Canteen. The following costs are expected to be incurred.

	$
Indirect materials	20,000
Rent	15,000
Electricity	10,000
Machine depreciation	5,000
Building maintenance	10,000

Information on the departments (Basis of apportionment)

	Assembly	Finishing	Maintenance	Canteen	Total
Area (sq m)	1,000	2,000	500	500	4,000
Kw hours consumed	1,000	4,000	Nil	5,000	10,000
Machine value	$45,000	$35,000	$11,000	$9,000	$100,000
Indirect materials consumed	$7,000	$8,000	$3,000	$2,000	$20,000

You are required to complete the table (to the nearest $) to allocate and apportion the overheads in each cost centre. Overheads can be apportioned in 2 ways:

Overhead for department = total overhead ÷ total of chosen basis × basis for that department

OR

Convert the chosen basis into percentages and then calculate the % of the overhead.

Calculate the overhead allocated or apportioned to each department using the most suitable basis.

Overhead	Basis	Assembly $	Finishing $	Maintenance $	Canteen $	Total $
Indirect materials						
Rent						
Electricity						
Machine depreciation						
Building maintenance						
Total						

Notes

Test your understanding 1

Match the overhead costs to the most appropriate basis of cost apportionment. An apportionment basis may be selected more than once.

Overhead cost
Canteen costs
Cleaning of factory premises
Power
Rent
Insurance of plant and machinery

Apportionment basis
Floor area
Plant and equipment at cost
Number of employees
Machine running hours
Direct labour hours

Test your understanding 2

Maintenance costs are to be apportioned to production cost centres on the basis of the number of maintenance hours worked in each cost centre.

	Machining	Assembly	Finishing
Hours worked	1,000	700	300

Complete the following extract from the overhead analysis sheet.

	Total $	Machining $	Assembly $	Finishing $
Maintenance cost	38,000			

Notes

3 Reapportionment

Reapportionment – apportion the service cost centre total costs to the production cost centres that make use of the service cost centre. This process is known as reapportionment or secondary apportionment.

This is so all the production costs can be identified with a production cost centre to enable the cost of the units that the production cost centre produces to be calculated.

3.1 Direct method

e.g.

Example 2

Direct method

In this method any reciprocal services are ignored. The following information is available:

	Assembly	Finishing	Maintenance	Canteen	Total
Number of staff	20	40	–	–	60
% time spent by maintenance	60%	40%	–	–	100%

Complete the table below (to the nearest $):

	Basis	Assembly	Finishing	Maintenance	Canteen	Total
Overhead	B Fwd	16,500	26,250	6,675	10,575	60,000
Canteen	Number of staff					
Maintenance	% time spent					
Total						

3.2 Step-down method

Example 3

Step-down method

A more accurate method is to fully reapportion the service centre that does the most work for the other service centre.

The production manager informs us that the 10 maintenance staff eat in the canteen therefore we should reapportion canteen first into maintenance and the production departments. Maintenance should then be reapportioned only into the production departments.

The following information is available:

	Assembly	Finishing	Maintenance	Canteen	Total
Number of staff	20	40	10	–	70
% time spent by maintenance	60%	40%	–	–	100%

Complete the table below (to the nearest $):

	Basis	Assembly	Finishing	Maintenance	Canteen	Total
Overhead	B Fwd	16,500	26,250	6,675	10,575	60,000
Canteen	Number of staff			1,511		
Maintenance	% time spent					
Total						

3.3 Repeated distribution method

When the service cost centres use each other's services the repeated distribution method is used for reapportionment.

As seen in the previous examples the services cost centres were canteen and maintenance, it is possible that the maintenance staff could use the services of the canteen and should therefore pick up a share of the canteen's costs. It is also possible that the canteen uses the services of the maintenance department and should therefore also pick up a share of the maintenance department costs. This is known as **reciprocal servicing**.

Using the repeated distribution method the service cost centre costs are apportioned backwards and forwards between the cost centres until the figures become very small. At this stage it might be necessary to round the last apportionments.

Example 4

A manufacturing company has two production cost centres (P1 and P2) and two service cost centres (S1 and S2). The following shows the work done by the two service cost centres:

	P1	P2	S1	S2
Work done by S1	55%	35%		10%
Work done by S2	30%	65%	5%	

After the initial allocation and apportionment of overheads, the totals for each cost centre were:

	P1	P2	S1	S2
	$	$	$	$
Overhead cost	150,000	205,000	21,000	15,000

The reapportionment of the service cost centres is shown below:

	P1	P2	S1	S2
	$	$	$	$
Overhead cost	150,000	205,000	21,000	15,000
Reapportion S1				
Reapportion S2				
Reapportion S1				
Reapportion S2				
Reapportion S1				
Total overhead				

Test your understanding 3

GHS has commenced the preparation of its fixed production overhead budget for year 2 and has identified the following costs:

	$000
Machining	600
Assembly	250
Finishing	150
Stores	100
Maintenance	80
	1,180

The Stores and Maintenance departments are production service departments. An analysis of the services they provide indicates that their costs should be apportioned as follows:

	Machining	Assembly	Finishing	Stores	Maintenance
Stores	40%	30%	20%	–	10%
Maintenance	55%	20%	20%	5%	–

After the apportionment of the service department costs, the total overheads of the production departments will be (to the nearest $500)

	$
Machining	
Assembly	
Finishing	

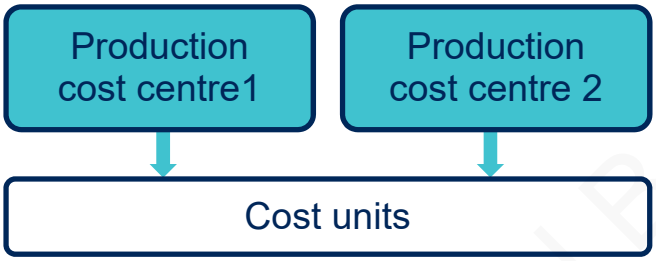
Illustrations and further practice

Notes

4 Absorption

4.1 Overhead absorption

The last stage in absorption costing is the absorption of the overheads into the cost units produced in the production cost centres. This is sometimes referred to as **overhead recovery**.



The absorption can be done on a number of bases, the most common are:

- physical units produced
- labour hours worked
- machine hours operated.

Different production cost centres may use different bases.

4.2 Overhead absorption rate

An overhead absorption rate is used to calculate the amount of overhead to be picked up by each unit.

$$\text{Overhead absorption rate (OAR)} = \frac{\text{Budgeted production overhead}}{\text{Budgeted quantity of absorption base (units/labour hours/machine hours)}}$$

Notes

Example 5

Overheads have been allocated, apportioned and reapportioned to 2 production cost centres as below:

	Prod cost centre 1	Prod cost centre 2
Total overheads	$108,802	$102,998
Labour hours	15,000	10,000
Machine hours	20,000	6,000

The overheads of production department 1 would be absorbed on the basis of machine hours as it is more machine hour intensive, while production department 2 would use labour hours as it is more labour intensive.

OAR for production cost centre 1 =

OAR for production cost centre 2 =

Notes

4.3 Applying the overhead absorption rate

Example 6

For every machine hour a unit uses in production cost centre 1 it will pick up $5.44 and for every labour hour a unit uses in production cost centre 2, it will pick up $10.30.

Consider the following data for product XX:

	Prod cost centre 1	Prod cost centre 2
Labour hours per unit	5	3
Machine hours per unit	2	4

The overhead one unit of product XX will pick up is:

Production cost centre 1:

Production cost centre 2:

Remember: this is the overhead, or indirect cost, to be picked up by each unit of XX. To find the total cost of a unit of XX the direct costs must be added on.

Notes

Test your understanding 4

A hotel has completed its initial allocation and apportionment of overhead costs and has established that the total budgeted annual overhead cost of its linen services activity is $836,000

The cost unit used to plan and control costs in the hotel is an occupied room night. The hotel expects the occupancy rate of its 400 rooms, which are available for 365 nights each year, to be 85% for the forthcoming year.

To the nearest cent, the overhead absorption rate for the linen services activity is:

$_____ per occupied room night

Illustrations and further practice

Notes

5 Under and over absorption

5.1 Predetermined overhead absorption rates

Overhead absorption rates are usually predetermined, that is, they are calculated in advance of the period over which they will be used, **using budgeted or expected costs and activity levels**.

5.2 Under or over absorption

The problem with using predetermined overhead absorption rates is that the actual figures for overhead and for the absorption base **are likely to be different** from the estimates used in calculating the absorption rate.

At the end of the period, the company must determine if it has absorbed too much or too little overhead into the products. Two things could have changed during the period:

-
-

It is these differences which cause an under- or over-absorption of production overheads.

Notes

Example 7

Consider the following data:

Budgeted labour hours	12,000
Budgeted overheads	$175,000
Actual labour hours	11,500
Actual overheads	$182,000

Calculate the over or under absorption of overheads.

Step one – calculate the OAR

Labour hour overhead absorption rate =

Step two – calculate the overhead absorbed

Overhead absorbed =

Step three – compare the actual cost with the absorbed overhead

Absorbed > Actual = Over absorbed

Absorbed < Actual = Under absorbed

	$
Overhead incurred	
Overhead absorbed	
	_____
Under-absorption	
	_____

Test your understanding 5

Budgeted labour hours	8,500
Budgeted overheads	$148,750
Actual labour hours	7,928
Actual overheads	$146,200

(a) What is the labour hour overhead absorption rate?

A $17.50 per hour

B $17.20 per hour

C $18.44 per hour

D $18.76 per hour

(b) What is amount of overhead under-/over-absorbed?

A $2,550 under-absorbed

B $7,460 over-absorbed

C $2,550 over-absorbed

D $7,460 under-absorbed

Test your understanding 6

Production overhead in department A is absorbed using a predetermined rate per machine hour. Last period, the production overhead in department A was under-absorbed.

Which of the following situations could have contributed to the under-absorption? (Tick all that apply)

The actual production overhead incurred was lower than budgeted	
The actual production overhead incurred was higher than budgeted	
The actual machine hours were lower than budgeted	
The actual machine hours were higher than budgeted	

Test your understanding 7

A management consultancy recovers overheads on chargeable consulting hours. Budgeted overheads were $615,000 and actual consulting hours were 32,150. Overheads were under-recovered by $35,000.

If actual overheads were $694,075, what was the budgeted overhead absorption rate per hour?

A $19.13

B $20.50

C $21.59

D $22.68

Illustrations and further practice

Notes

6 Production overhead account

The production overhead account gathers all of the production overheads (or indirect costs) in a period.

Example 8

Production overhead account

	$		$
Actual overhead incurred	24,000	Absorbed overhead (WIP)	24,000
	24,000		24,000

At the end of the period the production overhead cost is absorbed into work in progress costs using the predetermined overhead absorption rate. The amount absorbed is credited in the production overhead account and debited in the work in progress account.

In the above, if we assume $24,000 would be debited to the work in progress account, the balance on the production overhead account would be zero.

Where there is a remaining balance on the production overhead account, this represents the amount of production overhead which is **under absorbed** (debit balance) or **over absorbed** (credit balance).

Notes

6.1 Over absorbed overheads

Example 9

If $28,500 of overheads were absorbed into work in progress:

Production overhead account

	$		$
Actual overhead incurred	24,000	Work in progress	28,500
Over absorption	4,500		
	28,500		28,500

Production overhead over absorption account

	$		$
		Production overhead	4,500

To take this over absorption to the statement of profit or loss, the entry would be:

Debit Production overhead over absorption account
Credit Statement of profit or loss

A credit to the statement of profit or loss reduces the cost which makes sense as we have absorbed too much overhead.

Note: If there is no production overhead over absorption account, the over absorption can be taken straight to the statement of profit or loss. The entry to record the over absorption would be:

Debit Production overhead account
Credit Statement of profit or loss

6.2 Under absorbed overheads

Example 10

If $21,000 of overheads were absorbed into work in progress:

Production overhead account

	$		$
Actual overhead incurred	24,000	Work in progress	21,000
		Under absorption	3,000
	24,000		24,000

Production overhead under absorption account

	$		$
Production overhead	3,000		

To take this under absorption to the statement of profit or loss, the entry would be:

Debit Statement of profit or loss account
Credit Production overhead under absorption account

A debit to the statement of profit or loss increases the cost which makes sense as we have absorbed too little overhead.

Note: If there is no production overhead under absorption account, the under absorption can be taken straight to the statement of profit or loss. The entry to record the under absorption would be:

Debit Statement of profit or loss
Credit Production overhead account

Notes

Test your understanding 8

In an integrated accounting system, the accounting entries required when a company absorbs production overheads would be:

	Debit	Credit
A	Work in progress	Overheads
B	Overheads	Work in progress
C	Overheads	Cost of sales
D	Cost of sale	Overheads

Test your understanding 9

At the end of a period, in an integrated accounting system, the accounting entries for $18,000 overheads under-absorbed would be:

	Debit	Credit
A	Work in progress	Overheads
B	Statement of profit or loss	Work in progress
C	Statement of profit or loss	Overheads
D	Overheads	Statement of profit or loss

Notes

Illustrations and further practice

Notes

Further practice

Exam kit questions

Test your understanding answers

Test your understanding 1

Match the overhead costs to the most appropriate basis of cost apportionment. An apportionment basis may be selected more than once.

Overhead cost	Apportionment basis
Canteen costs	Number of employees
Cleaning of factory premises	Floor area
Power	Machine running hours
Rent	Floor area
Insurance of plant and machinery	Plant and equipment at cost

Test your understanding 2

	Total $	Machining $	Assembly $	Finishing $
Maintenance cost	38,000	19,000	13,300	5,700

Working:

Overhead cost per maintenance hour = $38,000/2,000 hours = $19

Machining = $19 × 1,000 hours = $19,000

Assembly = $19 × 700 hours = $13,300

Finishing = $19 × 300 hours = $5,700

Test your understanding 3

	$
Machining	691,500
Assembly	299,500
Finishing	189,000

Working:

	Machining	Assembly	Finishing	Stores	Maintenance
Allocated costs	600	250	150	100	80
Stores apportionment	40	30	20	(100)	10
Maintenance apportionment	49.5	18	18	4.5	(90)
Stores apportionment	2	1.5	1	(4.5)	–
Total	691.5	299.5	189	–	–

Test your understanding 4

The overhead absorption rate for the linen services activity is **$6.74** per occupied room night.

Budgeted number of occupied room nights

= 400 rooms × 365 nights × 85% = 124,100 occupied room nights

Overhead absorption rate = $836,000/124,100 = $6.74

Test your understanding 5

(a) **A**

OAR = $148,750 / 8,500 = **$17.50 per hour**

(b) **D**

	$
Overhead incurred	146,200
Overhead absorbed ($17.50 × 7,928)	138,740
Under-absorption	7,460

Test your understanding 6

The actual production overhead incurred was lower than budgeted	
The actual production overhead incurred was higher than budgeted	✓
The actual machine hours were lower than budgeted	✓
The actual machine hours were higher than budgeted	

Test your understanding 7

B

Overhead incurred	$694,075
Less under-absorption	($35,000)
Overhead absorbed	$659,075

OAR = 659,075/32,150 = **$20.50**

Test your understanding 8

A

The production overhead is first collected in the overhead account. It is then absorbed into production costs by debiting the work in progress account using the predetermined overhead absorption rate.

Test your understanding 9

C

Under-absorbed overhead is transferred from the production overhead account as a debit to the statement of profit or loss.

Notes

Chapter 8

Absorption and marginal costing

Outcome

By the end of this session you should be able to:

- explain the importance of, and apply, the concept of contribution
- demonstrate and discuss the effect of absorption and marginal costing on inventory valuation and profit determination
- calculate profit or loss under absorption and marginal costing
- reconcile the profits or losses calculated under absorption and marginal costing
- describe the advantages and disadvantages of absorption and marginal costing.

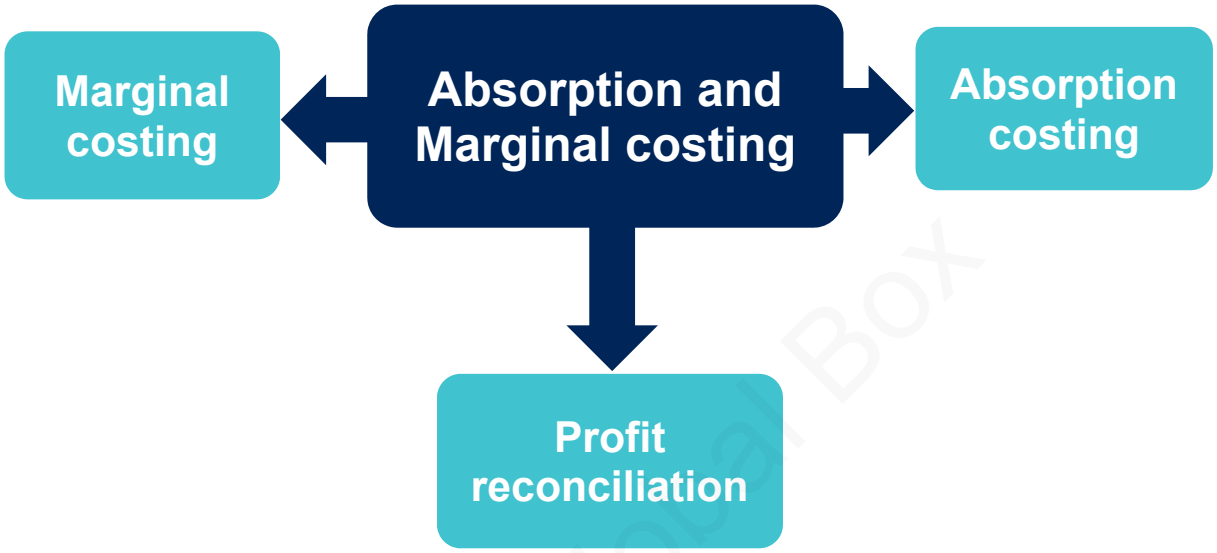
and answer questions relating to these areas.

PER

One of the PER performance objectives (PO12) is to apply different management accounting techniques is different business contexts to effectively manage and use resources. Working through this chapter should help you understand how to demonstrate that objective.

The underpinning detail for this Chapter in your Integrated Workbook can be found in Chapter 8 of your Study Text

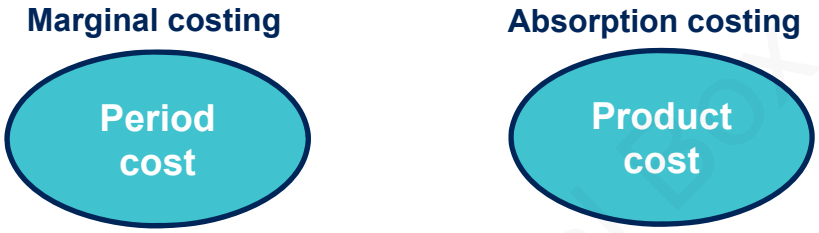
Overview



1 The treatment of fixed production costs

Marginal and absorption costing are two different ways of valuing the cost of goods sold and finished goods in inventory which can affect the profit charged to the statement of profit or loss.

The main difference between marginal costing and absorption costing is the treatment of fixed production costs:



- Period costs are costs which are charged in full to the statement of profit or loss in the period in which they are incurred.
- Product costs are charged to the individual product and matched against the sales revenue they generate.

Notes

2 Marginal costing

The marginal cost of a product is the additional cost incurred in producing one additional unit of the product. This will include the total of the variable costs, including direct materials, direct labour, direct expenses and variable overheads.

Note that fixed overheads are not included as the total fixed production overhead will not increase as a result of making one additional unit. Fixed overheads are treated as a period cost and deducted in full within the statement of profit or loss

2.1 Contribution

The contribution concept lies at the heart of marginal costing. Contribution can be calculated as follows:

CONTRIBUTION = SALES VALUE – VARIABLE COSTS

Once the contribution from a product or service has been calculated, the fixed costs associated with the product or service can be deducted to determine the profit for the period.

- Contribution gives an idea of how much 'money' there is available to 'contribute' towards paying for the fixed costs of the organisation and generating profit.
- At varying levels of output and sales, contribution per unit is constant (while profit varies).
- Can be used to calculate profit:

  Total contribution = Contribution per unit × Sales volume.

  Profit = Total contribution – Fixed costs.

Notes

2.2 Marginal costing profit statement

Example 1

Summary results for Y Ltd for this month are as follows:

		$000
Sales revenue		820
Variable production costs		300
Variable selling costs		105
Fixed production costs		180
Fixed selling costs		110
Production in month	1,000 units	
Opening inventory	0 units	
Closing inventory	150 units	

A Marginal costing profit statement

	$000	$000
Sales		
Less Cost of sales:		
Opening inventory		
Variable production costs		
Less Closing inventory		
Less variable selling, admin and distribution costs		
Contribution		
Less fixed production costs		
Less fixed non-production costs		
Profit/(loss)		

Notes

Test your understanding 1

Consider a product with a variable cost per unit of $26 and selling price of $42. Fixed costs for the period are $12,000.

(a) What is the contribution per unit for the product?

(b) If 1,000 units are sold, what is the total contribution?

(c) What is the total profit and profit per unit at this level of sales?

(d) Calculate the total profit and profit per unit for the following levels of sales:

- 500 units
- 900 units
- 1,200 units

Test your understanding 2

For the forthcoming year, GHI's variable costs are budgeted to be 60% of the sales value and fixed costs are budgeted to be 10% of sales value.

If GHI increases its selling prices by 10%, but if fixed cost, variable costs per unit and sales volume remain unchanged, the effect on GHI's contribution would be:

A a decrease of 2%

B an increase of 5%

C an increase of 10%

D an increase of 25%

Illustrations and further practice

Notes

2.3 Advantages and disadvantages of marginal costing

When compared to other costing systems the marginal costing system has the following advantages and disadvantages.

Advantages

- Simple.
- Avoids arbitrary allocation and absorption of overheads.
- Better for short-term decision making.
- Profits only rise if sales rise (not production).

Disadvantages

- Fixed overheads may be significant.
- Some direct costs may be fixed.

Notes

3 Absorption costing

The **absorption** cost of a product is the **full** cost of producing a unit of the product. This will include the total of the variable costs, including direct materials, direct labour, direct expenses and variable overheads **and** fixed production overheads.

In the previous chapter we looked at how production overheads are absorbed into each cost unit.

3.1 Absorption costing profit statement

Example 2

Summary results for Y Ltd for this month are as follows:

	$000
Sales revenue	820
Variable production costs	300
Variable selling costs	105
Fixed production costs	180
Fixed selling costs	110

Production in month	1,000 units
Opening inventory	0 units
Closing inventory	150 units

Absorption costing profit statement

	$000	$000
Sales		
Less Cost of sales:		
Opening inventory		
Production costs		
Less Closing inventory		
Gross profit		
Less non-production costs:		
Variable selling costs		
Fixed selling costs		
Profit/(loss)		

Notes

3.2 Advantages and disadvantages of absorption costing

When compared to other costing systems the absorption costing system has the following advantages and disadvantages.

Advantages

- Fixed production costs can be a significant part of total costs.
- This method is required for financial reporting purposes.
- Under/over-absorption can identify inefficient utilisation.
- There is an argument that in the longer term, all costs are variable.

Disadvantages

- It requires arbitrary apportionment and allocation of overheads.
- The absorption basis may not actually drive the overhead cost.
- It is more complex than marginal costing.
- It encourages over-production.

Notes

4 Comparing marginal and absorption costing profits

4.1 Comparing absorption and marginal costing

Marginal costing highlights the contribution per unit and treats fixed production overheads as a period cost, deducting these in total from the total contribution.

- In marginal costing, the fixed costs actually incurred are deducted from contribution earned in order to determine the profit or loss for the period.

Absorption costing treats fixed production overhead as a product cost and each unit absorbs a share of the fixed overhead.

- In absorption costing, fixed overheads are absorbed into each unit of product using a predetermined overhead absorption rate. An adjustment for under or over absorption of overheads is necessary in absorption costing statements of profit or loss.

Notes

4.2 Changes in inventory levels

In a period where more or less inventory is produced than is sold, inventory levels will change and the profits under marginal and absorption costing will differ.

- Marginal costing values inventory at the **total variable production cost** of a unit of product while absorption costing values inventory at the **full production cost** of a unit of product.
- Inventory values will be different at the beginning and end of a period under marginal and absorption costing.
- If inventory values are different, then this will have an effect on the cost of sales and therefore on the profits reported in the statement of profit or loss in a period under both methods.

Notes

4.3 Reconciling marginal and absorption costing profits

- **If inventory levels are constant, both methods give the same profit.**
- **If inventory levels increase, absorption costing gives the higher profit.**

  This is because in absorption costing, fixed overheads held in closing inventory are carried forward to the next accounting period instead of being written off as a period cost in the current accounting period as in marginal costing.

- **If inventory levels decrease, marginal costing gives the higher profit.**

  This is because fixed overhead brought forward in opening inventory is released, thereby increasing cost of sales and reducing profits.

The difference in profits is caused by the fixed overheads contained in inventory:

	$
Absorption costing profit	X
(Increase)/decrease in inventory × fixed overheads per unit	(X)/X
Marginal costing revenue	X

As inventory...	Which profit is higher?
Increases	Absorption costing
Decrease	Marginal costing

Notes

Example 3

A company produced 3,000 units of their only product in the last period. The unit costs of the product were:

	$
Direct material	20
Direct labour	15
Variable production overhead	8
Fixed production overhead	11
Total production cost	54

The sales for the period were 2,500 units.

There were 50 units of opening inventory.

The fixed production overhead incurred in the last period was $30,000

The profit using absorption costing was $54,250 and marginal costing was $48,750

Reconcile the profits

	$
Absorption costing profit	
(Increase)/decrease in inventory × OAR	
Marginal costing profit	

Further explanation

Notes

Test your understanding 3

ABC makes only one product, the unit costs of which are:

	$
Direct materials	3
Direct labour	6
Variable production overhead	2
Fixed production overhead	4
Variable selling cost	5

The selling price of one unit is $21

Budgeted fixed overheads are based on budgeted production of 5,000 units. Opening inventory was 1,000 units and closing inventory was 4,000 units.

Sales during the period were 3,000 units and actual fixed production overheads incurred were $25,000.

(a) Calculate the total contribution earned during the period

(b) Calculate the total profit or loss for the period under marginal costing

(c) Calculate the total profit or loss for the period under absorption costing

(d) Reconcile the profits calculated in parts (c) and (d)

Notes

Test your understanding 4

The number of units of closing inventory at the end of a period is greater than at the beginning.

What would the effect be of using marginal costing method of inventory valuation?

A less operating profit than the absorption costing method

B the same operating profit as the absorption costing method

C more operating profit than the absorption costing method

D more or less operating profit than the absorption costing method depending on the ratio of fixed to variable costs

Notes

Test your understanding 5

GHI has just completed its first year of trading, manufacturing and selling product GH1. The following information has been collected from the accounting records.

Product GH1

Sales volume	70,000
	$
Selling price per unit	8.00
Variable cost per unit	
Production	6.00
Selling and administration	0.20
Fixed costs per unit	
Production overhead	1.20

The fixed production overhead cost was based on a budget of $90,000. Actual fixed production overheads and production volume were as budgeted.

GHI uses absorption costing

If GHI used marginal rather than absorption costing:

The profit will be $_____higher/lower

Illustrations and further practice

Notes

Further practice

Exam kit questions

Test your understanding answers

Test your understanding 1

(a) Contribution per unit = sales value – variable costs

$42 – $26 = $16

(b) Total contribution = contribution per unit × number of units

$16 × 1,000 = $16,000

(c) Total profit = total contribution – fixed costs

$16,000 – $12,000 = $4,000

Profit per unit = total profit/number of units

$4,000/1,000 = $4

(d)

	500 units	900 units	1,200 units
	$	$	$
Contribution per unit	16	16	16
× units	500	900	1,200
Total contribution	8,000	14,400	19,200
Fixed costs	(12,000)	(12,000)	(12,000)
Profit	(4,000)	2,400	7,200
Profit per unit	($8)	$2.67	$6

Test your understanding 2

D

Fixed costs are not relevant because they do not affect contribution. Taking a selling price of, for example, £100 per unit, the cost structure will look like this:

	Before change $ per unit	After change $ per unit
Sales price	100	110
Variable cost	60	60
Contribution	40	50

Contribution per unit increases by 25%. If sales volume remains unchanged then total contribution will also increase by 25%

Test your understanding 3

(a) The total contribution earned during the period is **$15,000**

Total variable costs = $(3 + 6 + 2 + 5) = $16

Contribution per unit = $21 – $16 = $5

Total contribution = 3,000 × $5 = $15,000

(b) The total loss for the period under marginal costing is **$10,000**

Total profit/(loss) = total contribution – fixed production overheads incurred

= $(15,000 – 25,000) = $(10,000)

(c) The total profit for the period under absorption costing is **$2,000**

Total unit cost = $(3 + 6 + 2 + 5 + 4) = $20

Total profit per unit = $21 – $20 = $1

	$
Gross profit ($1 × 3,000)	3,000
Less under absorption of overheads*	(1,000)
Total profit	2,000

* Overheads have been under-absorbed

	$
Overhead absorbed ($4 × 6,000**)	24,000
Overhead incurred	25,000
Under-absorbed overheads	1,000

**6,000 units have been produced

	Units
Sales	3,000
Opening inventory	(1,000)
Closing inventory	4,000
Production	6,000

(d) Reconciliation

Absorption costing profit	2,000
Change in inventory × fixed overhead absorption rate (1,000 – 4,000) × $4	(12,000)
Marginal costing loss	(10,000)

Test your understanding 4

A

If the number of units of closing inventory at the end of a period is greater than at the beginning, marginal costing would give a lower operating profit than absorption costing.

Test your understanding 5

If GHI uses marginal rather than absorption costing, the profit will be **$6,000 lower**.

Budgeted production = budgeted fixed production overhead / fixed overhead absorption rate

= $90,000/$1.20 = 75,000 units

Opening inventory = 0 (just finished first year of trading)

Closing inventory = opening inventory + production – sales

= 0 + 75,000 – 70,000 = 5,000

Difference between marginal costing and absorption costing =

Change in inventory × fixed overhead absorption rate =

(0 – 5,000) × $1.20 = $6,000

Inventory is increasing therefore marginal profit will be lower.

Chapter 9

Process costing

Outcome

By the end of this session you should be able to:

- Job and batch costing:
  - describe the characteristics of job and batch costing
  - describe the situation where the use of job or batch costing would be appropriate
  - prepare cost records and accounts in job and batch costing situations
  - establish job and batch costs from given information
- Process costing:
  - describe the characteristics of process costing
  - describe situations where the use of process costing would be appropriate
  - explain the concepts of normal and abnormal losses and abnormal gains
  - calculate the cost per unit of process outputs
  - prepare process accounts involving normal and abnormal losses and abnormal gains
  - calculate and explain the concept of equivalent units
  - apportion process costs between work remaining in process and transfers out of a process using the weighted average and FIFO method (Note: situations involving work in progress (WIP) and losses in the same process are excluded)
  - prepare process accounts in situations where work remains incomplete

- prepare process accounts where losses and gains are identified at different stages of the process
- distinguish between by products and joint products
- value by products and joint products at the point of separation
- prepare process accounts in situations where by products and/or joint products occur.

and answer questions relating to these areas.

PER

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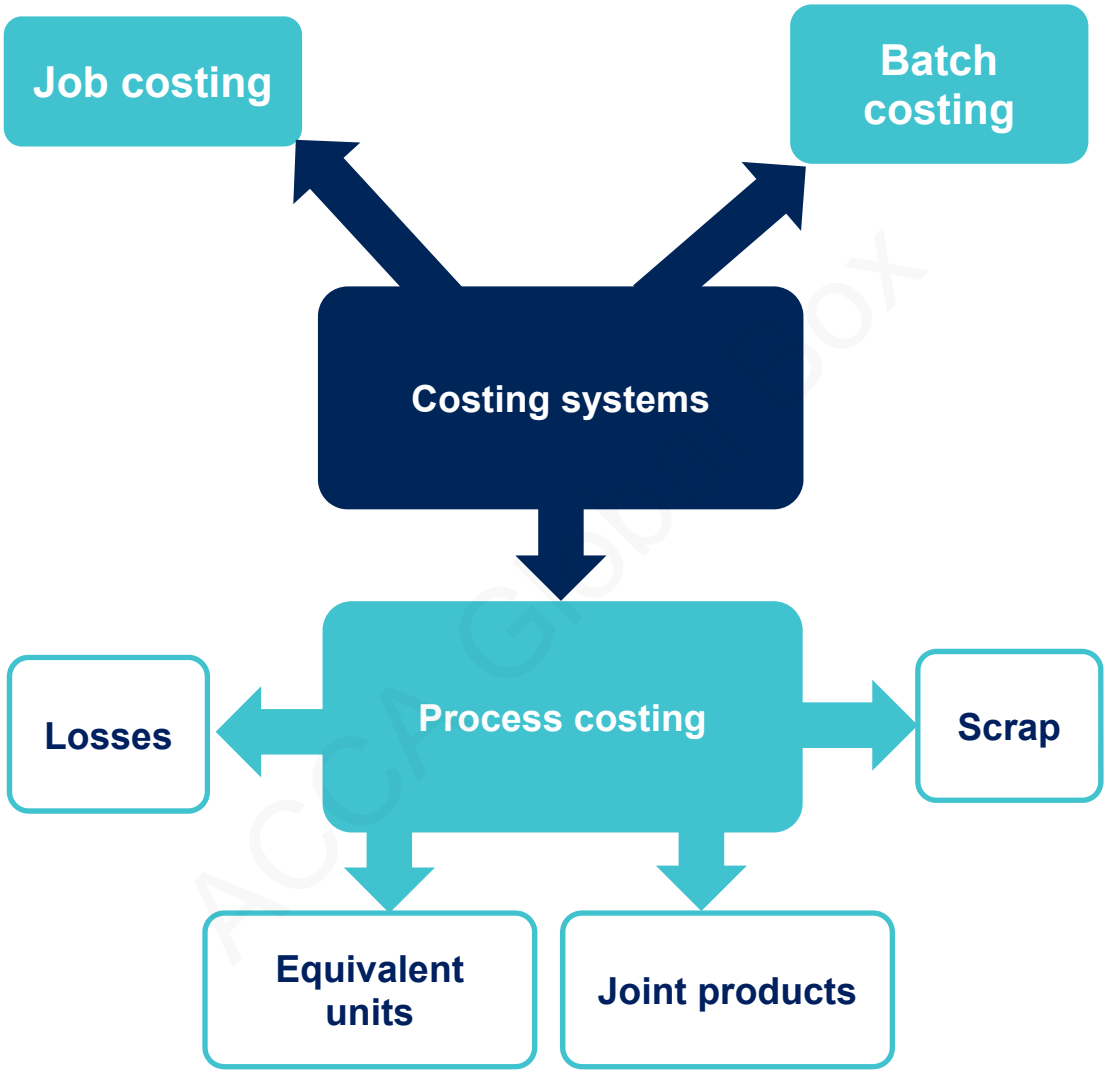
Overview



1 Different types of production

There are different types of costing system that are used depending on the type of production a business uses.

Specific order costing is the costing system used when the work done by an organisation consists of separately identifiable jobs or batches.

Continuous operation costing is the costing method used when goods or services are produced as a direct result of a sequence of continuous operations or processes.

Notes

2 Job and batch costing

2.1 Job costing

Job costing is a form of specific order costing and it is used in a business where the production is made up of individual jobs. Each job is different and has different inputs of materials and labour. Each job is identified separately and the costs are identified for this specific job, coded to it and recorded as job costs. Effectively the job is the cost unit.

Typical examples of businesses that use job costing would be ship building, civil engineering, construction, aeroplane manufacture, and vehicle repairs.

Test your understanding 1

Which of the following are characteristics of job costing? Select all that apply.

	Tick
Customer-driven production	
Job costing is a method of specific order costing	
Complete production possible within a single accounting period	
Can only be applied to manufacturing organisations	
Costs are gathered on a job cost sheet	

Notes

2.2 Batch costing

Batch costing is also a form of specific order costing. It is suitable for a business that produces batches of identical units, but each batch is for different units.

For example, a clothing manufacturer may have a production run for a batch of men's white shirts of collar size 16 inches. It may then have a production run for a batch of men's trousers with a waist size of 34 inches.

Each batch of production will have different costs but each unit within the batch should have the same cost. Therefore the total cost of the batch of production is calculated and divided by the number of units in that batch to find the cost per unit for that batch of production.

Illustrations and further practice

Notes

3 Process costing

Process costing is the costing method applicable where goods or services result from a sequence of continuous or repetitive operations or processes.

Process costing is used when a company is mass producing the same item and the item goes through a number of different stages.

Process costing is an example of continuous operation costing.

Examples include the chemical, cement, oil refinery, paint and textile industries.

Example 1

Fresh Walls manufactures paint through a series of processes. The data for the first process during a particular period is as follows:

The first stage is to input the raw materials to make the paint and mix and combine these materials. To do this the manufacturer incurs costs for materials, labour and overheads. By changing or processing the raw materials the value of the raw materials increases due to the cost of the labour and overheads.

We can show this by using a process account.

Process 1 account

	Litres	$		Litres	$
Materials	2,000	3,000	Output to Process 2	2,000	4,000
Labour		570			
Overheads		430			
	2,000	4,000		2,000	4,000

The next stage of this process is to add colour to the mixture. The output from the first process is transferred to the next process and more value is added with extra labour and overhead being added.

Process 2 account

	Litres	$		Litres	$
Input materials from Process 1	2,000	4,000	Output materials to Process 3	2,500	5,650
New materials	500	550			
Labour		600			
Overheads		500			
	2,500	5,650		2,500	5,650

The cost per litre of material input at the start of production = $3,000 ÷ 2,000 = $1.50

The cost per litre at the end of Process 1 = $4,000 ÷ 2,000 = $2.00

The cost per litre at the end of Process 2 = $5,650 ÷ 2,500 = $2.26

Notes

4 Losses in a process

In many industrial processes, some input is lost or damaged during the production process. This leads to the concept of normal losses (if the loss is as expected) and abnormal losses or gains (if the loss is more or less than expected).

Flow of units

- Input + Abnormal gain* = Output + Normal loss + Abnormal loss*
- *Abnormal gain OR Abnormal loss

Normal loss

- Normal loss represents items that you expect to lose during a process
- NL is valued at zero in the process account unless it can be sold as scrap

Scrap value

- If normal loss can be sold it will be transferred to the scrap account at the scrap value
  - Cr Process account, Dr Scrap account

Average cost per unit (value of good output)

- = Net costs of inputs / expected output
- = (input costs – scrap value) / (input units – NL units)

Abnormal loss

- An abnormal loss is more loss than expected – any loss above the normal loss
- AL is transferred to the AL account at the value of good output
  - Cr Process account, Dr AL account
- AL is then transferred to the scrap account at the scrap value
  - Cr AL account, Dr Scrap account

Abnormal gain

- An abnormal gain is less loss than expected – decrease in the NL and an increase in good output
- AG is transferred to the AG account at the value of good output
  - Dr Process account, Cr AG account
- AG is then transferred to the scrap account at the scrap value
  - Dr AG account, Cr Scrap account

There is a step by step procedure that can be followed for process costing and losses:

- Balance the units.
- Value the normal loss.
- Calculate the average cost per unit.
- Value the outputs, AL or AG at the average cost per unit and complete the process account.
- Transfer the NL to the scrap account at the scrap value.
- Transfer the AL or AG to the AL/AG account at the value of good output
- Transfer the AL or AG to the scrap account at the scrap value
- Balance the AL/AG and scrap accounts

Note: Not all steps may be required – it depends on whether the losses in the process can be sold or not.

Notes

Example 2

At the start of a heating process 1,000 kg of material costing $18 per kg is input. Normal loss is expected to be 10% of input which can be sold for $1.80 per kg. Labour costs are $1,800 and overheads are $900. Output was 800 kg.

Step 1 – balance the units and determine any loss/gain

Input = Output + Loss

Step 2 – value the normal loss

Step 3 – calculate the average cost per unit

The cost per unit = net cost of inputs ÷ expected output

Step 4 – value the output and complete the process account

Process account

	Kg	$		Kg	$
Materials			Output		
Labour			Normal loss		
Overheads			Abnormal loss		

Step 5 – complete the normal loss (scrap) and abnormal loss accounts

(a) the normal loss is transferred to the normal loss account

(b) the abnormal loss is transferred to the abnormal loss account

(c) the abnormal loss increases the availability of scrap to be sold. It is transferred from the abnormal loss account to the scrap account at the scrap value.

(d) the balancing figure in the abnormal loss account shows the net loss from having lost more than expected.

(e) the balancing figure in the scrap account represents the cash received for the sale of the loss.

Normal loss (scrap) account

	Kg	$		Kg	$
(a) Process account (NL)			(e) Cash/Bank		
(c) Abnormal loss					

Abnormal loss

	Kg	$		Kg	$
(b) Process account (AL)			(c) Normal loss		
			(d) SoPL		

Notes

Example 3

At the start of a heating process 1,000 kg of material costing $18 per kg is input. Normal loss is expected to be 10% of input which can be sold for $1.80 per kg. Labour costs are $1,800 and overheads are $900. Output was 950 kg.

Step 1 – balance the units and determine any loss/gain

Input = Output + Loss

Step 2 – value the normal loss

Step 3 – calculate the average cost per unit

The cost per unit = net cost of inputs ÷ expected output

Step 4 – value the output and complete the process account

Process account

	Kg	$		Kg	$
Materials			Output		
Labour			Normal loss		
Overheads					
Abnormal gain					
	_____	_____		_____	_____
	_____	_____		_____	_____

Step 5 – complete the normal loss (scrap) and abnormal loss accounts

(a) the normal loss is transferred to the normal loss account

(b) the abnormal gain is transferred to the abnormal gain account

(c) the abnormal gain reduces the availability of scrap to be sold. It is transferred from the abnormal gain account to the scrap account at the scrap value.

(d) the balancing figure in the abnormal gain account shows the net gain from having lost less than expected.

(e) the balancing figure in the scrap account represents the cash received for the sale of the remaining loss.

Normal loss (scrap) account

	Kg	$		Kg	$
(a) Process account (NL)			(c) Abnormal gain		
			(e) Cash/Bank		
	____	____		____	____
	____	____		____	____

Abnormal gain

	Kg	$		Kg	$
(c) Normal loss			(b) Process account (AG)		
(d) SoPL					
	____	_____		____	_____
	____	_____		____	_____

Notes

Test your understanding 2

X plc makes one product, which passes through a single process.

Details of the process are as follows:

Materials: 5,000 kg at $0.50 per kg

Labour: $800

Production overheads: 200% of labour

Normal losses are 20% of input in the process, and without further processing any losses can be sold as scrap for $0.30 per kg.

The output for the period was 3,800 kg from the process.

There was no work in progress at the beginning or end of the period.

Calculate the following values:

	$
The amount to be credited to the process account for the value of the normal loss is:	
The value of the abnormal loss in the process account is:	
The value of the completed output is:	

Notes

Test your understanding 3

In process costing, where losses have a positive scrap value, when an abnormal gain arises the abnormal gain account is:

A debited with the normal production cost of the abnormal gain units

B credited with the normal production cost of the abnormal gain units

C credited with the normal production cost of the abnormal gain units and debited with the scrap value of the abnormal gain units

D debited with the normal production cost of the abnormal gain units and credited with the scrap value of the abnormal gain units.

Illustrations and further practice

Notes

5 Work in progress

Equivalent units (EU)

- Closing work in progress and completed units need to be valued in a fair way so we use the concept of equivalent units

Equivalent units = Number of physical units × percentage completion.

At the end of a period there are 1,000 units that 50% complete, this is the equivalent of 1,000 × 50% = 500 EU

Different degrees of completion

- A process involves direct materials and conversion costs (direct labour and overheads)
- Usually all the material is input at the beginning of the process, whereas the conversion is 'added' as the product advances through the process. This means there may be a different amount of EUs for conversion and materials i.e. different degrees of completion.

The cost per EU

- The cost per EU will be calculated and applied to the completed units, and CWIP based on the number of EU.
- Cost per EU = total cost for materials or conversion / total EU for materials or conversion

Closing work in progress units

- Process costing is used for products where there are incomplete units at the end of a time period – closing work in progress (CWIP)

Opening work in progress

- Process costing is used for products where there are m units at the start of a time period – opening work in progress (OWIP)
- EUs are used to ensure the costs to complete the OWIP are fairly shared with the completed units and the CWIP

There are 2 different techniques that need to be considered for OWIP

Average cost method (AVCO)/weighted average cost method (WACO)

- Used when the units of a product are mixed together and are inseparable (liquids)
- OWIP brought forward costs are included in the cost per EU calculation

First in First out (FIFO)

- Used when the units are separable and identifiable (cars on a production line)
- The OWIP is completed first then further units are started
- The OWIP EUs are based on how much effort is needed to complete the OWIP
- OWIP brought forward costs are included at the output valuation stage

A step by step approach is:

- Balance the units (there will be no losses or gains in the questions you are set).
- Calculate the EU for each element of cost – material, labour and overheads.
- Calculate total costs for each element of cost – material, labour and overheads.
- Calculate cost per EU for each element of cost.
- Calculate the value of the completed units and CWIP
- Complete the ledger accounts

Notes

Example 4

At the beginning of September, the opening work-in-process in Process 2 was 15,000 kilos. The degree of completion of the work, and the value of the opening WIP, were as follows:

	Degree of completion	Value
		$
Direct materials	100%	79,800
Conversion cost	40%	20,500
Total value		100,300

During September, 30,000 kilos of materials were input to the process from Process 1 and 38,000 kilos of completed units were output to Process 3. Closing work-in-process was 7,000 kilos, which were 100% complete for materials and 80% complete for conversion costs.

The cost of the materials transferred from Process 1 was $154,200 and conversion costs in Process 2 in the month were $145,180.

There are no losses or gains in the process.

Using the AVCO method, calculate the cost of output transferred to Process 3 in the period and the value of closing WIP. Prepare the ledger account for Process 2.

Step 1 – balance the units

OWIP + Input = Output units + CWIP

Step 2 – calculate the EUs for each element of cost

		Equivalent units	
	Physical units	Direct materials	Conversion costs
Finished output			
Closing WIP			
Total EU			

Step 3 – calculate the total cost for each element of cost

	Direct Materials	Conversion costs
	$	$
Opening WIP		
Current period		

Step 4 – calculate the cost per EU

Step 5 – value the completed units and closing WIP

The cost of finished output can be calculated as follows:

	$
Completed units =	
Closing WIP =	

Step 6 – complete the ledger accounts

Process 2 account

	Kilos	$		Kilos	$
Opening WIP			Output		
Materials			Closing WIP		
Conversion cost					

Notes

Example 5

At the beginning of September, the opening work-in-process in Process 2 was 15,000 kilos. The degree of completion of the work, and the value of the opening WIP, were as follows:

	Degree of completion	Value
		$
Direct materials	100%	79,800
Conversion cost	40%	20,500
Total value		100,300

During September, 30,000 kilos of materials were input to the process from Process 1 and 38,000 kilos of completed units were output to Process 3. Closing work-in-process was 7,000 kilos, which were 100% complete for materials and 80% complete for conversion costs.

The cost of the materials transferred from Process 1 was $154,200 and conversion costs in Process 2 in the month were $146,640.

There are no losses or gains in the process.

Using the FIFO method, calculate the cost of output transferred to Process 3 in the period and the value of closing WIP. Prepare the ledger account for Process 2

Step 1 – balance the units

OWIP + Input = Output units + CWIP

Step 2 – calculate the EUs for each element of cost

		Equivalent units	
	Physical units	Direct materials	Conversion costs
Finished output			
Opening WIP			
Completed units			
Closing WIP			
Total EU			

Step 3 – calculate the total cost for each element of cost

	Direct Materials	Conversion costs
	$	$
Current period only		

Step 4 – calculate the cost per EU

Step 5 – value the completed units and closing WIP

The cost of finished output can be calculated as follows:

	$
Completed units	
Opening WIP	
Value b/fwd	
Cost to complete	
Units started and completed	
Closing WIP	

Step 6 – complete the ledger accounts

Process 2 account

	Kilos	$		Kilos	$
Opening WIP			Output		
Materials			Closing WIP		
Conversion cost					

Notes

Test your understanding 4

PP Ltd makes one product, which passes through a single process. The details of the process for period 2 were as follows:

There were 400 units of opening work-in-progress, valued as follows:

Material	$49,000
Labour	$23,000
Production overheads	$3,800

No losses are expected in the process.

During the period, 900 units were added to the process, and the following costs occurred:

Material	$198,000
Labour	$139,500
Production overheads	$79,200

There were 500 units of closing work-in-progress, which were 100% complete for material, 90% complete for labour and 40% complete for overheads. No losses were incurred in the process.

PP Ltd uses weighted average cost method.

(a) The number of equivalent units used when calculating the cost per unit in relation to labour is_____

(b) The value of completed output for the period was $_____

(c) The value of the CWIP for the period was $_____

Notes

Test your understanding 5

CF Processing operates the FIFO method of accounting for opening work in process in its mixing process. The following data relate to April 20X8:

Opening work in process	1,000 litres valued at	$1,500
Input	30,000 litres costing	$14,700
Conversion costs		$10,115

Output	24,000 litres
Closing work in process	7,000 litres

Opening work in process was 100% complete as to input materials, and 70% complete as to conversion. Closing work in process is complete as to input materials and 80% complete as to conversion.

(a) Calculate the number of material-equivalent units produced.

(b) Calculate the number of conversion-equivalent units produced.

(c) Calculate the value of the completed output.

(d) Calculate the value of the closing work in progress.

Illustrations and further practice

Notes

6 Joint and by-products

The nature of process costing is such that processes often produce more than one product. These additional products may be described as either joint products or by-products. Essentially joint products are main products whereas by-products are incidental to the main products.

6.1 Joint products

Joint products are two or more products separated in the course of processing, each having a sufficiently high saleable value to merit recognition as a main product.

6.2 By-products

By-products are outputs of some value produced incidentally in manufacturing something else (main products).

The distinction between joint and by-products is important because the accounting treatment of joint products and by-products differs.

Notes

6.3 Joint costs

Joint process costs occur before the split-off point. The joint costs need to be apportioned between the joint products at the split-off point to obtain the cost of each of the products in order to value closing inventory and cost of sales.

The basis of apportionment of joint costs to products is usually one of the following:

- sales value of production (also known as market value)
- production units (physical measurement)
- net realisable value.

Example 6

Clare plc produces two products, X and Y, in a single joint process.

Last month the joint costs were $50,000.

5,000 units of Product X and 7,500 units of Product Y were produced.

Additional processing costs were $10,000 for Product X and $5,000 for Product Y.

Product X sells for $15, and Product Y sells for $8.

The Market value method of apportioning joint costs:

Physical units method of apportioning joint costs:

The net realisable value method of apportioning joint costs:

Notes

6.4 By-products

Non-cost methods

Non-cost methods make no attempt to allocate joint cost to the by-product but instead the proceeds either increase income or to reduce the cost of the main product.

- Other income – The net sales of by-products for the current period is recognised as other income and is reported in the statement of profit or loss.
- By-product revenue deducted from the main product(s) cost – The net sales value of the by-products will be treated as a deduction from the cost of the main product(s). This is similar to the accounting treatment of normal loss.

Cost methods

Cost methods attempt to allocate some joint costs to by-products and to carry inventories at the allocated cost levels.

- Replacement cost method – values the by-product inventory at its opportunity cost of purchasing or replacing the by-products.
- Total costs less by-products valued at standard price method – By-products are valued at a standard price to avoid fluctuations in by-product value. This means that the main product cost will not be affected by any fluctuations in the by-product price.
- Joint cost pro-rata method – allocates some of the joint cost to the by-product using any one of the joint cost allocation methods. This method is rarely used in practice.

Notes

Test your understanding 6

A by-product is

A a product which arises in a process at the same time as other products and which has a significant sales value

B a product which arises in a process at the same time as other products and which requires further processing after separation in the main process

C a product which arises in a process at the same time as other products and which has no sales value

D a product which arises in a process at the same time as other products and which has a relatively low sales value

Test your understanding 7

A company produces two products along with a single by-product. The joint process costs total $100,000. Product X can be sold for $225,000 after additional processing of $125,000; Product Y can be sold for $300,000 after additional processing of $100,000. The by-product AZ can be sold for $12,500 after packaging costs of $2,500. The by-product is accounted for using the by-product revenue deducted from the main product cost approach.

What would be the joint cost allocation using the net realisable value method?

	Product X	Product Y
A	$30,000	$60,000
B	$33,333	$66,667
C	$38,572	$51,429
D	$42,857	$57,143

Illustrations and further practice

Notes

Further practice

Exam kit questions

Test your understanding answers

Test your understanding 1

	Tick
Customer-driven production	✓
Job costing is a method of specific order costing	✓
Complete production possible within a single accounting period	✓
Can only be applied to manufacturing organisations	
Costs are gathered on a job cost sheet	✓

Test your understanding 2

The amount to be credited to the process account for the value of the normal loss is:	Normal loss = 20% × 5,000 kg = 1,000 kg Scrap value = 1,000 kg × $0.30 = **$300**
The value of the abnormal loss in the process account is:	Input = Output + NL + AL 5,000 = 3,800 + 1,000 + 200 Expected output = Input units – NL units = 5,000 – 1,000 = 4,000 units Net costs = 2,500 + 800 + 1,600 – 300 = $4,600 Value of AL = 200 × $4,600/4,000 = **$230**
The value of the completed output is:	3,800 × $4,600/4,000 = **$4,370**

Test your understanding 3

C

Since the process account is debited with the production value, the abnormal gain account is credited with this value to complete the double entry. The scrap value of the abnormal gain (which represents a loss of expected revenue) is then debited to the abnormal gain account, and the resulting balance represents the net gain.

Test your understanding 4

(a) The number of equivalent units of labour is **1,250**.

The weighted average cost method is used, so OWIP cost is included in the calculations of equivalent units.

OWIP + Input = Output + CWIP

400 + 900 = **800** + 500

	Total units	**Equivalent units**		
		Materials	**Labour**	**Overhead**
Finished output	800	800	800	800
CWIP	500	500	450	200
Total equivalent units	1,300	1,300	1,250	1,000

(b) The value of completed output for the period was **$322,400.**

Costs	**Materials**	**Labour**	**Overhead**	**Total**
	$	$	$	
OWIP	49,000	23,000	3,800	
Incurred during the period	198,000	139,500	79,200	
Total costs	247,000	162,500	83,000	
Cost per equivalent unit	$190	$130	$83	$403

Therefore the value of completed output = 800 units × $403 = $322,400.

(c) The value of CWIP for the period was **$170,100**

(500 × $190) + (450 × $130) + (200 × 83) = $170,100

Test your understanding 5

(a) The number of material-equivalent units produced was **30,000 litres.**

(b) The number of conversion-equivalent units produced was **28,900 litres**.

(c) The value of the completed output is **$20,925**

(d) The value of the closing work in progress is **$5,390**

Statement of equivalent units

	Total	Equivalent units			
	units	Materials		Conversion	
OWIP completed	1,000	0%	0	30%	300
Units started and finished	23,000	100%	23,000	100%	23,000
CWIP	7,000	100%	7,000	80%	5,600
Total EU			30,000		28,900

Statement of cost/equivalent unit

	Materials $	Conversion $	Total $
Costs this month	14,700	10,115	
Cost per equivalent unit	0.49	0.35	0.84

Completed units	$
Opening WIP	
Value b/fwd	1,500
Cost to complete = 300 EU × $ 0.35	105
Units started and completed = 23,000 EU × $0.84	19,320
	20,925
Closing WIP = 7,000 EU × $0.49 + 5,600 EU × $0.35	5,390

Test your understanding 6

D

A by-product has a sales value, therefore answer C is incorrect. However the value is incidental compared to the value of the main products, therefore answer A is wrong and D is correct. Answer A describes a joint product. Answer B could apply to a by-product but it could also describe a joint product which requires further processing after the separation point

Test your understanding 7

A

Adjusted joint cost after reduction of net sale of by-product = $100,000 – ($12,500 – $2,500) = $90,000

Joint cost allocation ratios are computed using the net realisable value method as follows:

X: $225,000 – $125,000 = $100,000

Y: $300,000 – $100,000 = $200,000

Total net realisable value = $300,000

Joint cost allocation is computed as follows:

A: $90,000 ÷ $300,000 × $100,000 = $30,000

B: $90,000 ÷ $300,000 × $200,000 = $60,000

Chapter 10

Service and operation costing

Outcome

By the end of this session you should be able to:

- identify situations where the use of service/operation costing is appropriate
- illustrate suitable unit cost measures that may be used in different service/operation situations
- carry out service cost analysis in simple service industry situations

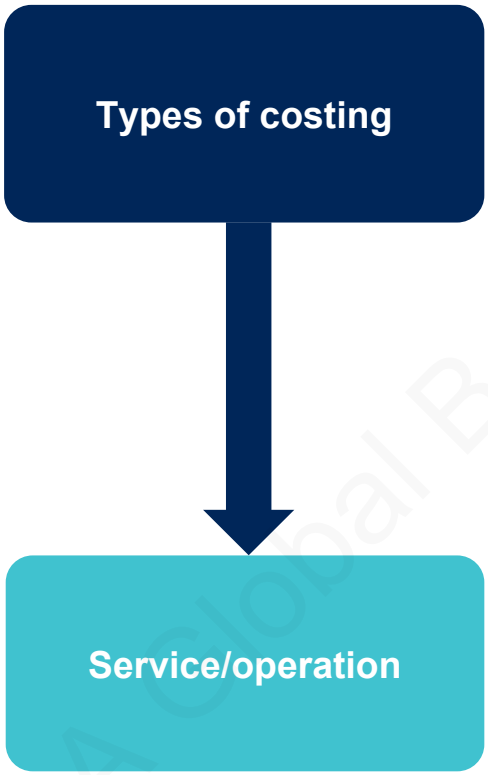
and answer questions relating to these areas.

PER

One of the PER performance objectives (PO12) is to apply different management accounting techniques is different business contexts to effectively manage and use resources. Working through this chapter should help you understand how to demonstrate that objective.

The underpinning detail for this Chapter in your Integrated Workbook can be found in Chapter 10 of your Study Text

Overview



1 Service and operation costing

Service costing is a form of continuous operation costing. The output from a service industry differs from manufacturing for the following four reasons:

- Intangibility – the output is in the form of 'performance' rather than tangible or touchable goods or products.
- Heterogeneity – the nature and standard of the service will be variable due to the high human input.
- Simultaneous production and consumption – the service that you require cannot be inspected in advance of receiving it.
- Perishability – the services that you require cannot be stored.

Test your understanding 1

Which of the following are characteristics of service organisations? Select all that apply.

	Tick
A low incidence of work in progress at the end of a period	
Difficulty in identifying and measuring objectives	
A focus on contribution	
The use of composite cost units	

Notes

Cost units

Service organisations may use several different cost units to measure the different kinds of service that they are providing.

A **composite cost unit** is more appropriate if a service is a function of two variables.

The calculation of a cost per service unit is as follows:

Cost per service unit = Total costs for providing the service ÷ Number of service units used to provide the service

Test your understanding 2

Records for a passenger limousine company reveal the following data for the last period:

No of passengers	Miles travelled
80	4
40	5
90	6
100	7
140	8
180	9
150	10

The drivers' wages cost incurred was $1,100

The drivers' wages cost per passenger mile was (to the nearest cent):

A $0.03

B $0.18

C $1.41

D $22.45

Illustrations and further practice

Notes

Further practice

Exam kit questions

Test your understanding answers

Test your understanding 1

Which of the following are characteristics of service organisations? Select all that apply.

	Tick
A low incidence of work in progress at the end of a period	✓
Difficulty in identifying and measuring objectives	
A focus on contribution	
The use of composite cost units	✓

Many services are consumed as soon as they are made available to the customer. They cannot be held in inventory for sale at a later date. Therefore there is a low incidence of work in progress at the end of a period.

Composite cost units are often used because they are more useful for control purposes, for example in a haulage company a cost per tonne-mile might be more useful for planning and control purposes than a simple cost per tonne.

Difficulty in identifying and measuring objectives would be a feature of a not-for-profit organisation.

There is more likely to be a focus on contribution in a manufacturing organisation as service organisations tend to have a very high proportion of indirect costs making contribution less useful.

Test your understanding 2

B

No of passengers	Miles travelled	Passenger miles
80	4	320
40	5	200
90	6	540
100	7	700
140	8	1,120
180	9	1,620
150	10	1,500
Total passenger miles		6,000

Drivers' wages cost per passenger mile = $1,100/6,000 = $0.18

Chapter 11

Alternative costing principles

Outcome

By the end of this session you should be able to:

- explain activity based costing (ABC), target costing, life cycle costing and total quality management (TQM) as alternative cost management techniques
- differentiate ABC, target costing and life cycle costing from the traditional costing (note: calculations are not required)

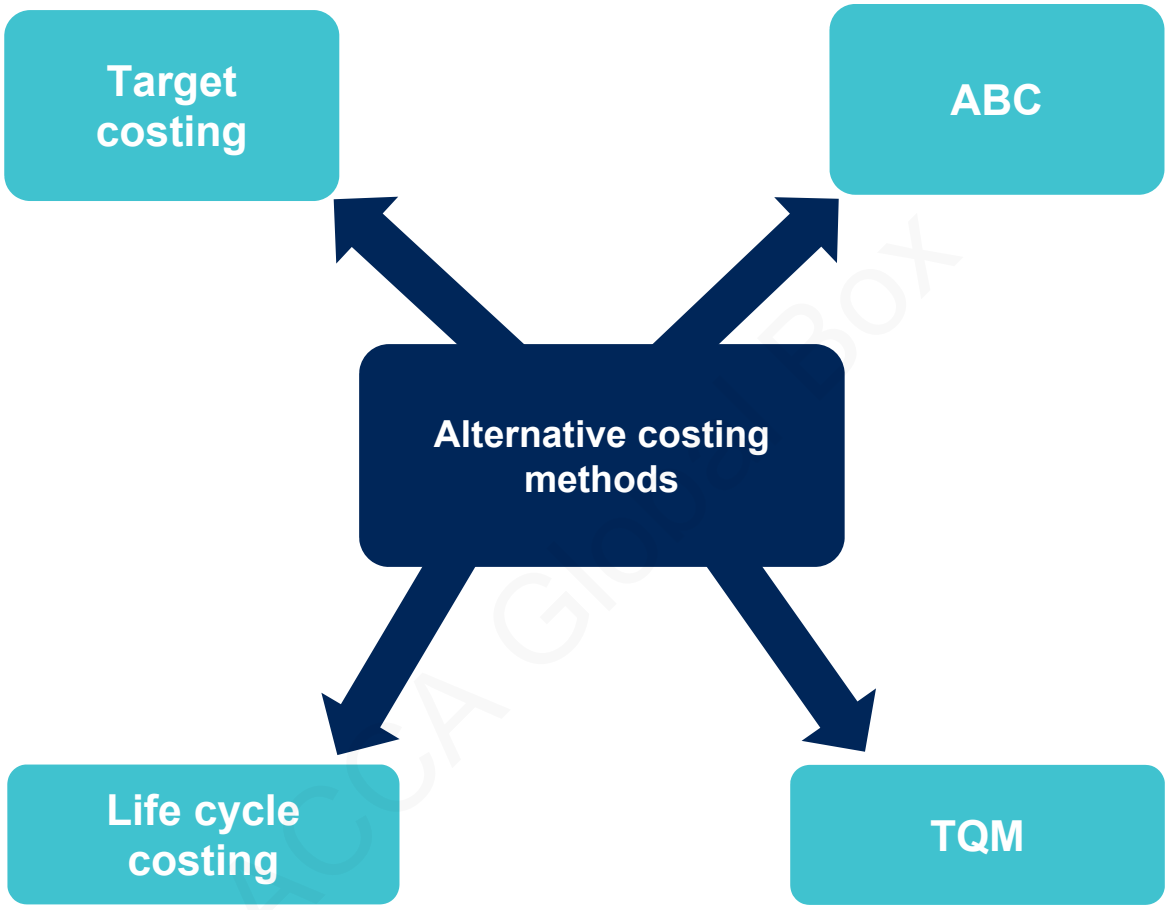
and answer questions relating to these areas.

PER

One of the PER performance objectives (PO12) is to apply different management accounting techniques is different business contexts to effectively manage and use resources. Working through this chapter should help you understand how to demonstrate that objective.

The underpinning detail for this Chapter in your Integrated Workbook can be found in Chapter 11 of your Study Text

Overview



1 Modern production environments

Manufacturers are changing production methods and using more machinery and computers, and less labour. This has a profound impact on the nature of their production costs.

- Increased complexity of operation.
- Increased percentage of overhead costs.
- Reduced significance of labour.
- Less volume related costs.

Notes

2 Activity based costing (ABC)

2.1 Cost pools and cost drivers

Rather than absorbing overheads on a production volume basis ABC firstly allocates overheads to cost pools before absorbing them into units using cost drivers.

Cost pool

- An activity that incurs cost.
- Costs are linked to the activity accurately and from the activity to the cost unit.
- Knowledge of the activity is key to the application of ABC.

Cost driver

- This is the causal link between the activity and the cost unit.
- Cost drivers describe exactly how the production of units will incur costs within the activity.
- The overhead is linked to the cost unit using a cost driver rate.

Notes

2.2 Advantages and disadvantages of ABC

When compared to other costing systems ABC has the following advantages and disadvantages.

- Costs are understood better.
- Costs are absorbed better.
- Cost control can be improved.
- Pricing decisions can be improved.
- Decision making can be improved.
- ABC can be used in service industries.

- Arbitrary cost apportionments are still required.
- It can be costly to implement.
- The choice of activities and cost drivers might be inappropriate.
- Not always relevant.

Test your understanding 1

Which of the following statements are correct?

(i) A cost driver is any factor that causes a change in the cost of an activity.

(ii) For long-term variable overhead costs, the cost driver will be the volume of activity.

(iii) Traditional absorption costing tends to under-allocate overhead costs to low-volume products.

A (i) and (iii) only

B (ii) and (iii) only

C (i) and (ii) only

D (i), (ii) and (iii)

Notes

3 Target Costing

Target Costing is a proactive cost control system. The target cost is calculated by deducting the target profit from a pre-determined selling price based on customers' views.

Step 1: A target price is set, based on the customers' perceived value of the product. This will therefore be a market based price.

Step 2: The required target operating profit per unit is then calculated. This may be based on either return on sales or return on investment.

Step 3: The target cost is derived by subtracting the target profit from the target price.

Step 4: The cost gap is then calculated.

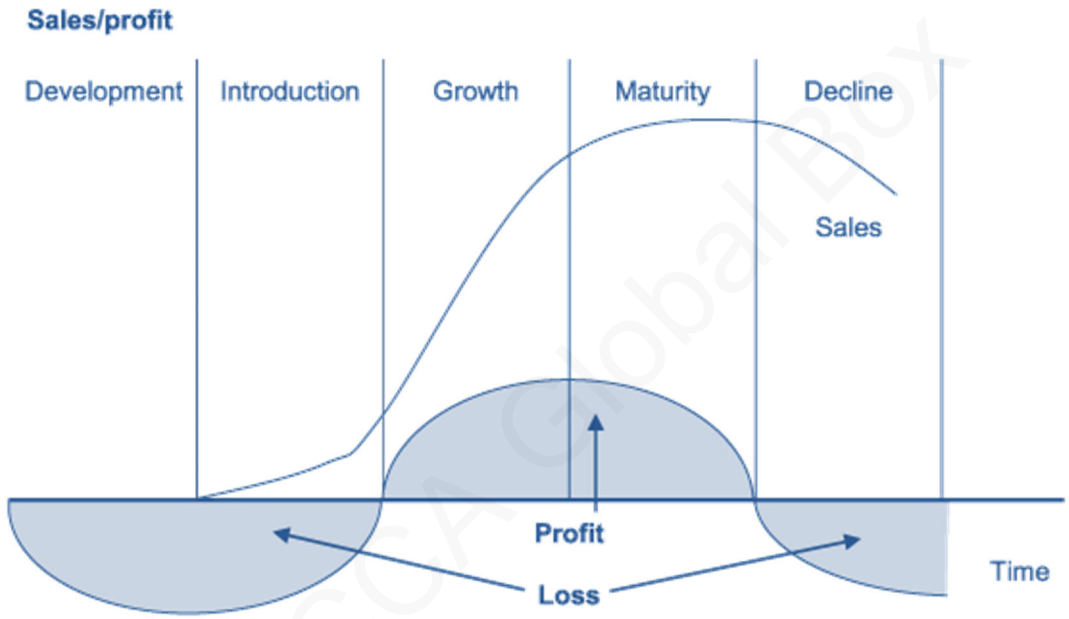
Step 5: If there is a cost gap, attempts will be made to close the gap with techniques such as value engineering which will look at every aspect of the value chain business function.

Notes

4 Life cycle costing

Life cycle costing tracks and accumulates the actual costs and revenues attributable to each product from inception to abandonment. This is a technique which compares the revenues from a product with all the costs incurred over the entire product life cycle.

The product life cycle:



Notes

There are a number of factors that need to be managed in order to maximise a product's return over its lifecycle:

Design costs out of the product: around 80% of a product costs are often incurred at the design and development stage of a product's life.

Minimise the time to market: make a profit before competition increases.

Maximise the length of the life cycle itself: the longer the life cycle, the greater the profit that will be generated.

Notes

5 Total Quality Management (TQM)

5.1 What is TQM?

The key impacts of TQM are often that problems are avoided rather than solved, and inventory levels can be greatly reduced. This is achieved through the application of three principles:

- 'get it right, first time'
- continuous improvement
- customer focus.

5.2 Contrast to traditional costing

- TQM expects continuous improvement rather than standard performance.
- TQM expects everyone to take responsibility for failures in the system.
- TQM systems do not accept waste as being acceptable.
- TQM is concerned with quality related costs rather than production costs.

Notes

5.3 Quality costs

Quality costs are usually categorised into one of four different types.

- Prevention costs – represent the cost of any action taken to prevent or reduce defects and failures.

- Appraisal costs – he costs incurred, such as inspection and testing, in initially ascertaining the conformance of the product to quality requirements.

- Internal failure costs – the costs arising from inadequate quality where the problem is discovered before the transfer of ownership from supplier to purchaser.

- External failure costs – the cost arising from inadequate quality discovered after the transfer of ownership from supplier to purchaser

TQM aims to reduce overall quality costs.

Test your understanding 2

In the context of quality costs, training costs and reworking costs are classified as:

	Training costs	Reworking costs
A	internal failure costs	external failure costs
B	prevention costs	external failure costs
C	external failure costs	internal failure costs
D	prevention costs	internal failure costs

Notes

Further practice

Exam kit questions

Test your understanding answers

Test your understanding 1

D

Statement (i) provides a definition of a cost driver. Cost drivers for long-term variable overhead costs will be the volume of a particular activity to which the cost driver relates, so Statement (ii) is correct. Statement (iii) is also correct. In traditional absorption costing, standard high-volume products receive a higher amount of overhead costs than with ABC. ABC allows for the unusually high costs of support activities for low-volume products (such as relatively higher set-up costs, order processing costs and so on).

Test your understanding 2

D – Training costs would be a prevention cost as staff are being trained to avoided an error occurring. An internal failure is an error that is identified before the unit leaves the business and will therefore need to be reworked to correct the error.

Chapter 12

Forecasting techniques

Outcome

By the end of this session you should be able to:

- establish a linear function using regression analysis and interpret the results
- explain, calculate and interpret correlation coefficient and coefficient of determination
- use linear regression coefficients to make forecasts of costs and revenues
- explain the advantages and disadvantages of linear regression analysis
- describe the product life cycles and explain its importance in forecasting
- explain the principles of time series analysis (cyclical, trend, seasonal variation and random elements)
- calculate moving averages
- calculation of trend, including the use of regression coefficients
- use trend and season variation (additive and multiplicative) to make budget forecasts
- explain the advantages and disadvantages of time series analysis
- explain the purpose of index numbers
- calculate simple index numbers for one or more variables
- adjust historical and forecast data for price movements.

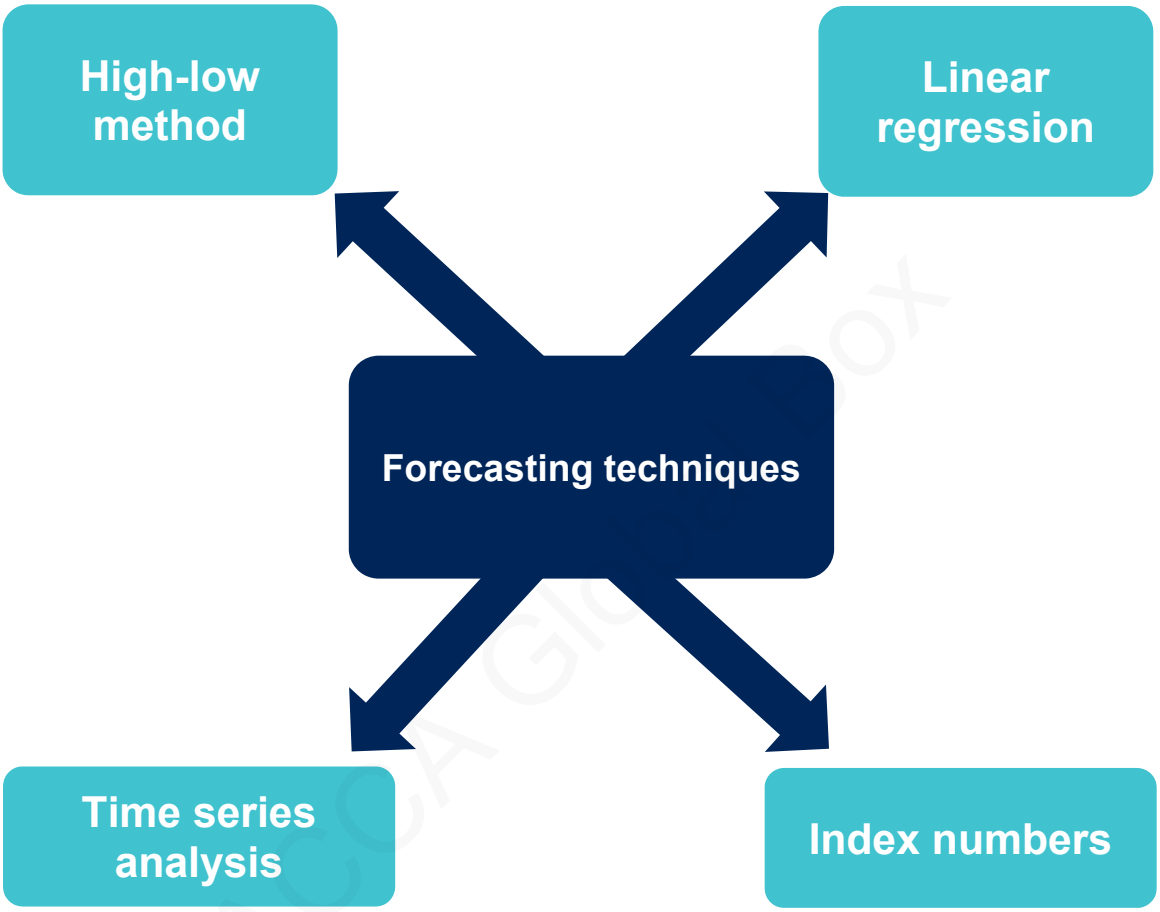
and answer questions relating to these areas.

PER

One of the PER performance objectives (PO13) is to plan business activities and control performance, making recommendations for improvement. Working through this chapter should help you understand how to demonstrate that objective.

The underpinning detail for this Chapter in your Notes can be found in Chapter 12 of your Study Text

Overview



1 The need for forecasting

1.1 What is it?

The purpose of forecasting in the budgeting process is to establish realistic assumptions for planning. Forecasts might also be prepared on a regular basis for the purpose of feedforward control reporting.

Forecasts may be needed in the following areas of budgeting:

- the volume of output and sales
- sales revenue
- costs.

Notes

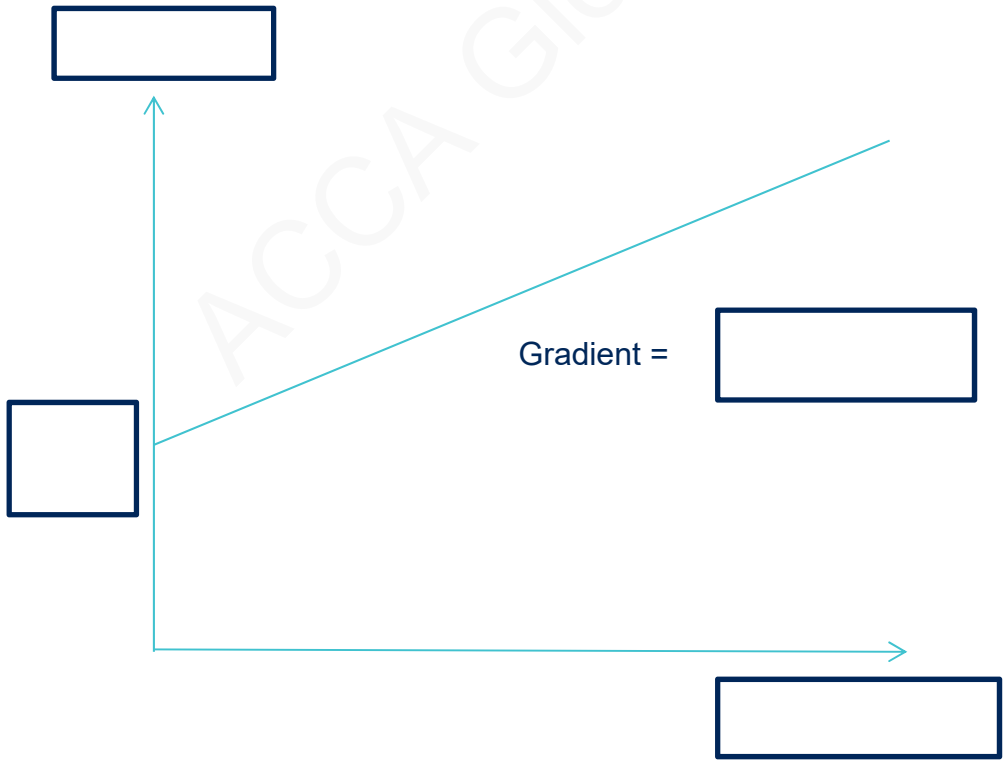
2 The high-low method (re-cap)

Test your understanding 1

The graph below plots total cost against activity levels

Place the following labels in the correct place on the graph:

- Cost ($)
- Fixed cost
- Variable cost
- Activity (units)



2.1 Step by step process

This is a method of breaking semi-variable costs into their two components.

A semi-variable cost being a cost which is partly fixed and partly variable.

Step 1

Pick the highest and lowest levels of activity

Find the variable cost per unit

$$= \frac{\text{Change in cost}}{\text{Change in activity}}$$

Step 2

Find the fixed cost

= Total cost – (variable cost per unit × activity level)

Step 3

Calculate the expected cost

Total cost = Total fixed cost + (Variable cost per unit × activity level)

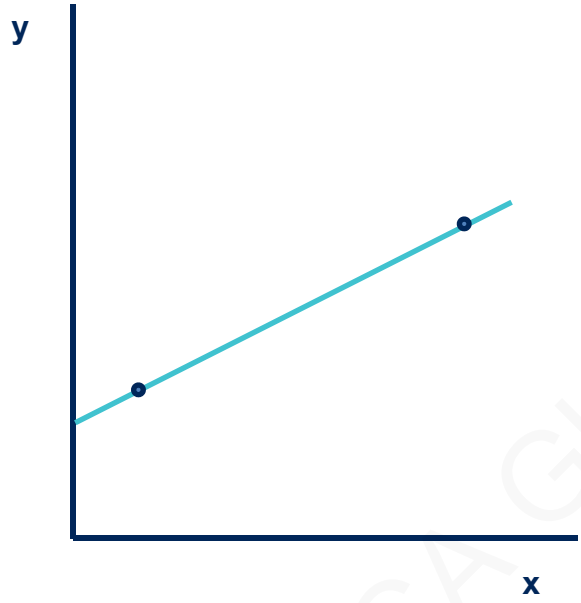
With the high-low method only two observations are used and a linear relationship is assumed. However these two extreme points may hide the true relationship between the variables.

Notes 

3 Linear regression

Linear regression performs a similar role to that of the high low method, but it **uses mathematical equations** that examine all data in the series in order **to improve accuracy**.

Consider the equation of a straight line:



y = a + bx

where: y = dependent variable

x = independent variable

a = intercept on y-axis

b = gradient of the line

Notes

3.1 Using Linear regression

Linear regression calculates a straight line relationship between the variables (y = a + bx) as follows:

$$a = \bar{y} - b\,\bar{x}$$

$$b = \frac{n\sum xy - \sum x \sum y}{n\sum x^2 - (\sum x)^2}$$

where n = number of observations

$\bar{x}$ and $\bar{y}$ are the arithmetic mean (or average) of x and y and are calculated as:

$$\bar{x} = \frac{\sum x}{n} \qquad \bar{y} = \frac{\sum y}{n}$$

Notes

Example 1

Using the following data we will calculate a (the fixed cost) and b (the variable cost). The numbers in the calculations can get big so the figures are shown in 000s.

	Activity level	Cost		
	x	**y**	**x^2**	**xy**
Quarter 1	10	38.3	100	383
Quarter 2	12	42.7	144	512.4
Quarter 3	9	35.7	81	321.3
Quarter 4	14	47.2	196	660.8
	45	163.9	521	1,877.5

$$b = \frac{n\sum xy - \sum x \sum y}{n\sum x^2 - (\sum x)^2} = \frac{(4 \times 1{,}877.5) - (45 \times 163.9)}{(4 \times 521) - 45^2} = \frac{134.5}{59} = \mathbf{2.28}$$

(**$a = \bar{y} - b\bar{x}$ =** $(163.9 \div 4) - 2.28 \times (45 \div 4)$ = **15.325)**

Regression uses all of the observations rather than just the highest and lowest so gives a better estimation of a and b.

Notes

Test your understanding 2

For a set of six pairs of observations the following results were obtained:

$\sum x = 1$

$\sum y = 15$

$\sum x^2 = 15$

$\sum y^2 = 65$

$\sum xy = 7$

Illustrations and further practice

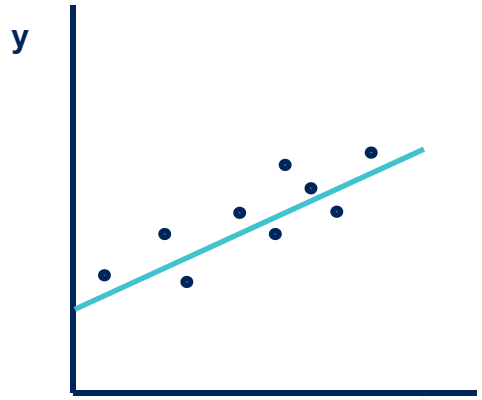
Notes

4 Correlation

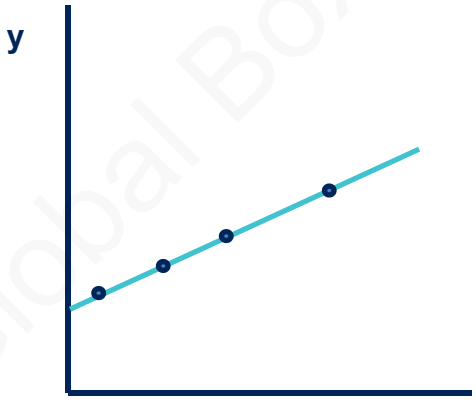
4.1 The correlation coefficient (r)

Regression analysis attempts to find the straight line relationship between two variables. Correlation is concerned with establishing how strong the straight line relationship is. Correlation can be positive or negative:

Positive correlation means that high values of one variable are associated with high values of the other and that low values of one are associated with low values of the other.

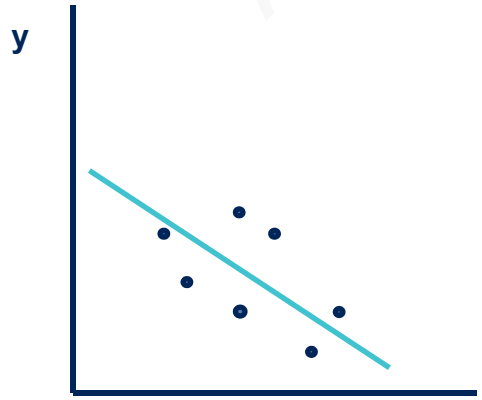


Strong positive

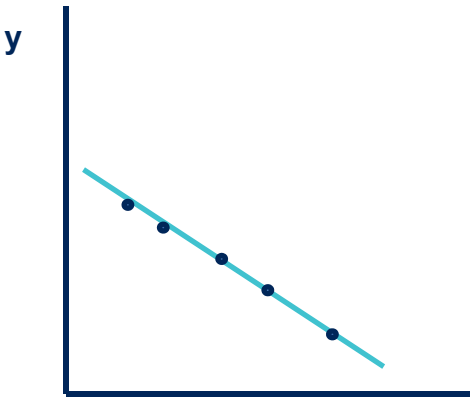


Perfect positive

Negative correlation means that low values of one variable are associated with high values of the other and vice versa.



Strong negative



Perfect negative

Pearson's correlation coefficient, denoted r, is defined as:

$$r = \frac{n\sum xy - \sum x \sum y}{\sqrt{[(n\sum x^2 - (\sum x)^2)(n\sum y^2 - (\sum y)^2)]}}$$

r always lies in the range –1 to +1, where:

r = +1 denotes perfect positive linear correlation

r = –1 denotes perfect negative linear correlation

r = 0 denotes no linear correlation

Notes

4.2 Using correlation

Example 2

	Activity level	Cost			
	x	y	x^2	xy	y^2
Quarter 1	10	38.3	100	383	1,466.89
Quarter 2	12	42.7	144	512.4	1,823.29
Quarter 3	9	35.7	81	321.3	1,274.49
Quarter 4	14	47.2	196	660.8	2,227.84
	45	163.9	521	1,877.5	6,792.51

$$r = \frac{(4 \times 1{,}877.5) - (45 \times 163.9)}{\sqrt{((4 \times 521) - 45^2)((4 \times 6{,}792.51) - 163.9^2)}} = \frac{134.5}{134.5} = 1$$

This suggests perfect positive correlation.

Test your understanding 3

For a set of 12 racing cars, the following data has been found for the power in kw (x) and the top speed in mph (y).

$\Sigma x = 802$

$\Sigma y = 1{,}850$

$\Sigma xy = 124{,}258$

$\Sigma x^2 = 53{,}792$

$\Sigma y^2 = 287{,}868$

The correlation coefficient to two decimal places is: _____

Notes

4.3 The coefficient of determination

This **squares the correlation** in order to express the strength of the relationship between the variables as a percentage.

The coefficient of determination, r^2, gives the proportion of changes in y that can be explained by changes in x, assuming a linear relationship between x and y.

For example:

If a correlation coefficient r = +0.9, then r^2 = 0.81 and we could state that 81% of the observed changes in y can be explained by the changes in x and that 19% of the changes must be due to other factors.

Test your understanding 4

If the correlation coefficient is 0.8, what is the coefficient of determination?

A 0.64

B 89

C 20.8

D 0.4

Notes

Test your understanding 5

DGR is trying to understand the relationship between sales and advertising expenditure. The management accountant has carried out some analysis and has found that the coefficient of determination is 0.49.

Which of the following in correct?

A For every $0.49 spent on advertising, $1.00 of sales will be generated.

B For every $1.00 spent of advertising, $0.49 of sales will be generated.

C 49% of the variation in sales can be explained by the corresponding variation in advertising

D 49% of the variation in advertising can be explained by the corresponding variation in sales

Illustrations and further practice

Notes

4.4 Limitations of linear regression analysis

- Assumes a **linear relationship** between the variables.
- Only measures the relationship between **two variables**. In reality the dependent variable is affected by many independent variables.
- Only interpolated forecasts tend to be reliable. The equation should **not be used for extrapolation**.
- Regression assumes that the **historical behaviour** of the data continues into the foreseeable future.
- Interpolated predictions are only reliable if there is a **significant correlation** between the data.

Notes

5 Time series analysis

Time series analysis uses moving averages to create a trend line over time, established from historical data, that, when adjusted for **seasonal variations**, can then be used to make predictions for the future.

5.1 Components of a time series

The trend is the long term general movement of the data.

Cyclical variations are economic cycles of booms and slumps.

Season variations are a regular variation around the trend over a fixed time period, usually one year.

Residual variations are irregular, random fluctuations in the data usually caused by factors specific to the time series

Notes

5.2 Calculating the trend and seasonal variation

The trend

There are three ways to calculate the trend:

- using the high-low method
- by linear regression
- using moving averages.

The seasonal variation

Seasonal variations can be estimated by comparing an actual time series with the trend line values calculated from the time series.

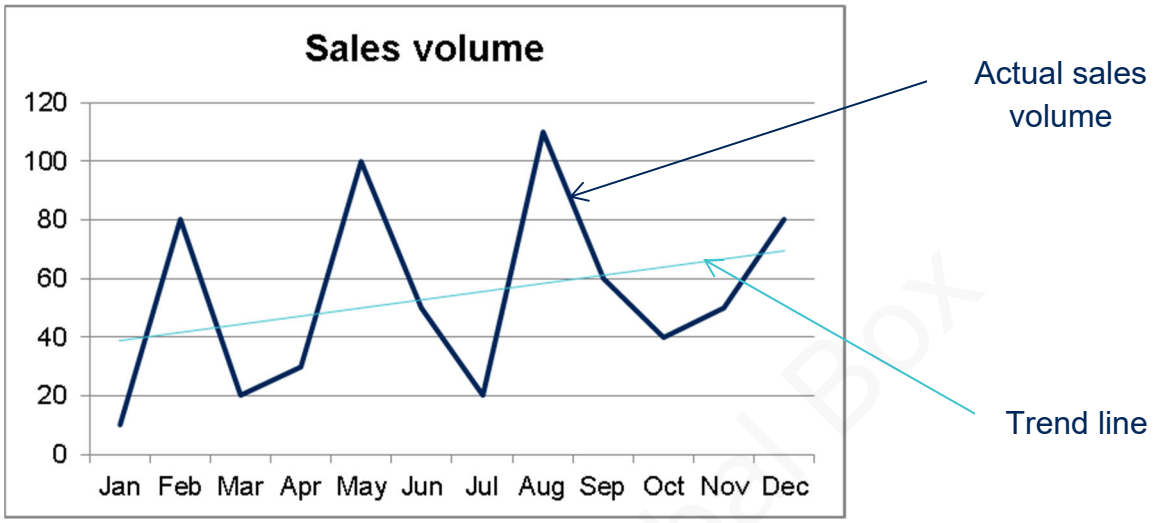
- For each 'season' the seasonal variation is the difference **between the trend line value and the actual historical value** for the same period.

A seasonal variation can be calculated for each period in the trend line. When the actual value is higher than the trend line value, the seasonal variation is positive. When the actual value is lower than the trend line value, the seasonal variation is negative.

Notes

5.3 Moving averages

Moving averages is a set of calculations used to smooth out the variations in a time series to identify a trend



Step 1

Choose the correct cycle length. For instance, if there are seasonal variations present in a time series and the pattern is repeated every third period (quarterly), the moving average should be calculated based on three periods at a time to get the best results. It is possible to calculate a moving average based on any length of cycle.

Step 2

Calculate the total for the first cycle.

Step 3

Calculate the average by dividing the total by the number of periods in the cycle.

Step 4

Repeat the process for the next cycle, moving on just one period.

Repeat the calculation for each successive cycle until the data has been fully analysed.

Example 3

Calculate the 3 point moving total and the trend for the set of data below.

Month	Actual Sales	3 month moving total	Trend
Jan	12		
Feb	26		
Mar	19		
Apr	15		
May	29		
Jun	22		
Jul	18		
Aug	32		
Sept	25		

Calculate the 3 month moving total and the trend for the set of data below.

Notes

5.4 Extrapolating the trend

If the trend is constant then extrapolation is easy to calculate as the increase between each value is the same.

Example 4

The trend for a set of data is as follows:

Month	Trend
Jan	85
Feb	89
March	93
April	97
May	101
June	105

What is the trend figure for September?

Notes

If the trend is not constant then the average increase can be calculated

Example 5

The trend for a set of data is as follows:

Month	Trend
Jan	100
Feb	102
March	106
April	111
May	114
June	118

What is the trend figure for September?

Notes

5.5 Seasonal variations

Once the trend has been identified it is possible to calculate the seasonal variations from the trend. This is how much the data varies from the trend line.

There are two methods:

Additive model:

Using an additive model, variations are expressed in absolute terms with above and below average figures shown by using a plus or minus sign respectively.

Example 6

Calculate the seasonal variation for the following set of data using the additive model.

Month	Value	Trend	Seasonal variation
Jan	12		
Feb	26	19	
Mar	19	20	
Apr	15	21	
May	29	22	
Jun	22	23	
Jul	18	24	
Aug	32	25	
Sept	25		

Multiplicative model:

Using a multiplicative or proportional model, the variations are shown as a percentage of the trend.

Example 7

Calculate the seasonal variation for the following set of data using the multiplicative model.

Month	Value	Trend	Seasonal variation
Jan	12		
Feb	26	19	
Mar	19	20	
Apr	15	21	
May	29	22	
Jun	22	23	
Jul	18	24	
Aug	32	25	
Sept	25		

Notes

5.6 Forecasting

Once the seasonal variations have been calculated they can be used to forecast future values.

The trend line is extrapolated and the variations are applied to the trend

Additive model forecast = T + S (where T = the trend line and S = the seasonal variation).

Multiplicative model forecast = T × S (S is normally represented as a percentage).

Test your understanding 6

Consider a business with the following actual results in a year:

Year	Quarter	Actual units sold	Trend	Additive variation	Multiplicative variation
20X1	1	65	60		
20X1	2	80	70		
20X1	3	70	80		
20X1	4	85	90		

(a) Using the additive model forecast unit sales in each quarter of year 2

Year	Quarter	Trend	Variation	Forecast
20X2	1	100		
20X2	2	110		
20X2	3	120		
20X2	4	130		

(b) Using the multiplicative model forecast unit sales in each quarter of year 2

Year	Quarter	Trend	Variation	Forecast
20X2	1	100		
20X2	2	110		
20X2	3	120		
20X2	4	130		

Test your understanding 7

A company is preparing its budgets for next year.

The following regression equation has been found to be a reliable estimate of the deseasonalised sales in units:

$y = 500 + 15x$

Where y is the total sales units and x refers to the accounting period.

Quarterly seasonal variations have been found to be:

Q1	Q2	Q3	Q4
+10%	+25%	–5%	–30%

Calculate the seasonally adjusted sales units for accounting period 18 (which is quarter 1)

5.7 Limitations of time series analysis

- There is an assumption that what has **happened in the past** is a reliable guide to the future.
- There is an assumption that a **straight-line trend** exists.
- There is an assumption that **seasonal variations are constant,**

Illustrations and further practice

Notes

6 Index numbers

6.1 Index numbers

An index number is a technique for comparing, over time, changes in some feature of a group of items (e.g. price or quantity) by expressing the property each period as a percentage of some earlier period.

6.2 Calculating an index number

An index number is calculated as:

Current period value ÷ base period value × base period index (usually 100)

Test your understanding 8

Calculate the following index numbers

Month	Cost $000	Calculation	Index
May	138		100.0
June	149		
July	158		
August	130		
September	136		

numbers with May as the base period

6.3 Using an index number

Index numbers can also be used to forecast future data.

The formula for using an index is:

Current index ÷ base index × base value

Test your understanding 9

The sales price of $20 was set when the index number was 100. The index numbers for the coming months are:

January 102.7

February 105.5

March 108.3

Calculate the sales prices for January, February and March

Notes

6.4 Types of index numbers

- simple indices – measures the changes in either price or quantity of a single item
  - Price index = $P_1 \div P_0 \times 100$
  - Quantity index = $Q_1 \div Q_0 \times 100$
  - P_1 and Q_1 – price/quantity at time 1
  - P_0 and Q_0 – price/quantity at time 0 (base year)

Test your understanding 10

The unit price of Brand X in May 20X0 and May 20X1 was as follows:

Year	**20X0**	**20X1**
Unit price of Brand X	$1.40	$1.75

The price index for Brand X in May 20X1, with base May 20X0 = 100 is:

A 80

B 120

C 125

D 135

- chain based indices
  - A chain base index number expresses each year's value as a percentage of the value for the previous year.
  - This simply means that each index number is calculated using the previous year as base.
  - If the rate of change is increasing, then the index numbers will be rising; if it is constant, the numbers will remain the same and if it is decreasing the numbers will be falling.
- Weighted or relative index numbers
  - A weighted index measures the change in overall price or overall quantity of a number of different items compared to the base year.

Example 8

The average prices of four commodities, along with the number of units used annually by a company, are given in the following table:

	Year 1	Year 2	
Commodity	**Price per unit**	**Price per unit**	**Quantity**
	$	$	Units
A	10	11	10
B	20	24	1
C	50	52	5
D	100	105	4

Calculate a weighted price index for year 2 based on year 1 using the quantities given as weights.

Price index	**Quantity weighting**	**Total Price index × Quantity**
A		
B		
C		
D		

Weighted price index =

Test your understanding 11

Details of an index number are given below:

Group	Price Index	Weight
Food & Drink	140	50
Travel & Leisure	130	30
Housing	120	20
		100

The weighted price index number is closest to:

A 130

B 133

C 135

D 146

Notes

6.5 Index numbers and forecasting

The accuracy of forecasting is affected by the need to adjust historical data and future forecasts to allow for price or cost inflation.

- When historical data is used to calculate a trend line or line of best fit, it should ideally be adjusted to the same index level for prices or costs. If the actual cost or revenue data is used, without adjustments for inflation, the resulting line of best fit will include the inflationary differences.
- When a forecast is made from a line of best fit, an adjustment to the forecast should be made for anticipated inflation in the forecast period

Illustrations and further practice

Notes

Further practice

Exam kit questions

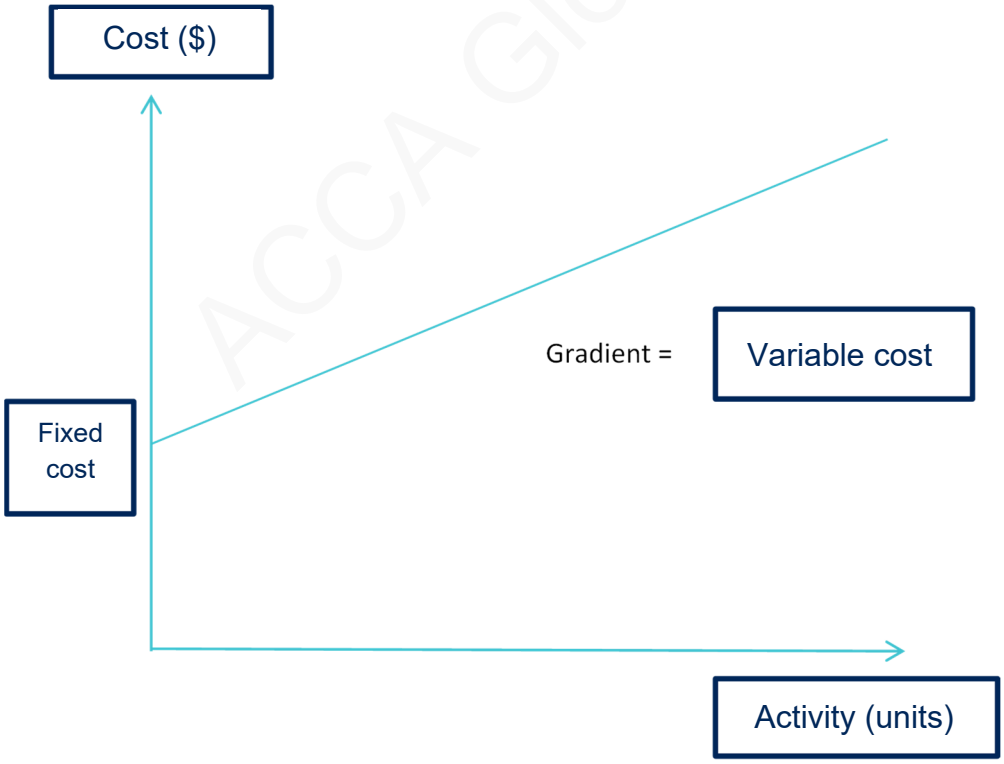
Test your understanding answers

Test your understanding 1

The graph below plots total cost against activity levels

Place the following labels in the correct place on the graph:

- Cost ($)
- Fixed cost
- Variable cost
- Activity (units)



Test your understanding 2

The equation of a straight line for the above data would be:

$y = \mathbf{2.45} + \mathbf{0.30}x$

$$b = \frac{n\sum xy - \sum x \sum y}{n\sum x^2 - (\sum x)^2} = \frac{(6 \times 7) - (1 \times 15)}{(6 \times 15) - 1^2} = \frac{27}{89} = \mathbf{0.30}$$

$a = \overline{y} - b\,\overline{x} = (15 \div 6) - 0.30 \times (1 \div 6) = \mathbf{2.45}$

Test your understanding 3

The correlation coefficient to two decimal places is: **0.86**

Using the formula

$$r = \frac{(12 \times 124{,}258) - (802 \times 1{,}850)}{\sqrt{((12 \times 53{,}792) - 802^2)((12 \times 287{,}868) - 1{,}850^2)\}}} = 0.86$$

Test your understanding 4

A

The coefficient of determination = r^2

$r^2 = 0.8^2 = 0.64$. This suggests that 64% of the changes in y can be explained by the changes in x.

Test your understanding 5

C

The coefficient of determination gives the percentage of the variation in y (in this case sales) which can be explained by the regression relationship with x (in this case advertising)

Test your understanding 6

Consider a business with the following actual results in a year:

Year	Quarter	Actual units sold	Trend	Additive variation	Multiplicative variation
20X1	1	65	60	5	+8.33%
20X1	2	80	70	10	+14.29%
20X1	3	70	80	–10	–12.50%
20X1	4	85	90	–5	–5.56%

(a) Using the additive model forecast unit sales in each quarter of year 2

Year	Quarter	Trend	Variation	Forecast
20X2	1	100	5	105
20X2	2	110	10	120
20X2	3	120	–10	110
20X2	4	130	–5	125

(b) Using the multiplicative model forecast unit sales in each quarter of year 2

Year	Quarter	Trend	Variation	Forecast
20X2	1	100	+8.33%	108
20X2	2	110	+14.29%	126
20X2	3	120	–12.50%	105
20X2	4	130	–5.56%	123

Test your understanding 7

The forecast trend

Y = 500 + 15x

Y = 500 + 15 × 18

Y = 500 + 270

Y = 770

Apply the seasonal variation:

Forecast sales units = 770 × 1.1 = **847 units**

Test your understanding 8

Month	Cost $000	Calculation	Index
May	138		100.0
June	149	149/138 × 100	108.0
July	158	158/138 × 100	114.5
August	130	130/138 × 100	94.2
September	136	136/138 × 100	98.6

Test your understanding 9

January = 102.7/100 × $20 = **$20.54**

February = 105.5/100 × £20 = **$21.10**

March = 108.3/100 × $20 = **$21.66**

Test your understanding 10

C

Price index = $P_1 \div P_0 \times 100$ = 1.75 / 1.40 × 100 = **125**

Test your understanding 11

B

Group	Price Index	Weight	Price index × weight
Food & Drink	140	50	7,000
Travel & Leisure	130	30	3,900
Housing	120	20	2,400
		100	13,330

Weighted price index = 13,330 / 100 = **133**

Notes

Chapter 13

Budgeting

Outcome

By the end of this session you should be able to:

- explain why organisations use budgeting
- describe the planning and control cycle in an organisation
- explain the administrative procedures used in the budgeting process
- describe the stages in the budgeting process (including sources of relevant data, planning and agreeing draft budgets and purpose of forecasts and how they link to budgeting)
- explain the importance of motivation in performance management
- identify factors in a budgetary planning and control system that influence motivation
- explain the impacts of targets upon motivation
- discuss managerial incentive schemes
- discuss the advantages and disadvantages of a participative approach to budgeting
- explain top down, bottom up approaches to budgeting
- explain the importance of principal budget factor in constructing the budget
- prepare sales budgets
- prepare functional budgets (production, raw materials usage and purchases, labour, variable and fixed overheads)
- prepare cash budgets

- prepare master budgets (statement of profit or loss and statement of financial position)
- explain and illustrate 'what if' analysis and scenario planning
- explain the importance of flexible budgets in control
- explain the disadvantages of fixed budgets in control
- identify situations where fixed or flexible budgetary control would be appropriate
- flex a budget to a given level of volume
- calculate simple variances between flexed budget, fixed budget and actual sales, costs and profits
- define the concept of responsibility accounting and its significance in control
- explain the concept of controllable and uncontrollable costs
- prepare control reports suitable for presentation to management (to include recommendation of appropriate control action).

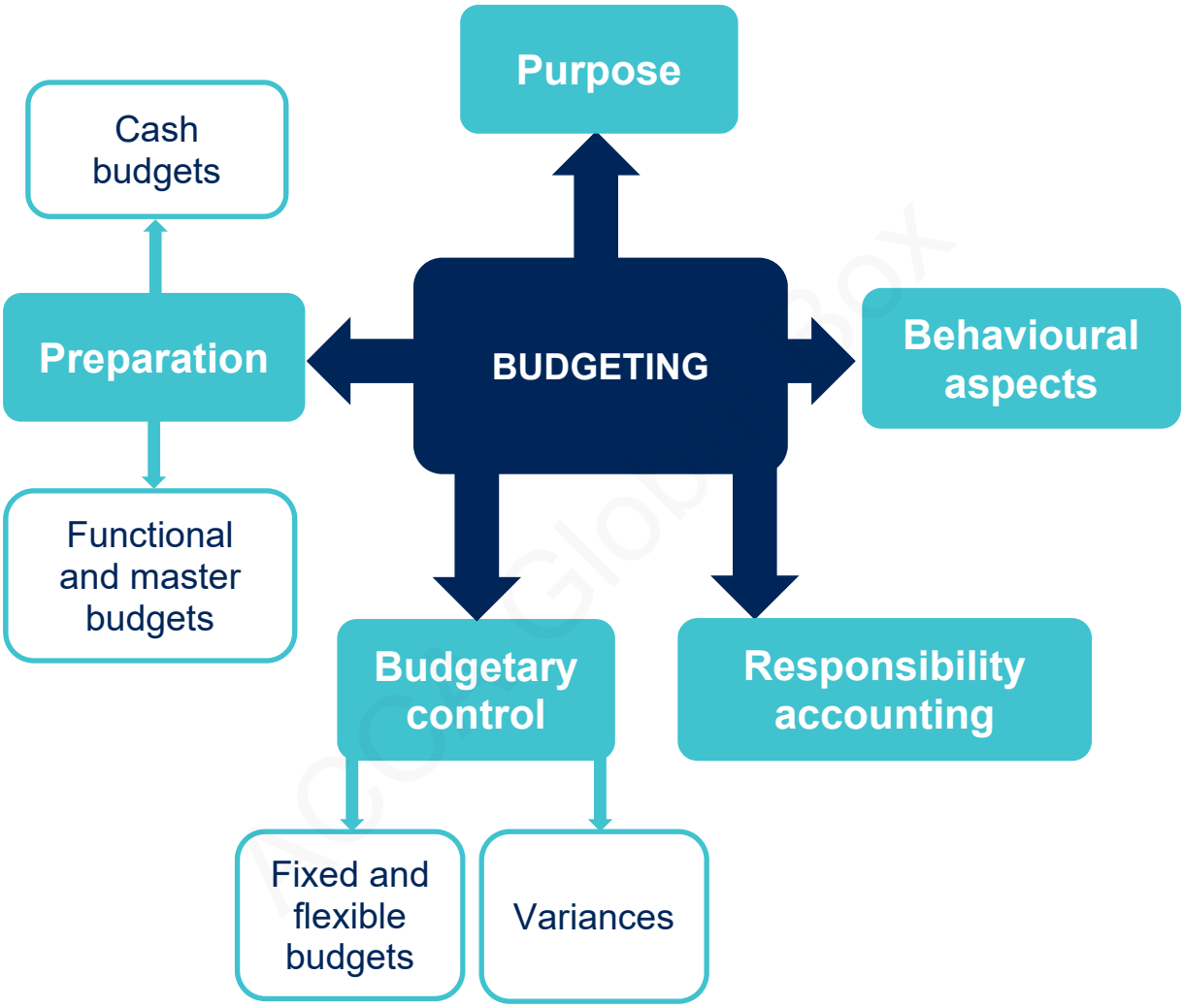
and answer questions relating to these areas.

PER

One of the PER performance objectives (PO13) is to plan business activities and control performance, making recommendations for improvement. Working through this chapter should help you understand how to demonstrate that objective.

The underpinning detail for this Chapter in your Integrated Workbook can be found in Chapter 13 of your Study Text

Overview



1 The purpose of budgeting

A budget is a **quantitative** or **financial plan** relating to the future. It can be for the company as a whole or for departments or functions or products or for resources such as cash, materials, labour, etc. It is **usually for one year or less**.

1.1 The purpose of budgeting

- **Planning –**
- **Control –**
- **Co-ordination –**
- **Communication –**
- **Motivation –**
- **Performance evaluation –**
- **Authorisation –**

Notes

2 Behavioural aspects of budgeting

It is often accepted that participation in the budget setting process will improve motivation, which in turn will improve the quality of budget decisions and the efforts of individuals to achieve their budget targets.

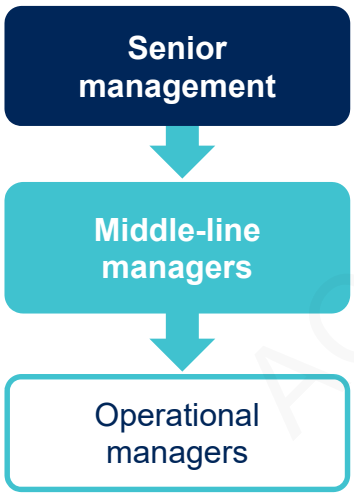
2.1 Imposed style budgeting

An imposed 'top down' budget is set without permitting the ultimate budget holder to have the opportunity to participate in the budgeting process.

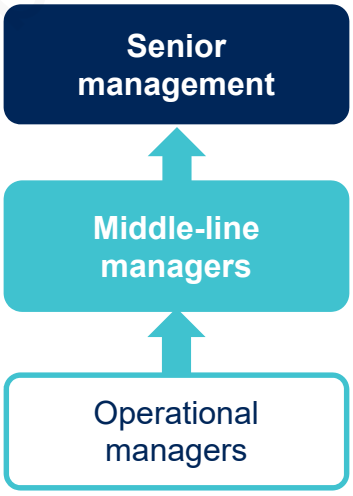
2.2 Participative budgeting

A budgeting system in which all budget holders are given the opportunity to participate in setting their own budgets.

Top down (imposed)



Bottom up (participative)



Test your understanding 1

The term 'budget slack' refers to:

A the extended lead time between the preparation of the functional budgets and the master budget

B the difference between the budgeted output and the breakeven output

C the additional capacity available which can be budgeted for

D the deliberate over-estimation of costs or under-estimation of revenues in a budget

Notes

2.3 Motivation

Motivation is the drive or urge to achieve an end result. An individual is motivated if they are moving forward to achieving goals or objectives.

There is evidence which suggests that management accounting planning and control systems can have a significant effect on manager and employee motivation.

These include:

- the level at which budgets and performance targets are set
- manager and employee reward systems
- the extent to which employees participate in the budget setting process

2.4 Incentive schemes

Budgets by themselves have a limited motivational effect. It is the reward structure that is linked to achieving the budget requirements, or lack of reward for non-achievement, which provides the real underlying motivational potential of budgets.

There are three main types of incentive schemes:

- Performance related pay (PRP)
- Bonus schemes
- Profit sharing

Notes

3 The budgetary process

The process of preparing and using budgets will differ from organisation to organisation. However there are a number of key requirements in the budgetary planning process.

3.1 The budget committee

The need for coordination in the planning process is paramount. For example, the purchasing budget cannot be prepared without reference to the production budget. The best way to achieve this coordination is to set up a budget committee. The budget committee should comprise representatives from all functions in the organisation.

The budget committee should meet regularly to review the progress of the budgetary planning process and to resolve problems that have arisen. These meetings will effectively bring together the whole organisation in one room, to ensure a coordinated approach to budget preparation.

3.2 The budget manual

A budget manual is a collection of documents which contain key information for those involved in the planning process:

- The budget process.
- Organisation chart.
- Budget timetable.
- Proformas.
- Account codes.
- Key assumptions.
- Budget Officer.

Notes

3.3 Principle budget factor

The principal budget factor is the factor which limits the activities of the organisation. The principal budget factor is also known as the limiting factor or key factor.

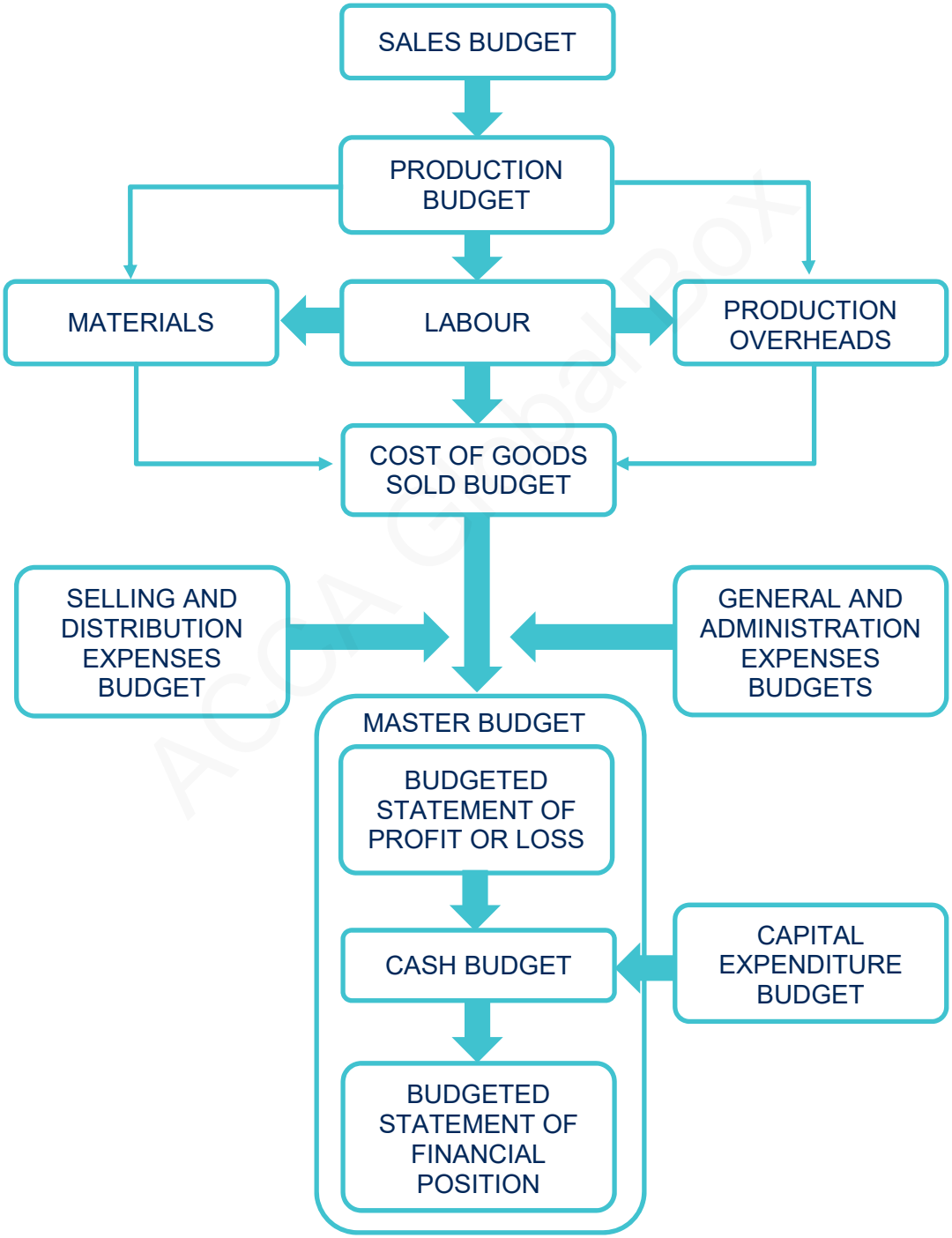
This factor indicates which budget should be prepared first

For example, if sales volume is the principal budget factor, then the sales budget must be prepared first. All other budgets should follow from this. It is important to realise that all budgets are **inter-related**.

Notes

4 Budget preparation

4.1 Budget preparation



Notes

5 Functional budgets

5.1 Functional budgets and the master budget

A number of functional budgets will be prepared and these will be pulled together into the master budget which is a summary of all the functional budgets. It usually comprises the budgeted statement of profit or loss, budgeted statement of financial position and budgeted cash flow statement (cash budget).

5.2 Sales budgets

For most organisations, the principal budget factor is usually **sales volume**.

The **sales budget** is therefore the primary budget from which the majority of other budgets are derived.

The sales budget = sales volume × selling price

5.3 Production budgets and inventory adjustment

Budgeted production = forecast sales + closing inventory – opening inventory

Notes

5.4 Material usage

Material usage = usage per unit × units produced

5.5 Materials purchases budget

Materials purchases budget = forecast materials usage + closing inventory – opening inventory

Notes

Test your understanding 2

An ice cream manufacturer is in the process of preparing budgets for the next few months, and the following draft figures are available.

Sales forecast

June	6,000 cases
July	7,500 cases
August	8,500 cases
September	7,000 cases
October	6,500 cases

Each case uses 2.5 kg of ingredients and it is policy to have inventories of ingredients at the end of each month to cover 50% of next month's production.

There are 600 cases of finished ice cream in inventory on 1 June and it is policy to have inventories at the end of each month to cover 10% of the next month's sales.

(a) The production budget (in cases) for June and July will be:

June _____ cases

July _____ cases

(b) The ingredient purchases budget (in kg) for August will be _____ kg

Notes

5.6 Labour budgets

Labour budgets are (on the whole) the number of hours multiplied by the labour rate per hour.

Test your understanding 3

A requires, 2,400 actual labour hours for completion and it is anticipated that there will be 20% idle time.

If the wage rate is $10 per hour, what is the budgeted labour cost for the job?

A $19,200

B $24,000

C $28,800

D $30,000

5.7 Overhead budgets

Overhead budgets will be based on budgeted activity and budgeted OAR.

5.8 The master budget

The master budget is the overall budget into which all the subsidiary budgets are consolidated. It will normally comprise a budgeted statement of profit or loss and a budgeted statement of financial position (and possibly also a budgeted cash flow statement).

Illustrations and further practice

Notes

6 Cash budgets

6.1 Definition

A cash **forecast** is an estimate of cash receipts and payments for a future period under existing conditions.

A cash **budget** is a commitment to a plan for cash receipts and payments for a future period after taking any action necessary to bring the forecast into line with the overall business plan.

The cash budget is one of the most vital planning documents in an organisation. It will show the cash effect of all of the decisions taken in the planning process.

A cash budget can give forewarning of potential problems that could arise so that managers can be prepared for the situation or take action to avoid it.

Notes

6.2 Preparing a cash budget

There is no definitive format which should be used for a cash budget. However, it should include:

- A clear distinction between the cash receipts and cash payments for each period and a subtotal clearly shown for each.
- A figure for the net cash flow for each period.
- The closing cash balance for each period.

- Only include cash flows – items such as depreciation are not cash flows.
- Allowance must be made for bad and doubtful debts – bad debts will never be received, and doubtful debts may not be received. When you are forecasting the cash receipts from customers you must remember to adjust for these items.
- Include **all** cash flows – the cash budget does not just reflect sales revenue and production costs, but all movements of cash including cash flows for financial items such as inflows from the sale of shares or grants received and outflows such as the purchase of a non-current asset or the repayment of a loan.

Notes

6.3 Cash receipts and payments

To calculate the cash receipts from the credit sales there are two things to consider:

- the value of the receipts – how much cash will be received from the credit sales
- the timing of the receipts – when will the cash be received from the credit sales.

To calculate the cash payments for the credit purchases there are two things to consider:

- the value of the payment – how much cash will be paid to the payable
- the timing of the payment – when will the cash be paid to the payable.

It may be necessary to calculate the amount due to be paid based on quantities purchased.

Test your understanding 4

The following details have been extracted from the receivables records of HUI:

Invoice paid in the month after sale	60%
Invoice paid in the second month after sale	25%
Invoice paid in the third month after sale	12%
Irrecoverable debts	3%

Invoices are issued on the last day of each month

Customers paying in the month after sale are entitled to deduct a 2% settlement discount.

Credit sales for June to September are budgeted as follows:

June	July	August	September
$35,000	$40,000	$60,000	$45,000

What is the amount budgeted to be received from credit sales in September?

A $47,280

B $47,680

C $48,850

D $49,480

Test your understanding 5

A small manufacturing company is to commence operations on 1 July. The following estimates have been prepared:

	July	August	September
Production (units)	40	50	50

It is planned to have raw material inventories of $10,000 at the end of July, and to maintain inventories at that level thereafter. There is no opening inventory.

Costs and other information:

	Per unit
	$
Material cost	280
Labour cost	160
Variable overheads	40

Fixed overheads are expected to be $5,000 per month, including $1,000 depreciation.

Labour is paid in the month incurred, and all other expenditures the following month.

(a) The budgeted cash payments for raw materials are:

July	$
August	$
September	$

(b) The total of the budgeted cash payments for labour and overhead in August is $_____

Illustrations and further practice

Notes

7 Budgetary control

Budgetary control is about assessing actual performance against budgeted performance and taking corrective action when necessary.

7.1 Feedback and feedforward control

Feedback control

Here the aim is to correct problems that have been discovered at the period end when the actual results are compared with the budget.

Feedback happens after the event and discovers that something has gone wrong (or right). It is obviously too late to affect the result that has just happened, but the idea is that if we can understand what went wrong in the previous period, then we can stop the problem from recurring.

It is therefore a reactive system of control.

Feedforward control

Here the aim is to anticipate problems with the aim of preventing them from occurring.

Feedforward is the comparison of the results that are currently expected in the light of the latest information and the desired results. If there is a difference, then it is investigated and corrected.

It is therefore a proactive system of control.

Notes

8 Fixed and flexible budgets

8.1 Fixed budget

This contains information on costs and revenues for one level of activity.

Where the actual level of activity is different to that expected, comparisons of actual results against a fixed budget can give misleading results.

8.2 Flexed/flexible budget

This shows the same information, but for a number of different levels of activity.

This type of budget provides two key benefits:

- managers are better prepared for a range of scenarios
- variances can be based on the most suitable budget.

In budgetary control systems managers should always compare performance against a flexed budget.

The flexed budget (budget cost allowance) is calculated as follows:

Fixed costs: no change

Variable costs:

$$\text{Budgeted cost allowance} = \frac{\text{Budgeted cost}}{\text{Budgeted activity level}} \times \text{Actual activity level}$$

Semi-variable costs: The fixed element will not change and the variable element will be flexed as above.

8.3 Variances

Budgetary control is achieved by comparing the actual results with the budget. The differences are calculated as variances and management action may be taken to investigate and correct the variances if necessary or appropriate.

- If costs are higher or revenues are lower than the budget, then the difference is an **adverse variance**.
- If costs are lower or revenues are higher than the budget, then the difference is a **favourable variance**.

Example 1

A company planned to produce and sell 1,000 units and had a direct material budget of $5,000 but they only produced and sold 900 units with a direct material cost of $4,800.

It looks like the company has spent less on material than it had budgeted,

Budget	Actual	Variance
$5,000	$4,800	

However, this is not comparing like with like, the actual cost must be compared to the **flexed budget**.

Budgeted material cost per unit = $5,000/1,000 = $5 per unit

Total flexed budget material cost = $5 × 900 = $4,500

Budget	Flexed budget	Actual	Variance
1,000 units	900 units	900 units	
$5,000	$4,500	$4,800	

The difference between the actual and the flexed budget is known as the **budget variance**.

Notes

Test your understanding 6

A flexible budget is:

A a budget which, by recognising different cost behaviour patterns, is designed to change as the volume of activity changes

B a budget for a defined period of time which includes planned revenues, expenses, assets, liabilities and cash flow

C a budget which is prepared for a period of one year which is reviewed monthly, whereby each time actual results are reported, further forecast period is added and the intermediate period forecasts are updated

D a budget of semi-variable production costs only

Test your understanding 7

ASD operates a system of flexible budgets. The flexed budgets for expenditure for the first two quarters of year 3 are given below.

Assuming the cost structures in quarters 1 and 2 continue, complete the statement of the budget cost allowances for quarter 3, when production was 15,000 units.

	Quarter 1	Quarter 2	Quarter 3
Units	10,000	13,000	15,000
	$	$	$
Direct materials	130,000	169,000	
Direct labour	74,000	96,200	
Production overhead	88,000	109,000	
Administration overhead	26,000	26,000	
Total budget cost allowance	347,700	421,700	

Test your understanding 8

SDE produces and sells a single product. The budget and actual results for the latest period is as follows.

Budget	Budget 12,600 units	Actual 13,200 units
	$	$
Sales revenue	277,200	303,600
Variable costs:		
Direct material	75,600	78,350
Direct labour	50,400	51,700
Production overhead	12,600	14,160
Fixed costs		
Production overhead	13,450	13,710
Other overhead	10,220	10,160
Profit	114,930	135,520

Prepare a flexible budget control statement and calculate the variances

Illustrations and further practice

Notes

9 Responsibility accounting

9.1 Budget centres

Each budget centre is often a **responsibility centre**. Each centre will have its own budget and a manager will be responsible for managing the centre and controlling the budget. This manager is often referred to as the budget holder. Regular budgetary control reports will be sent to each budget holder so that they may monitor their centre's activities and take control action if necessary.

The budgetary reporting system should ideally be based on the exception principle which means that management attention is focused on those areas where performance is significantly different from budget.

Notes

9.2 Responsibility accounting

A key aspect of budgetary control is ensuring that managers account for the costs (and/or revenues) for which they have responsibility. However this will only work effectively if **managers are appraised only on the costs which they can control**.

Controllable costs are costs which can be influenced by the budget holder and are generally considered to be those which are:

- variable or
- directly attributable fixed costs.

Uncontrollable costs are costs that cannot be influenced (i.e. their value can neither be increased nor decreased) by management action.

Notes

Further practice

Exam kit questions

Test your understanding answers

Test your understanding 1

D

A manager might build some slack into a budget to provide some 'leeway' to disguise unnecessary spending or to make a performance target easier to reach.

Test your understanding 2

(a) June = **6,150** cases, July = **7,600** cases

	June	July	August	September
Sales	6,000	7,500	8,500	7,000
Closing inventory	750	850	700	650
Opening inventory	(600)	(750)	(850)	(700)
Production budget	**6,150**	**7,600**	8,350	6,950

Closing inventory for June is calculated as 10% of July sales (7,500 × 10% = 750. All other months are calculated in the same way.

(b) August ingredients purchases = **19,125 kg**

		August kg
Production quantity	8,350 × 2.5kg	20,875
Closing inventory	6,950 × 2.5kg × 50%	8,687.50
Opening inventory	8,350 × 2.5kg × 50%	(10,437.50)
		19,125

Test your understanding 3

D

Idle time is 20% of the total hours to be paid for.

Therefore, hours to paid be for = 2,400/0.8 = 3,000

Budgeted labour cost = 3,000 × $10 = **$30,000**

Test your understanding 4

D

60% of August sales less 2% discount ($60,000 × 60% × 98%)	35,280
25% of July sales ($40,000 × 25%)	10,000
12% of June sales ($35,000 × 12%)	4,200
	$49,480

Test your understanding 5

(a)

July	**$0**
August	**$21,200**
September	**$14,000**

	July	August	September
Opening inventory	0	($10,000)	($10,000)
Purchases	40 × $280 = $11,200	50 × $280 = $14,000	50 × $250 = $14,000
Closing inventory	$10,000	$10,000	$10,000
Total purchases	$21,200	$14,000	$14,000

Cash payments each month are for the previous month's purchases. Therefore, no payments are made in July

(b) **$13,600**

	$
August labour cost 50 × $160	8,000
July variable overhead cos 40 × $40	1,600
Fixed overhead cash cost ($5,000 – $1,000 depreciation)	4,000
	$13,600

Test your understanding 6

A

A flexible budget is designed to show the budgeted costs and revenues at different levels of activity

Test your understanding 7

	Quarter 1	Quarter 2	Quarter 3
Units	10,000	13,000	15,000
	$	$	$
Direct materials	130,000	169,000	**195,000**
Direct labour	74,000	96,200	**111,000**
Production overhead	88,000	109,000	**123,000**
Administration overhead	26,000	26,000	**26,000**
Total budget cost allowance	347,700	421,700	**455,000**

Cost behaviour patterns need to be identified.

Examine the total costs – administration overhead is a fixed cost as the total cost is constant as activity level changes.

Calculate the cost per unit – Direct materials and direct labour are variable costs as the cost per unit is constant.

Production overheads must be a semi-variable cost as the cost per unit and the total cost changes as activity level changes.

Flex the budget based on cost behaviours:

Direct materials = 130,000/10,000 × 15,000 = 195,000

Direct labour = 74,000/10,000 × 15,000 = 111,000

Production overheads – high low method

VC = (109,000 – 88,000)/(13,000 – 10,000) = $7 per unit

FC = 109,000 – (13,000 × 7) = $18,000

Total cost at 15,000 units = 18,000 + (15,000 × 7) = 123,000

Test your understanding 8

SDE produces and sells a single product. The budget and actual results for the latest period is as follows.

Budget	Original budget 12,600 units	Flexed budget 13,200 units	Actual 13,200 units	Variance
	$	$	$	$
Sales revenue	277,200	290,400	303,600	13,200 F
Variable costs:				
Direct material	75,600	79,200	78,350	850 F
Direct labour	50,400	52,800	51,700	1,100 F
Production overhead	12,600	13,200	14,160	960 A
Fixed costs:				
Production overhead	13,450	13,450	13,710	260 A
Other overhead	10,220	10,220	10,160	60 F
Profit	114,930	121,530	135,520	13,990 F

Chapter 14

Capital Budgeting

Outcome

By the end of this session you should be able to:

- discuss the importance of capital investment planning and control
- define and distinguish between capital and revenue expenditure
- outline the issues to consider and the steps involved in the preparation of a capital expenditure budget
- explain and illustrate the difference between simple and compound interest, and between nominal and effective interest rates
- explain and illustrate compounding and discounting
- explain the distinction between cash flow and profit and the relevance of cash flow to capital investment appraisal
- identify and evaluate relevant cash flows for individual investment decisions
- explain and illustrate the net present value (NPV) and internal rate of return (IRR) methods of discounted cash flow
- calculate present value using annuity and perpetuity formulae
- calculate NPV, IRR and payback (discounted and non-discounted)
- interpret the results of NPV, IRR and payback calculations of investment viability.

and answer questions relating to these areas.

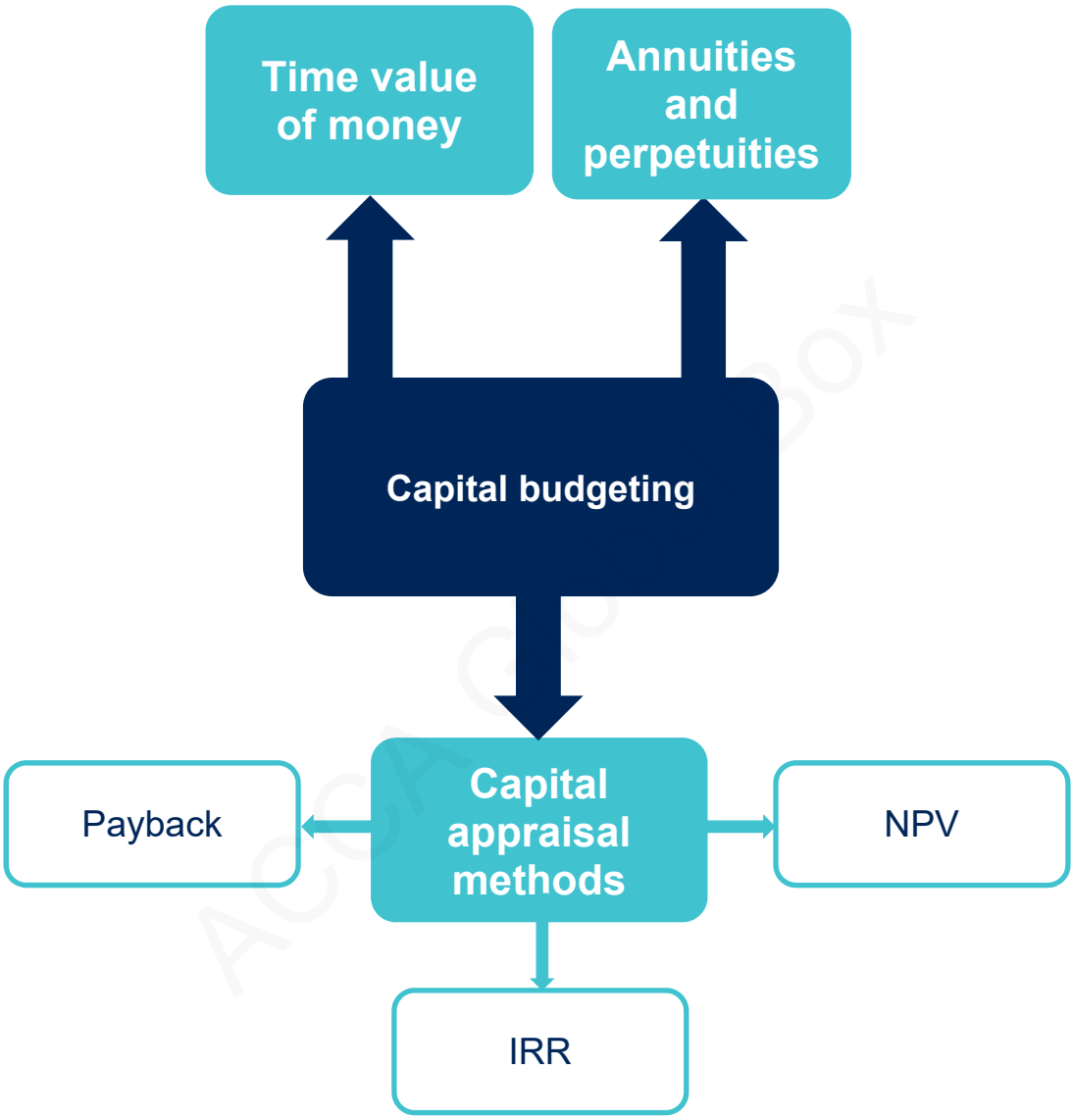
Chapter 14

PER

One of the PER performance objectives (PO13) is to plan business activities and control performance, making recommendations for improvement. Working through this chapter should help you understand how to demonstrate that objective.

The underpinning detail for this Chapter in your Integrated Workbook can be found in Chapter 14 of your Study Text

Overview



1 The capital investment process

Capital investment decisions normally represent the most important decisions that an organisation makes. They are normally **high cost** and **long-term**.

Examples of capital decisions:

- replacement of assets
- cost-reduction schemes
- new product/service developments
- product/service expansions.

To appraise a potential capital project:

- Estimate the costs and benefits from the investment
- Select an appraisal method and use it to assess if the investment is financially worthwhile
- Decide whether or not to go ahead with the project

Notes

1.1 Cash flows used for investment appraisal

In capital investment appraisal it is more appropriate to evaluate future cash flows rather than accounting profits.

Cash flows that are appraised should be relevant to or change as a direct result of making a decision to invest. Relevant cash flows are:

- future costs and revenues – it is not possible to change what has happened so any relevant costs or revenues are future ones
- cash flows – actual cash coming in or leaving the business not including any non-cash items such as depreciation and notional costs
- incremental costs and revenues – the change in costs or revenues that occur as a direct result of a decision to invest.

Illustrations and further practice

Notes

2 Time value of money

2.1 The time value of money

Suppose you were offered $100 now or $100 in one year's time. Even though the sums are the same, most people would prefer the money now. The $100 in the future is effectively worth less to us than $100 now – the timing of the cash makes a difference.

The main reasons for this are as follows:

- Investment opportunities: the $100 received now could be deposited into a bank account and earn interest. It would therefore grow to become more than $100 in one year. There are different forms of interest which are discussed next.
- Inflation: the $100 now will buy more goods than $100 in one year due to inflation.
- Cost of capital: the $100 received now could be used to reduce a loan or overdraft and save interest.
- Risk: the $100 now is more certain than the offer of money in the future.

2.2 Simple interest

Simple interest is calculated based on the original sum invested. Any interest earned in earlier periods is not included:

$V = X + (X \times r \times n)$

V – future value

X – initial investment (present value)

r – interest rate (expressed as a decimal)

n – number of time periods

2.3 Nominal interest rate

The nominal interest rate is the stated interest rate for a time period – for example a month or a year.

2.4 Effective interest ate

The effective interest rate is the interest rate that includes the effects of compounding a nominal interest rate.

$r = (1 + i/n)^n - 1$

r – effective interest rate

i – nominal interest rate

n – number of time periods

Notes

2.5 Compound interest

A sum invested today will earn interest. Compounding calculates the future value of a given sum invested today for a number of years.

Present value → **Future value**

Formula for compounding:

$V = X(1+r)^n$

V = Future value

X = Initial investment (present value)

r = Interest rate

n = number of time periods

Test your understanding 1

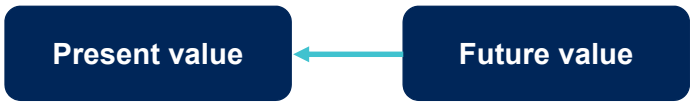
How much would $2,000 invested at 6% be worth at the end of 4 years?

Illustrations and further practice

Notes

2.6 Discounting

Discounting performs the opposite function to compounding. Compounding finds the future value of a sum invested now, whereas discounting considers a sum receivable in the future and establishes its equivalent value today. This value in today's terms is known as the Present Value.



Formula for discounting:

$$\text{Present value (X)} = \frac{\text{Future value (V)}}{(1 + r)^n}$$

This can be shown as:

$$\text{Present value (X)} = \text{Future value (V)} \times \frac{1}{(1 + r)^n}$$

Or

$$\text{Present value (X)} = \text{Future value (V)} \times (1 + r)^{-n}$$

Where $1 \div (1 + r)^n$ or $(1 + r)^{-n}$ is known as the discount factor

2.7 Present value tables

The discount factor, $(1 + r)^{-n}$ can be looked up in present value tables.

On the present value table, look along the top row for the interest rate and down the columns for the number of years, where the two intersect you can read off the discount factor.

Test your understanding 2

How much would $5,000 receivable in 10 years' time be worth today if the interest rate is 5%

Notes

2.8 Interest rates

In the above calculations we have referred to the rate of interest (r). There are a number of alternative terms used to refer to the rate an organisation should use to take account of the time value of money:

- Cost of capital
- Discount rate
- Required return

Whatever term is used, the rate of interest used for discounting reflects the cost of the finance that will be tied up in the investment.

Illustrations and further practice

Notes

3 The Payback Period

3.1 Payback technique

The payback technique considers the time a project will take to pay back the money invested in it. It is based on expected cash flows. To use the payback technique a company must set a **target payback period**.

Decision criteria

- Compare the payback period to the company's target return time and if the payback for the project is quicker the project should be accepted.
- Faced with mutually exclusive projects choose the project with the quickest payback.

Notes

3.2 Constant annual cash flows

In some cases, the cash flows estimated for the project are the same each year. We call these **constant annual cash flows**. In these cases, the payback calculation can be simplified by using the following formula:

$$\text{Payback period} = \frac{\text{Initial investment}}{\text{Annual cash flow}}$$

Test your understanding 3

Calculate the payback period for an investment that costs $1million and expects to generate cash flows of $300,000 per annum.

Illustrations and further practice

Notes

3.3 Uneven annual cash flows

If cash flows are uneven (a more likely state of affairs), the payback has to be calculated by working out the cumulative cash flow over the life of a project.

Example 1

Company X has a policy of only accepting projects that give a pay back of four years or less. A machine is available for purchase at a cost of $150,000. We expect it to have a life of five years and to have a scrap value of $20,000 at the end of the five-year period.

We have estimated that it will generate net cash flows over its life as follows:

	$000
1st year	40
2nd year	75
3rd year	60
4th year	30
5th year	10

Step 1 – set up a table with columns for year, cash flow, and cumulative balance.

Step 2 – put in the figures and calculate the cumulative balance until we get a positive figure (have paid back the investment).

Step 3 – work out what fraction of a year was required in the last year of payback.

Test your understanding 4

DER are considering two projects. Both cost $450,000 and only one may be undertaken. DER use the payback method for appraising investments and require payback within three years.

The details of the cash flows for the two projects are:

Year	Project A	Project B
	$000	$000
1	200	50
2	150	120
3	100	190
4	50	310
5	20	260

Advise DER which project they should undertake.

Notes

Test your understanding 5

SWE is considering a project which requires an initial investment of $500,000. The following profits have been forecast for the life of the project.

Year	Profit
1	$90,000
2	$120,000
3	$150,000
4	$130,000

These profit figures have taken account of annual depreciation which has been calculated as $15,000 per annum.

The company uses payment to appraise investments and requires a payback within 3 years.

Calculate the payback for the investment in years and months and advise if SWE would accept the project.

Notes

3.4 Discounted Payback

One of the major criticisms of using the payback period is that it does not take into account the time value of money. The discounted payback technique attempts to overcome this criticism by measuring the time required for the present values of the net cash flows from a project to equal the present values of the cash outflows.

The technique is identical – but the present value of the cash flow is calculated before calculating the cumulative cash flow.

Illustrations and further practice

Notes

3.5 Advantages and disadvantages of payback

Notes

4 Net present value (NPV)

4.1 NPV technique

Typically an investment opportunity will involve a significant capital outlay initially with cash benefits being received in the future for several years. To calculate the NPV:

- convert all future cash inflows into present value terms
- deduct the initial investment.

The NPV represents the surplus funds (after funding the investment) earned on the project. This tells us the impact the project has on shareholder wealth.

Decision criteria

- Any project with a positive NPV is viable. It will increase shareholder wealth
- Faced with mutually-exclusive projects, choose the project with the highest NPV

Notes

Example 2

X plc has the following estimated net cash flows for a new project.

X's cost of capital is 10% per annum (round answers to the nearest $000).

	Year 0	Year 1	Year 2	Year 3
	$000	$000	$000	$000
Capital expenditure	500			
Disposal proceeds				50
Revenue		400	500	300
Operating costs		100	150	110
Discount factors	1.000	0.909	0.826	0.751

Calculate the net present value for the project.

	Year 0	Year 1	Year 2	Year 3
	$000	$000	$000	$000
Capital expenditure/disposal				
Revenue				
Operating costs				
Net cash flows				
PV factors				
Discounted cash flows				
Net present value				

Test your understanding 6

KIO is considering two mutually exclusive projects with the following investment cost and cash flows:

	Project A	Project B
	($000)	($000s)
Initial investment	45	10
Scrap value in year 5	2	1
Year 1	20	5
Year 2	15	4
Year 3	10	3
Year 4	10	2
Year 5	10	2

Calculate the Net Present Value of the projects when the cost of capital is 10%

		Project A		Project B	
Year	**Discount factor 10%**	**Cash flow $000**	**PV $000**	**Cash flow $000**	**PV $000**
0					
1					
2					
3					
4					
5					
		NPV =		**NPV =**	

Illustrations and further practice

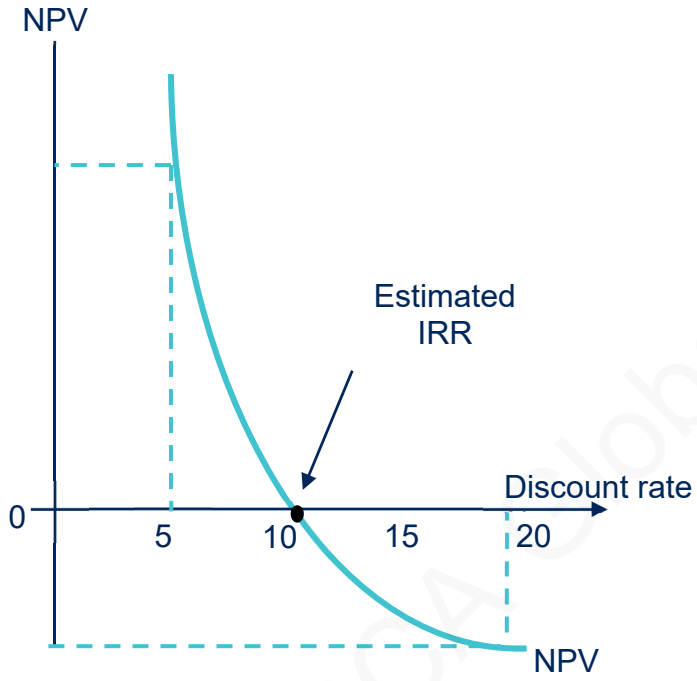
4.2 Advantages and disadvantages of NPV

Notes

5 Internal rate of return (IRR)

5.1 IRR technique

IRR calculates the rate of return at which a project has an **NPV of zero**.



Notes

The IRR is compared to the company's cost of capital (this is the target rate).

Decision criteria

- If the IRR is greater than the cost of capital the project should be accepted.
- Faced with mutually exclusive projects, choose the project with the higher IRR.

Notes

To calculate the IRR:

- Calculate two NPVs for the project at two different costs of capital. **The higher the discount rate – the lower the NPV will be.**
- Use the following formula to find the IRR:

$$IRR = L + \frac{N_L}{N_L - N_H}(H - L)$$

where: L = lower discount rate

H = higher discount rate

NL = NPV at the lower discount rate

NH = NPV at the higher discount rate.

Notes

Example 3

A project has an NPV of $4,400 at a discount rate of 10% and an NPV of –$31,000 at 20%. Calculate the IRR (to 2 decimal places)

You need to remember the rules of maths. Remove the brackets first, then deal with and division or multiplication and finally addition and subtraction (BODMAS)

Notes

Test your understanding 7

The NPV of a project has been calculated at two different discount rates:

At 10% the NPV is $13,725

At 15% the NPV is –$40,520

Calculate the IRR

Test your understanding 8

Which of the following statements regarding the IRR are true? Select all that apply.

A The IRR is the interest rate that equates the present value to expected future cash flows to the initial cost of the investment outlay.

B If the IRR for a project is greater than the company's cost of capital, the project should be accepted.

C With mutually exclusive projects, the project with the lowest internal rate of return should be selected.

D An advantage of IRR is that it is an absolute measure.

E If all projects with an IRR higher than the company's cost of capital are accepted, this should lead to the maximisation of shareholder wealth.

Illustrations and further practice

Notes

5.2 Advantages and disadvantages of IRR

Notes

6 Annuities and Perpetuities

6.1 Annuities

In the special case where a project has equal annual cash flow, the discounted cash flow can be calculated in a quicker way.

When a project has equal annual cash flows for a number of years the annuity factor may be used to discount the cash flows.

The present value of an annuity can therefore be quickly found using the formula:

PV = Annual cash flow × annuity factor (AF)

The annuity factor can be looked up on the annuity (cumulative present value) table or found using an annuity formula:

$$\text{Annuity factor} = \frac{1 - (1 + r)^{-n}}{r}$$

Test your understanding 9

A payment of $3,600 is to be made every year for seven years, the first payment occurring in one year's time. The interest rate is 8%

Calculate the present value of the annuity.

Notes

6.2 Perpetuities

While an annuity is a constant annual cash flow for a set number of years, a perpetuity is a constant annual cash flow which continues indefinitely. It is often described as a cash flow continuing 'for the foreseeable future'.

PV = Annual cash flow × Perpetuity factor

The perpetuity factor can be calculated as:

$$\text{Perpetuity factor} = \frac{1}{r}$$

Test your understanding 10

An investment of $50,000 is expected to yield $5,760 per annum in perpetuity.

Calculate the net present value of the investment if the cost of capital is 9%

Notes

6.3 IRR with Constant annual cash flows

In the same way that we can speed up the NPV and payback calculations when we have constant annual cash flows, we can also speed up the IRR calculation in the same situation.

For annuities, the quicker method involves setting the NPV to zero and using the cumulative present values tables to 'work backwards' to work out the discount rate.

For perpetuities the following formula can be used to calculate the IRR:

$$IRR = \frac{\text{Annual cash inflow}}{\text{Initial investment}}$$

Illustrations and further practice

Notes

Further practice

Exam kit questions

Test your understanding answers

Test your understanding 1

V = $2,000 × 1.06^4 = **$2,524.95**

Test your understanding 2

X = 5,000 × 1.05^{-10} = $3,069.57 = **rounded to $3,070**

Test your understanding 3

$$\text{Payback period} = \frac{1{,}000{,}000}{300{,}000}$$

= 3.33 years or 3 years 4 months

Test your understanding 4

Year	Project A	Cumulative cash flow	Project B	Cumulative cash flow
	$000	$000	$000	$000
0	(450)	(450)	(450)	(450)
1	200	(250)	50	(400)
2	150	(100)	120	(280)
3	100	0	190	(90)
4	50		310	220
5	20		260	

Based purely on payback DER should undertake **Project A** as it pays back with the required 3 years.

Note: Payback is useful when liquidity is a deciding factor; however, based on total net cash flows Project B is more financially worthwhile

Test your understanding 5

Year	Profit	Cash flow (adjusted for depreciation)	Cumulative cash flow
	$	$	$
0			(500,000)
1	90,000	105,000	(395,000)
2	120,000	135,000	(260,000)
3	150,000	165,000	(95,000)
4	130,000	145,000	50,000

The payback period is **3 years** and (95/145 × 12) **8 months**

This project should be **rejected** as the payback is longer than the required 3 years.

Test your understanding 6

		Project A		Project B	
Year	Discount factor 10%	Cash flow $000	PV $000	Cash flow $000	PV $000
0		(45)	(45)	(10)	(10)
1	0.909	20	18.18	5	4.55
2	0.826	15	12.39	4	3.30
3	0.751	10	7.51	3	2.25
4	0.683	10	6.83	2	1.37
5	0.621	12	7.45	3	1.86
		NPV =	**7.36**	**NPV =**	**3.33**

Test your understanding 7

IRR = 10 + [13,725 / (13,725 – –40,520)] × (15 – 10)

IRR = 10 + [13725 / 54245] × 5

IRR = 11.3%

Test your understanding 8

A, B and E are true

With mutually exclusive projects, the project with the highest IRR should be selected

The IRR does not provide an absolute measure, it is a relative measure.

Test your understanding 9

$(1 – (1.08)^{-7})/ 0.08 = 5.206$ (or taken from the present value tables)

£3,600 × 5.206 = **$18,741.63**

Test your understanding 10

NPV = ($5,670/0.09) – $50,000 = **$13,000**

Chapter 15

Standard costing

Outcome

By the end of this session you should be able to:

- explain the purpose and principles of standard costing
- explain and illustrate the difference between standard, marginal and absorption costing
- establish the standard cost per unit under marginal costing and absorption costing
- calculate sales price and volume variance
- calculate materials total, price and usage variance
- calculate labour total, rate and efficiency variances
- calculate the variable overhead total, expenditure and efficiency variance
- calculate fixed overhead total, expenditure and, where appropriate, volume, capacity and efficiency variance
- interpret the variances
- explain factors to consider before investigating variances, explain possible causes of the variances and recommend control action
- explain the interrelationships between the variances
- calculate actual figures or standard figures where the variances are given
- discuss the relative significance of variances
- explain potential action to eliminate variances

- reconcile budgeted profit with actual profit under standard absorption costing
- reconcile budgeted profit or contribution with actual profit or contribution under standard marginal costing.

and answer questions relating to these areas.

PER

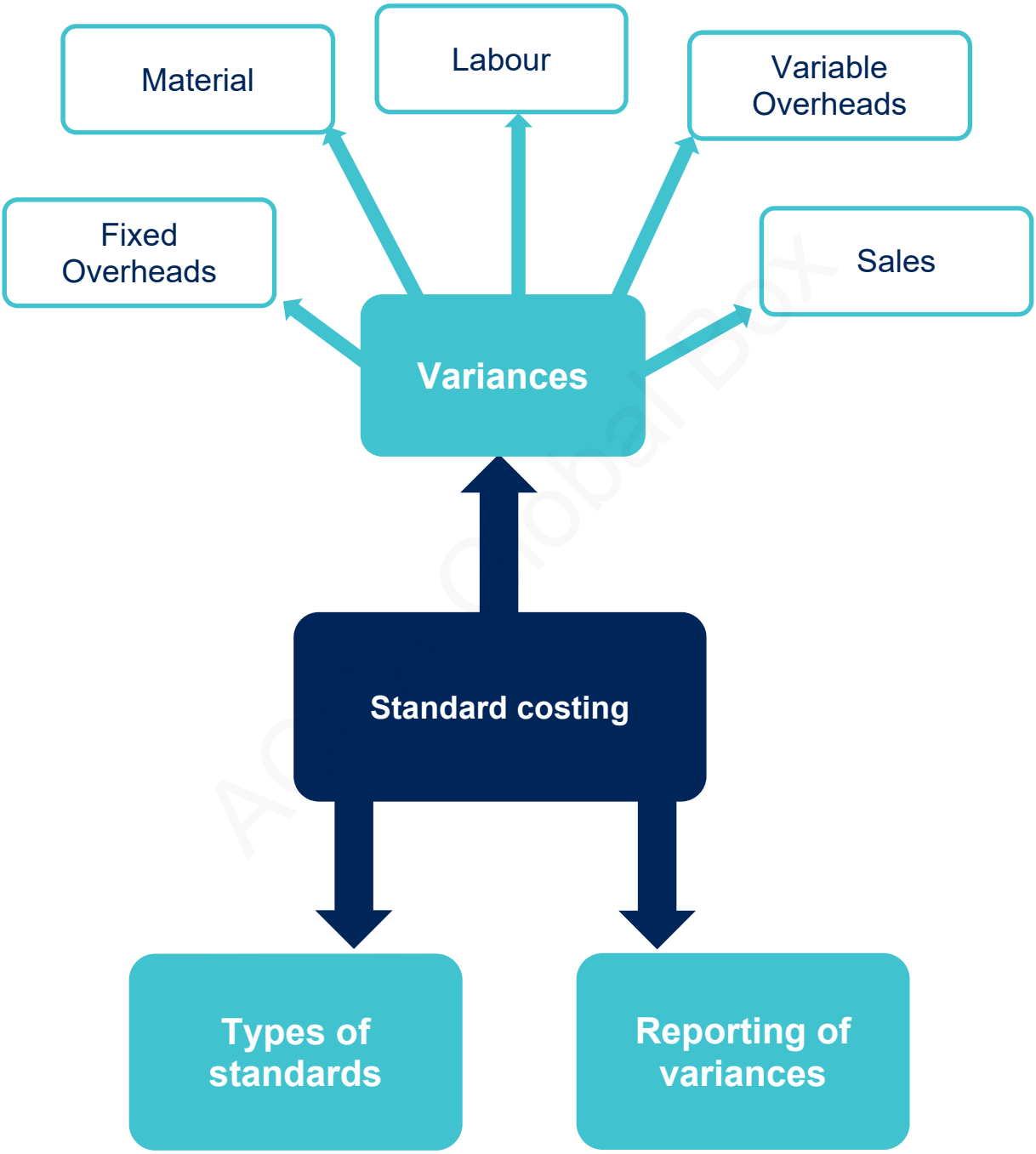
One of the PER performance objectives (PO13) is to plan business activities and control performance, making recommendations for improvement. Working through this chapter should help you understand how to demonstrate that objective.

PER

One of the PER performance objectives (PO14) is to measure and assess departmental and business performance. Working through this chapter should help you understand how to demonstrate that objective.

The underpinning detail for this Chapter in your Integrated Workbook can be found in Chapter 15 of your Study Text

Overview



1 Standard costing

1.1 What is standard costing?

In the budgeting chapter we looked at the preparation of budgets within an organisation. These budgets were prepared at a total level and became a target against which actual results could be measured.

In this chapter we will look at another control technique known as standard costing. Standard costing also produces a target against which we can measure actual results, but in standard costing the targets are set at a unit level.

A standard cost is a carefully **pre-determined** unit cost which is prepared for each cost unit.

The standard becomes a **target** against which performance can be measured.

The actual costs incurred are measured after the event and compared to the pre-determined standards.

The difference between the standard and the actual is known as a **variance**. Analysing variances can help managers focus on the areas of the business requiring the most attention. This is known as **management by exception**.

Test your understanding 1

A standard cost is:

A the planned unit cost of a product, component or service

B the budgeted cost for the level of activity achieved in a budget centre in a control period

C the budgeted production cost for the level of activity in a budget period

D the budget non-production cost for a product, component or service in a period

Notes

1.2 Standard cost card

Once standard costs for a product or service have been set, they are presented in a **standard cost card**.

Example 1

A standard cost card for a product, showing the variable elements of production cost per unit, might look like this:

Standard cost card: XX1

	$
Direct materials: 10 kg @ $5	50
Direct labour: 12 hours @ $11	132
Prime cost	182
Variable production overhead: 12 hours @ $9	108
Variable production cost	290

For each of the variable costs, the standard amount and the standard price are given.

Direct material	standard quantity (10kg) × standard price ($5 per kg)
Direct labour	standard hours (12 hours) × standard rate ($11 per hour)
Variable production overheads	standard hours (12 hours) × standard rate ($9 per hour)

Note: The standard hours for labour and overheads are usually the same as we normally assume that variable overheads are absorbed on the basis of labour hours.

These standard data provide the information for a detailed variance analysis, as long as the actual data are collected at the same level of detail.

Notes

1.3 Types of standard

There are four main types of standards:

- **Ideal standard**

- **Attainable standard**

- **Current standard**

- **Basic standard**

Notes

Test your understanding 2

X, Y and Z are manufacturing companies and all use standard costing.

X has set a standard cost which allows for 90% efficiency. This allows for machine downtime and the level of wastage normally experienced during production.

Y's standards were set several years ago. The managers of Y find it useful to compare current performance against these standards to measure the improvements which have been made.

Z has set standards which assume 100% efficiency will be achieved and no losses will be incurred during production.

Match each of the companies to the types of standard they are using:

Standard	Company
Ideal	X
Basic	Y
Attainable	Z

Notes

Test your understanding 3

Standards which remain unchanged over a period of years are known as:

A Attainable standards

B Basic standards

C Ideal standards

D Current standards

Standards which assume efficient levels of operation, but which includes allowances for factors such as waste and machine downtime, are known as:

A Attainable standards

B Basic standards

C Ideal standards

D Current standards

Notes

2 Variance analysis

2.1 What is a variance?

In budgetary control, we saw that variances were calculated by comparing the actual costs to the flexed budget cost. In standard costing, variances are calculated in the same way, although more detailed variance analysis is possible.

Total cost variances can be broken down to explain how much of it is caused by the usage of resources being different from the standard, and how much of it is caused by the price of resources being different from the standard.

If the resource price or usage is above standard, or if sales volume or selling price is below standard, an adverse variance will result. If resource price or usage is below standard, or if sales volume or selling price is above standard, a favourable variance will result.

A variance is the difference between actual results and the budget or standard.

Taken together, cost and sales variances can be used to explain the difference between the budgeted profit for a period and the actual profit.

- When actual results are better than expected results, a favourable (F) variance occurs.
- When actual results are worse than expected results, an adverse variance (A).

Notes

3 Material variances

3.1 Calculations

Actual Quantity × Actual Price

Actual Quantity × Standard Price — **Price** variance

Standard Quantity × Standard Price — **Usage** variance

Total variance

OR

Price variance = (SP – AP) × AQ

Usage variance = (SQ – AQ) × SP

If there is a change in materials inventory in the year, then the price variance is based on the quantity of material purchased whilst the usage variance is based on the actual quantity used.

Test your understanding 4

The standard cost card for product F shows that each unit requires 3 kg of material at a standard price of $9 per kg. Last period, 200 units of F were produced and $5,518 was paid for 620 kg of material that was bought and used.

The material variances for the period are:

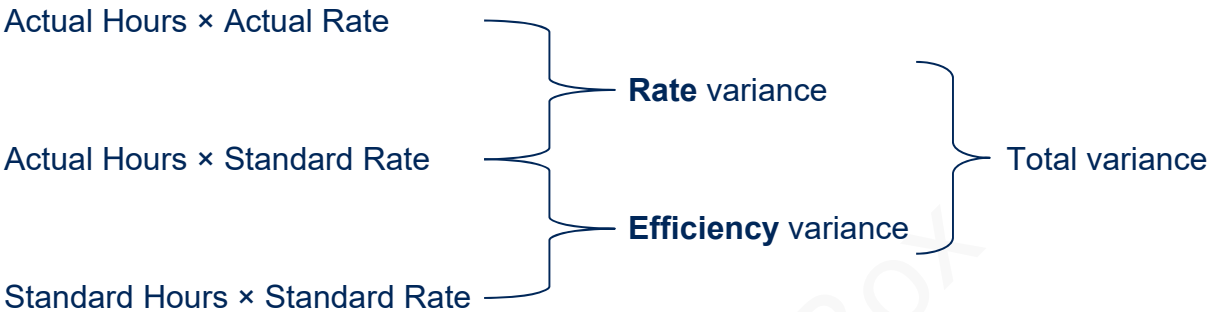
Material price variance	$	A	F
Material usage variance	$	A	F

Illustrations and further practice

Notes

4 Labour variances

4.1 Calculations



OR

Rate variance = (SR – AR) × AH

Efficiency variance = (SH – AH) × SR

If there is idle time, the rate variance is based on the hours actually paid whilst the efficiency variance is based on the hours actually worked.

Idle time variance:

Actual hours worked × standard rate per hour	X
Actual hours paid × standard rate per hour	Y
Idle time variance	X – Y

Test your understanding 5

The standard cost card for product V shows that each unit requires 3 hours of labour at a standard price of $9 per hour. Last period, 670 units of V were produced and $17,765 was paid for 2,090 hours of labour.

The labour variances for the period are:

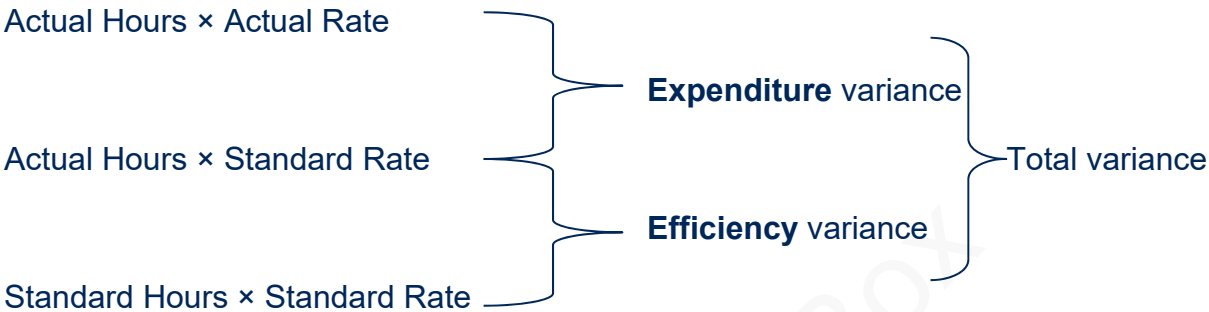
Labour rate variance	$	A	F
Labour efficiency variance	$	A	F

Illustrations and further practice

Notes

5 Variable overhead variances

5.1 Calculations



OR

Expenditure variance = (SR – AR) × AH

Efficiency variance = (SH – AH) × SR

There is no need to worry about idle time. The hours here, are the hours **worked**.

Test your understanding 6

The standard cost card for product P shows:

Variable production overheads 3 hours at $2 per hour $6 per unit.

Last period, 670 units of P were produced and actual results were:

Variable production overheads 2,090 hours $5,434

The variable overhead variances for the period are:

Variable overhead expenditure variance	$	A	F
Variable overhead efficiency variance	$	A	F

Illustrations and further practice

Notes

6 Sales variances

6.1 Calculations

Sales price variance		**$**
They did sell for	(actual sales revenue)	X
Units sold should have sold for	(actual sales units × standard sales price per unit)	Y
Sales price variance		X – Y

OR

Sales price variance = (AP – SP) × AQ

Sales volume variance	
Actual sales volume	X
Budgeted sales volume	Y
Sales volume variance (units)	X – Y
Standard margin contribution (MC) or standard profit (AC) per unit	$
Sales volume variance	(X – Y) × $

OR

Sales volume variance = (AQ – BQ) × SM

Notes

Test your understanding 7

The following data relate to product R for the latest period.

Budgeted sales revenue	$250,000
Standard selling price per unit	$12.50
Standard contribution per unit	$5.00
Actual sales volume (units)	19,500
Actual sales revenue	$257,400

The sales variances for the period are:

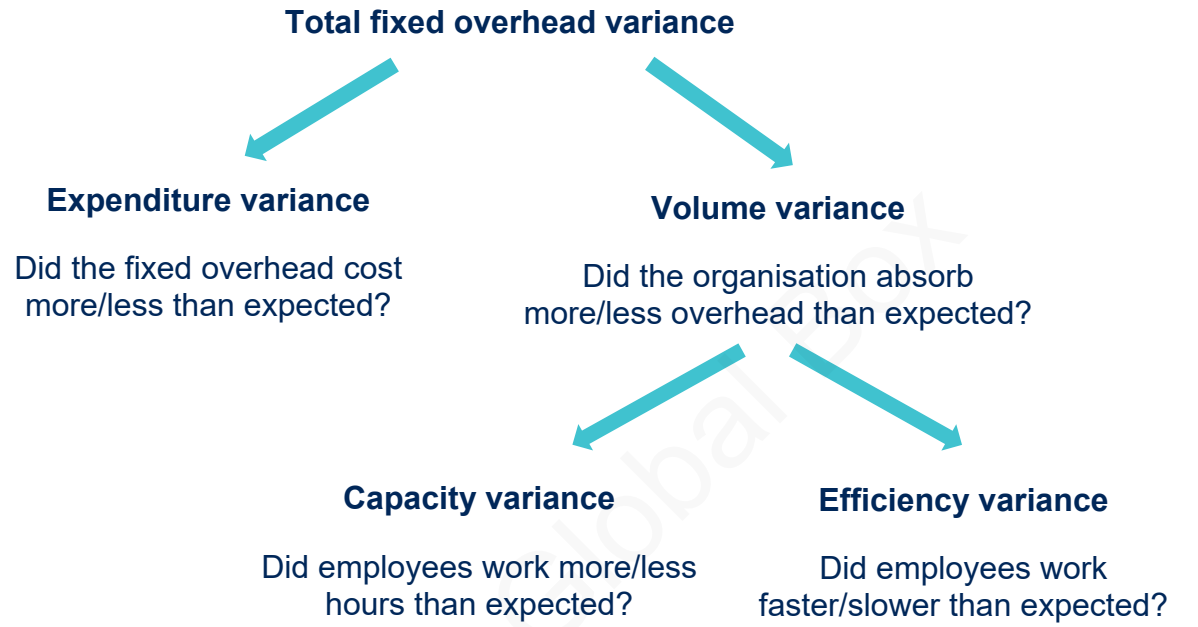
Sales price variance	$	A	F
Sales volume contribution variance	$	A	F

Illustrations and further practice

Notes

7 Fixed overhead variances

7.1 Fixed overhead variances



Notes

7.2 Calculations

Expenditure variance

= budgeted fixed cost – actual fixed cost.

Applicable in both marginal costing and absorption costing systems

Volume variance (units produced)	**Volume variance (hours worked)**	
Actual quantity × FOAR	Standard hours for actual production × FOAR	X
Budgeted quantity × FOAR	Budgeted hours × FOAR	Y
Fixed overhead volume variance		X – Y

This variance only arises in absorption costing systems.

If fixed overheads are absorbed based on hours then the volume variance can be split into efficiency and capacity.

Efficiency variance	$
Standard hours × FOAR per hour	X
Actual hours × FOAR per hour	Y
Fixed overhead efficiency variance	X – Y

Capacity variance	$
Actual hours × FOAR per hour	X
Budgeted hours × FOAR per hour	Y
Fixed overhead capacity variance	X – Y

Test your understanding 8

PQ operates a standard costing system for its only product. The standard cost card is as follows:

Direct materials	(4 kg at $2 per kg)	$8.00
Direct labour	(4 hours at $4 per hour)	$16.00
Variable overhead	(4 hours at $3 per hour)	$12.00
Fixed overhead	(4 hours at $5 per hour)	$20.00

Fixed overhead costs are budgeted at $120,000 per annum arising at a constant rate during the year.

Budgeted monthly production is 500 units. Actual production during period 3 was 600 units, with actual fixed overhead costs incurred being $9,800 and actual hours worked being 1,970.

Calculate the following variances:

Variance	**$**	**A**	**F**
Fixed overhead expenditure			
Fixed overhead volume			
Fixed overhead efficiency			
Fixed overhead capacity			

Illustrations and further practice

Notes

8 Calculating actual or standard from variance data

One way that the examiner can easily test your understanding of variances is to ask you to calculate the following instead of straightforward variance calculations:

- actual figures from variances and standards
- standards from variances and actual figures.

Test your understanding 9

During a period 17,500 hours were worked at a standard cost of $6.50 per hour. The labour efficiency variance was $7,800 favourable

The number of standard labour hours expected for the output achieved was:

A 1,200

B 16,300

C 17,500

D 18,700

Test your understanding 10

The standard cost card for product K shows that each unit requires four hours of direct labour at a standard rate of $8 per hour. Last period 420 units were produced and the direct labour cost amounted to $15,300. The direct labour efficiency variance was $160 adverse.

The actual rate paid per direct labour hour is $_____

Illustrations and further practice

Notes

9 Operating statements

Variances are often summarised in an operating statement. The statement allows for budgeted values to be reconciled with actual values.

If the statement starts with budgeted profit (absorption costing) or possibly budgeted contribution (marginal costing) then:

- Add the favourable variances as they increase profit/contribution
- Subtract the adverse variance as they decrease profit/contribution.

Test your understanding 11

The budgeted contribution for last month was $43,900 but the following variances arose

Variance	$
Sales price	3,100 A
Sales volume contribution	1,100 A
Material price	1,986 F
Material usage	2,200 F
Labour rate	1,090 A
Labour efficiency	512 A
Variable overhead expenditure	1,216 F
Variable overhead efficiency	465 A

The actual contribution for last month was $_____

Notes

9.1 Absorption costing operating statements

	$	$	$
Budgeted profit			
Sales variances:	**Favourable**	**Adverse**	
Sale price variance			
Sales profit volume variance			
Actual sales minus the standard full cost of sales			
Cost variances:			
Material price			
Material usage			
Labour rate			
Idle time			
Labour efficiency			
Variable overhead expenditure			
Variable overhead efficiency			
Fixed overhead expenditure			
Fixed overhead capacity			
Fixed overhead efficiency			
Total variances			
Actual profit			

Notes

9.2 Marginal costing operating statements

	$	$	$
Budgeted profit			
Add: Budgeted fixed overheads			
Budgeted contribution			
Sales variances:	**Favourable**	**Adverse**	
Sales price variance			
Sales contribution volume variance			
Actual sales minus the standard marginal cost of sales			
Cost variances			
Material price			
Material usage			
Labour rate			
Idle time			
Labour efficiency			
Variable overhead expenditure			
Variable overhead efficiency			
Total of variable cost variances			
Actual contribution			
Budgeted fixed overhead			
Fixed overhead expenditure			
Actual fixed cost			
Actual profit			

Illustrations and further practice

Notes

10 Reporting of variances

The causes of variances can be classified under four headings:

- **Planning errors**
- **Measurement errors**
- **Random factors**
- **Operational factors**

Notes

10.1 Reporting of variances

Factors to consider include the following:

- the size/significance of the variance
- whether favourable/adverse – firms often treat adverse variances as more important than favourable
- correction costs versus benefits
- ability to correct
- past pattern
- budget reliability
- reliability of measurement/recording systems.

Test your understanding 12

The material usage variance for last period was $3,400 adverse.

Which of the following reasons could have contributed to this variance?
Select all that apply

	Tick
Output was higher than budgeted	
The purchasing department bought poor quality material	
The original standard usage was set too high	
Market prices for the material were higher than expected	
An old, inefficient machine was causing excess wastage	

Test your understanding 13

If employees are more skilled than had been allowed for in the original standard cost, which of the following variances are most likely to results? Select all that apply

	Tick
Favourable material usage	
Adverse material usage	
Favourable labour efficiency	
Adverse labour efficiency	
Favourable labour rate	
Adverse labour rate	
Favourable variable overhead efficiency	
Adverse variable overhead efficiency	

Notes

10.2 Problems in using standard costing in modern environments

Standard costing may not be appropriate in the modern production environment because:

- products are non-standard
- standard costs become outdated quickly
- production is highly automated
- ideal standard used in modern environments
- emphasis on continuous improvement
- detailed information is required
- variance analysis provides results 'too late'.

Test your understanding 14

Are the following statements regarding standard costing true or false?

	True	False
Standard costing cannot be applied in an organisation that manufactures specialist furniture to customer' specifications because every cost unit is unique		
A standard is a benchmark measurement of resource usage or profit generation set in defined conditions		
To reconcile the budgeted contribution to the actual contribution, deduct adverse cost variances and favourable sales variances and add on favourable cost variances and adverse sales variances		

Notes

Further practice

Exam kit questions

Test your understanding answers

Test your understanding 1

A

Test your understanding 2

Standard	Company
Ideal	Z
Basic	Y
Attainable	X

Test your understanding 3

Standards which remain unchanged over a period of years are known as:

B Basic standards

Standards which assume efficient levels of operation, but which includes allowances for factors such as waste and machine downtime, are known as:

A Attainable standards

Test your understanding 4

The material variances for the period are:

Material price variance	$62	A	**F**
Material usage variance	$180	**A**	F

Actual quantity 620 kg ×	Actual price	$5,518
		Price variance $62 F
Actual quantity 620 kg ×	Standard price $9	$5,580
		Usage variance $180 A
Standard quantity 200 units × 3 kg ×	Standard price $9	$5,400

Test your understanding 5

The labour variances for the period are:

Labour rate variance	$1,045	A	**F**
Labour efficiency variance	$720	**A**	F

Actual hours 2,090 hours ×	Actual rate	$17,765
		Rate variance $1,045 F
Actual hours 2,090 hours ×	Standard rate $9	$18,810
		Efficiency variance $720 A
Standard hours 670 units × 3 hours ×	Standard rate $9	$18,090

Test your understanding 6

The variable overhead variances for the period are:

Variable overhead expenditure variance	$1,254	**A**	F
Variable overhead efficiency variance	$160	**A**	F

Actual hours 2,090 hours ×	Actual rate	$5,434
	Expenditure variance	$1,254 A
Actual hours 2,090 hours ×	Standard rate $2	$4,180
	Efficiency variance	$160 A
Standard hours 670 units × 3 hours ×	Standard rate $2	$4,020

Test your understanding 7

The sales variances for the period are:

Sales price variance	$13,650	A	**F**
Sales volume contribution variance	$2,500	**A**	F

Sales price variance		**$**
They did sell for		257,400
Units sold should have sold for	19,500 × $12.50	243,750
Sales price variance		13,650 F

Sales volume variance		
Actual sales volume		19,500
Budgeted sales volume	$250,000 / $12.50	20,000
Sales volume variance (units)		500 A
Standard contribution (MC) or standard profit (AC) per unit		× $5
Sales volume variance		$2,500 A

Test your understanding 8

Variance	$	A	F
Fixed overhead expenditure	= budgeted fixed cost – actual fixed cost. = $120,000 / 12 – $9,800 = **$200**		✓
Fixed overhead volume	Actual production volume × FOAR: 600 × $20 = $12,000 Budgeted production volume × FOAR: 500 × $20 = $10,000 Fixed overhead volume variance: **$2,000**		✓
Fixed overhead efficiency	Standard hours × FOAR per hour: 600 × 4 × $5 = 12,000 Actual hours × FOAR per hour: 1,970 × $5 = $9,850 Fixed overhead efficiency variance: **$2,150**		✓
Fixed overhead capacity	Actual hours × FOAR per hour: 1,970 × $5 = $9,850 Less: Budgeted expenditure: 500 × 4 × $5 = $10,000 Fixed overhead capacity variance: **$150**	✓	

Test your understanding 9

D 18,700

Actual hours 17,500 hours ×	Standard rate $6.50	$113,750
	Efficiency variance $7,800 F	
Standard hours $121,550 / $6.50 = 18,700 hours	Standard rate $6.50	$121,550

Test your understanding 10

The actual rate paid per direct labour hour is **$9**

Actual hours	Actual rate $15,300 / 1,700 hours **= $9**	$15,300
	Rate variance $N/A	
Actual hours $13,600 / $8 = 1,700 hours	Standard rate $8	$13,600
	Efficiency variance $ 160 A	
Standard hours 420 units × 4 hours ×	Standard rate $8	$13,440

Test your understanding 11

Budgeted contribution	$43,900
Sales price	–3,100
Sales volume contribution	–1,100
Material price	1,986
Material usage	2,200
Labour rate	–1,090
Labour efficiency	–512
Variable overhead expenditure	1,216
Variable overhead efficiency	–465
Actual contribution	**$43,035**

Test your understanding 12

	Tick
Output was higher than budgeted	Usage variance is based on actual output
The purchasing department bought poor quality material	✓
The original standard usage was set too high	Should lead to a variable variance
Market prices for the material were higher than expected	Affect price not usage
An old, inefficient machine was causing excess wastage	✓

Test your understanding 13

	Tick
Favourable material usage	✓
Adverse material usage	
Favourable labour efficiency	✓
Adverse labour efficiency	
Favourable labour rate	
Adverse labour rate	✓
Favourable variable overhead efficiency	✓
Adverse variable overhead efficiency	

Test your understanding 14

Are the following statements regarding standard costing true or false?

	True	False
Standard costing cannot be applied in an organisation that manufactures specialist furniture to customer' specifications because every cost unit is unique		✓
A standard is a benchmark measurement of resource usage or profit generation set in defined conditions	✓	
To reconcile the budgeted contribution to the actual contribution, deduct adverse cost variances and favourable sales variances and add on favourable cost variances and adverse sales variances		✓

Notes

Chapter 16

Performance measurement techniques

Outcome

By the end of this session you should be able to:

- discuss the purpose of mission statements and their role in performance measurement
- discuss the purpose of strategic and operational and tactical objectives and their role in performance measurement
- discuss the impact of economic and market conditions on performance measurement
- explain the impact of government regulation on performance measurement
- discuss the relationship between short-term and long-term performance
- discuss and calculate measures of financial performance (profitability, liquidity, activity and gearing) and nonfinancial measures
- discuss the importance of nonfinancial performance measure
- Perspectives of the balanced scorecard
  - discuss the advantages and limitations of the balanced scorecard
  - describe performance indicators for financial success, customer satisfaction, process efficiency and growth
  - discuss and establish critical success factors and key performance indicators and their link to objectives and mission statements
  - establish critical success factors and key performance indicators in a specific situation
- discuss the role of benchmarking in performance measurement

- Economy, efficiency and effectiveness
  - discuss the meaning of each of the efficiency, capacity and activity ratios
  - calculate the efficiency, capacity and activity ratios in a specific situation
- Resource utilisation
  - describe measures of performance utilisation in service and manufacturing environments
  - establish measures of resource utilisation in a specific situation
- distinguish performance measurement issues in service and manufacturing industries in relation to quality.
- discuss measures that may be used to assess managerial performance and the practical problems involved
- Profitability
  - calculate return on investment and residual income
  - explain the advantages and limitations of return on investment and residual income
- describe performance measures which would be suitable in contract and process costing environments
- describe performance measures appropriate for service industries
- discuss the measurement of performance in service industry situations
- discuss the measurement of performance in non-profit seeking and public sector organisations
- Economy, efficiency and effectiveness
  - explain the concepts of economy, efficiency and effectiveness
  - describe performance indicators for economy, efficiency and effectiveness
  - establish performance indicators for economy, efficiency and effectiveness in a specific situation
- compare cost control and cost reduction
- describe and evaluate cost reduction methods
- describe and evaluate value analysis.

and answer questions relating to these areas.

PER

One of the PER performance objectives (PO1) is to take into account all relevant information and use professional judgement, your personal values and scepticism to evaluate data and make decisions. You should identify right from wrong and escalate anything of concern. You also need to make sure that your skills, knowledge and behaviour are up-to-date and allow you to be effective in you role. Working through this chapter should help you understand how to demonstrate that objective.

PER

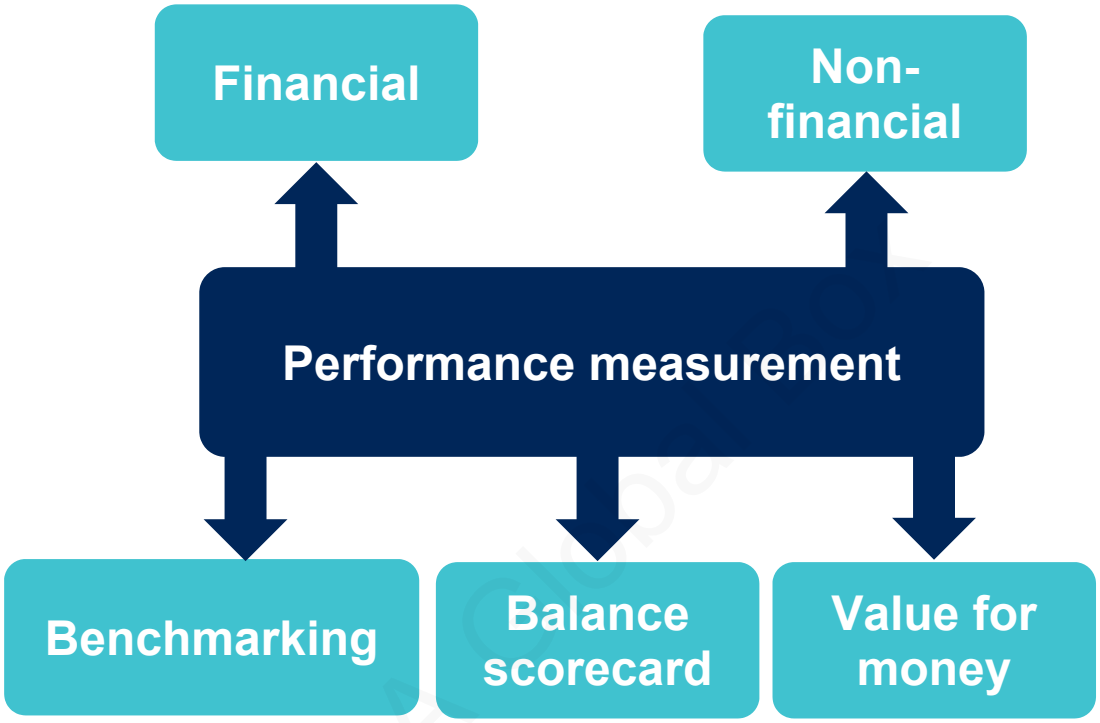
One of the PER performance objectives (PO13) is to plan business activities and control performance, making recommendations for improvement. Working through this chapter should help you understand how to demonstrate that objective.

PER

One of the PER performance objectives (PO14) is to measure and assess departmental and business performance. Working through this chapter should help you understand how to demonstrate that objective.

The underpinning detail for this Chapter in your Integrated Workbook can be found in Chapter 16 of your Study Text

Overview



1 The purpose of performance measurement

1.1 What is performance measurement?

Performance measurement is **the monitoring of budgets or targets against actual results** to establish how well the business and its employees are functioning as a whole and as individuals.

Performance measurement is a very important aspect of management accounting. Management accountants get involved in:

This information will be used by management to make decisions about the organisation.

Notes

1.2 Impact of performance measurement on behaviour

Performance measurement is very important as it can affect behaviour, so it is crucial when setting performance targets that we consider what behaviour we are looking to encourage. Setting poor performance targets can lead to **dysfunctional behaviour** which is behaviour that is not in the best interests of the organisation as a whole.

Performance can be measured at an individual, departmental or organisation level and the types of measurements used will depend on the area being measured.

Responsibility centres were covered in the budgeting chapter. In responsibility reporting, costs and revenues are grouped according to which individual manager or management team is responsible for their control.

Different types of organisations require different types of performance measures and different areas within an organisation require different measures.

Measures are especially relevant to managers if the manager has **control** over the costs and revenues.

Notes

2 Financial performance measures

Financial performance measures are used to monitor the inflows (revenue) and outflows (costs) and the overall management of money in the business. These measures focus on information available from the Statement of profit or loss and Statement of financial position of a business.

2.1 Measuring profitability

The primary objective of a profit seeking company is to maximise profitability. A business needs to make a profit to be able to provide a return to any investors and to be able to grow the business by reinvestment.

Three profitability ratios are often used to monitor the achievement of this objective:

- Gross margin = gross profit ÷ revenue %
- Return on sales (ROS) = operating profit ÷ revenue %
- Return on capital employed (ROCE) = operating profit ÷ (non-current liabilities + total equity) %
- Asset turnover = Revenue ÷ capital employed

Notes

Test your understanding 1

JUY has two production divisions, J and Y which operate as investment centres. A report for July has been prepared for the two divisions and extracts are shown below:

	J	Y
	$000	$000
Sales revenue	300	550
Direct costs of production	160	230
Indirect costs of production	50	160
Non-production costs	25	32
Capital employed	500	1,300

Calculate the following for J and Y:

	J	Y
Gross margin	%	%
ROCE	%	%
Return on sales	%	%
Asset turnover		

Notes

2.2 Measuring liquidity

Liquidity means having cash, or ready access to cash. Liquid assets are therefore cash and short-term investments that can be readily sold if the need arises. In addition, liquidity is improved by unused bank borrowing facilities.

Liquidity is improved through efficient cash management, and an important element of good cash management is control over inventory, trade receivables and trade payables

There are two liquidity ratios that are used to give an indication of a company's ability to manage short term financial obligations.

- Current ratio = current assets ÷ current liabilities
- Acid test (Quick ratio) = (current assets – inventories) ÷ current liabilities

Test your understanding 2

Extracts from B's master budget for the latest period are as follows:

Statement of profit or loss	$000
Revenue	5,440
Gross profit	2,730
Operating profit	900
Statement of financial position	
Non-current assets	1,850
Inventory	825
Receivables	710
Bank	50
Current liabilities	780

(a) Calculate the budgeted current ratio.

(b) Calculate the budgeted quick (acid test) ratio.

Notes

2.3 Measuring activity

Activity ratios look at how well a business manages to convert statement of financial position items into cash. They are used to investigate how efficiently current assets are managed.

- Inventory days = inventory ÷ cost of sales × 365
- Receivable days = receivables ÷ credit sales × 365
- Payable days = payables ÷ credit purchased × 365

Test your understanding 3

The summarised financial statements for P Limited, a potential major supplier, are shown below. Before a contract is signed, the financial performance of P Limited is to be reviewed.

Summary Statement of Financial Position for P Limited at year end

	20X3
	£000
Non-current assets	1,600
Inventories	300
Trade receivables	200
Cash	50
Trade payables	(280)
Long-term borrowings	(900)
Net assets	970
Share capital	600
Retained earnings	370
	970

Summary Statement of Profit or loss for the year

	2003
	£000
Revenue	3,000
Cost of sales	1,600
Operating profit	600

Calculate the following financial statistics for P Limited for 2003 (to 1 decimal place):

(a) receivables days

(b) payables days

(c) inventory days.

Illustrations and further practice

Notes

2.4 Measuring risk

How 'geared' a business is can be calculated to assess financial risk. Gearing indicates how well a business will be able to meet its long term debts.

- Capital gearing (leverage) = non-current liabilities (debt) ÷ ordinary shareholders funds (equity) × 100

Or

- Capital gearing = non-current liabilities (debt) ÷ (non-current liabilities + ordinary shareholders funds (debt + equity)) × 100
- Interest cover = operating profit ÷ finance cost

Notes

Test your understanding 4

Extracts from a company's accounts show the following:

	$000	$000
Non-Current assets		30,000
Current assets		
Inventory	22,000	
Trade receivables	12,506	
Cash	5,006	
		39,512
Total assets		**69,512**
Equity		
Share capital		100
Revaluation reserve		12,000
Retained earnings		26,412
Non-current liabilities		
Loans		16,000
Current liabilities		
Trade payables		15,000
Total equity and liabilities		**69,512**

Additional Notes	**$000**
Revenue	64,323
Profit before interest and taxation	27,657

What is the gearing ratio (total debt/equity) of the company?

A 44.3%

B 41.5%

C 60.6%

D 57.1%

Test your understanding 5

Extracts from a company's accounts show the following balances:

	$000		$000
Inventories	150	Revenue	2,700
Receivables	300	Cost of sales	1,300
Cash	25	Gross profit	1,400
Payables	230	Admin costs	500
Overdraft	90	Distribution costs	350
		Operating profit	550
		Finance cost	75

What is the interest cover of the company?

A 4.67 times

B 5.67 times

C 7.33 times

D 6.50 times

Notes

2.5 Divisional performance measures

If the principle of controllability is applied, a manager should be made responsible and accountable only for the costs and revenues that he or she is in a position to control.

Return on investment (ROI) = Controllable profit ÷ controllable capital employed × 100

Notes

Residual Income (RI) = Controllable Profit – Notional interest on capital

Test your understanding 6

An organisation is divided into a number of divisions, each of which operates as a profit centre. Which of the following would be useful measures to monitor divisional performance?

(i) Contribution

(ii) Controllable profit

(iii) Return on investment

(iv) Residual income

A (i) only

B (i) and (ii) only

C (iii), (iv) only

D All of them

Test your understanding 7

A division of a company has capital employed of £2m and its return on capital is 12%. It is considering a new project requiring capital of £500,000 and is expected to yield profits of £90,000 per annum. The company's interest rate is 10%. If the new project is accepted, the residual income of the division will be:

A £40,000

B £80,000

C £30,000

D £330,000

Notes

Test your understanding 8

Division M has produced the following results in the last financial year:

	$000
Net profit	360
Capital employed:	1,600

For evaluation purposes all divisional assets are valued at original cost. The division is considering a project which will increase annual net profit by $25,000, but will require capital employed to increase by $130,000. There is an 18% capital charge on investments.

Given these circumstances, will the evaluation criteria of Return on Investment (ROI) and Residual Income (RI) motivate Division M management to accept this project?

	ROI	RI
A	Yes	Yes
B	Yes	No
C	No	Yes
D	No	No

Illustrations and further practice

Notes

2.6 Problems with financial measures

Achievement of these target ratios (financial performance indicators) may be linked to a reward system in order to motivate managers to improve financial performance.

However, there are a number of problems associated with the use of financial performance indicators alone to monitor performance:

- Short-termism vs long term performance
- Manipulation of results
- Do not convey the full picture
- Backward looking.

Therefore, when monitoring performance, a broader range of measures should be used.

Notes

3 Non-financial performance measures

Information provided by management accountants needs to be **both financial and non-financial**. Financial information is important for management because many objectives of an organisation are financial in nature, such as making profits. While profit cannot be ignored as it is the main objective of commercial organisations, performance measures should not focus on profit alone. Managers also need information of a non-financial nature.

The large variety in types of businesses means that there are many non-financial measures which could be used. Each business and business unit will have its own set of non-financial measures which are relevant to their type of operation.

3.1 Examples of non-financial measures

Non-financial measures are often grouped together into the broad headings of **productivity** or **quality**, for example measurements of resource utilisation or customer satisfaction

Notes

3.2 Features of non-financial measures

- they offer a wider view of performance than using financial measures alone
- they are forward looking and can often highlight potential problem areas
- they can be easy to understand as they measure the aspects of the business area that the manager is interested in
- they are not distorted by inflation and are therefore directly comparable year on year
- they focus management's attention on potential problem areas.

However, they are not without their problems:

- it can be time-consuming and costly to set up a system to record a wide range of performance indicators
- it can be a complex system that managers may find difficult to understand
- there is no clear set of non-financial performance indicators that the organisation must use
- the scope for comparison with other organisations is limited as few businesses may use precisely the same non-financial performance indicators as the organisation under review
- it can be difficult to measure some aspects such as customer satisfaction
- it can lead to indicator overload.

Notes

3.3 Measuring productivity

A productivity measure is a measure of the efficiency of an operation; it is also referred to as resource utilisation. It relates the goods or services produced to the resources used, and therefore ultimately the cost incurred to produce the output.

Productivity measures are usually given in terms of labour efficiency. However productivity measures are not restricted to labour and can also be expressed in terms of other resource inputs of the organisation such as the machine hours used for production.

Productivity is often analysed using three control ratios:

- Production/volume ratio

Standard hours for actual output ÷ total budgeted hours × 100

- Capacity ratio

Actual production hours worked ÷ total budgeted hours × 100

- Efficiency ratio

Standard hours for actual output ÷ actual production hours worked × 100

Notes

Test your understanding 9

During a period, the actual hours worked by professional staff totalled 3,471. Budgeted hours were 3,630. The standard hours for the work totalled 3,502.

Calculate the following: (each to one decimal place).

Production/volume ratio	%
Capacity ratio	%
Efficiency ratio	%

Illustrations and further practice

Notes

3.4 Measuring quality

Quality is an issue whether manufacturing products or providing a service.

Examples of non-financial performance measures for different business areas:

Production department

Sales department

Call centre

Distribution centre

Notes

Test your understanding 10

Which of the following statements relating to financial and non-financial performance measures are correct? Select all that apply.

	Tick
With financial performance measures there is a risk that managers will take a more short-term view	
Financial performance measure tend to be more forward looking than non-financial performance measures	
A disadvantage of non-financial measures is that it can be costly and time consuming to gather the information required.	
Non-financial measure are not affected by inflation and are therefore directly comparable year on year	
Financial measures are more applicable to manufacturing industries	

Notes

4 The balanced scorecard

4.1 Definition

To get an effective system of performance appraisal a business should use a combination of financial and non-financial measures.

One of the major developments in performance measurement techniques in recent years that has been widely adopted is the **balanced scorecard**.

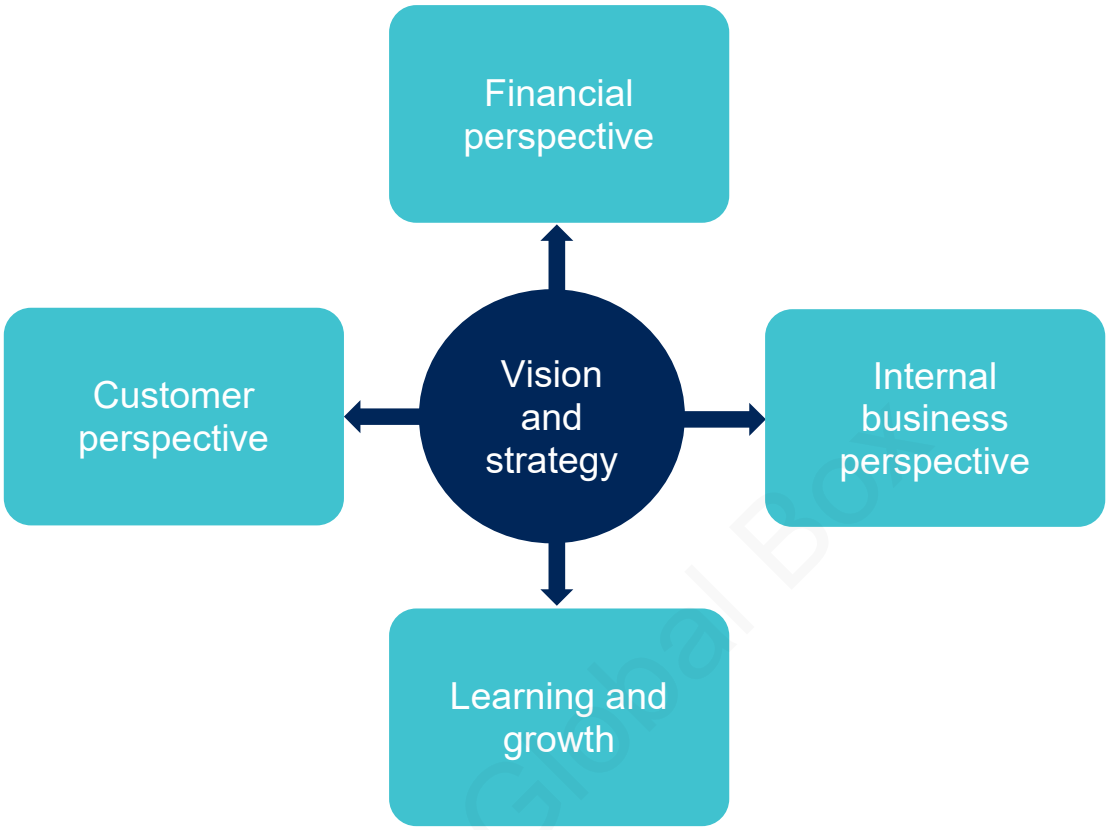
The concept was developed by Kaplan and Norton, 1993 at Harvard. It is a device for planning that enables managers to set a range of targets linked with appropriate objectives and performance measures.

4.2 The four perspectives

- financial
- customer
- internal business processes
- learning and growth.

Notes

4.3 The model



Examples of measures which can be used in each perspective:

Financial

Customer

Internal business processes

Learning and growth

Test your understanding 11

Match the following performance measures with the most appropriate balanced scorecard perspective.

Perspective
Financial
Internal business process
Learning and growth
Customer

Performance measure
Repeat customer visits
ROCE
Operational efficiency
Number of new products launched

Test your understanding 12

In the context of a balanced scorecard approach to the provision of management information, which of the following measures might be appropriate for monitoring the Learning and growth perspective? Select all that apply

	Tick
Training days per employee	
Employee satisfaction	
Cost income ratio	
Percentage of revenue generated by new products and services	
Labour turnover rate	

Notes

5 Benchmarking

The establishment, through data gathering, of targets and comparators, that permit relative levels of performance (and particular areas of underperformance) to be identified. The adoption of identified best practices should improve performance.

-
-
-
-

Notes

6 The service sector

Conventional financial analysis distinguishes four types of ratio: profitability, liquidity, gearing and activity ratios. Analysis of a company's performance using accounting ratios involves comparisons with past trends and/or competitors' ratios. Typical ratios that could be used by a service organisation include:

- revenue per 'service'
- revenue per 'principal' or partner in, for example, a management consultancy
- staff costs as a % of revenue
- space costs as a % of revenue
- training costs as a % of revenue
- profit %

Financial ratio analysis is of use but due to the 'human' nature of a service provider – the quality of the service also needs to be considered.

Inspection and monitoring of the inputs to the service process is important for all organisations. The quality of the solicitors in a practice or the number and grades of staff available in a consultancy organisation are crucial to the provision of service quality. The quality of the service may be measured after the event, that is by measuring the results by outputs of the service.

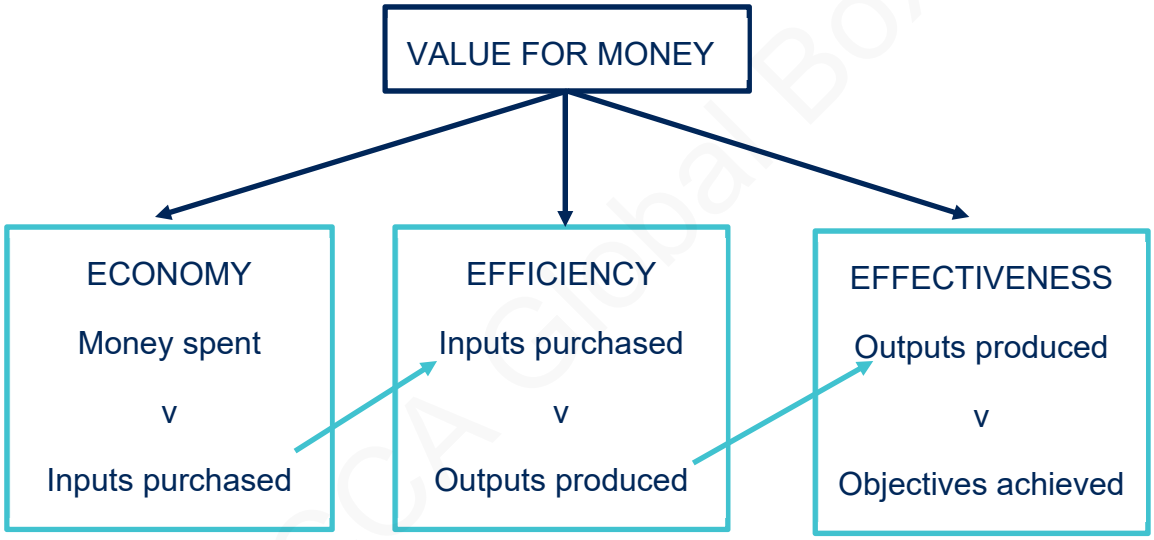
Notes

7 Non-profit seeking and public sector

There are said to be two main problems involved in assessing performance of these organisations:

- the problem of identifying and measuring objectives
- the problem of identifying and measuring outputs.

One way to address this problem is to use the Value for Money concept that revolves around the 'three E approach':



Notes

Test your understanding 13

A university is considering performance measures which it could include under each of the 3E headings.

Match the following performance measures to the correct 3E heading:

- % of lecturer's time spent teaching and undertaking research
- Salary costs of lecturers
- % of students achieving the target grade
- How often are library books loaned out to students
- % of graduates employed within 6 months
- Cost of books purchased for the library

Economy	Efficiency	Effectiveness

Notes

8 Cost control and reduction

Cost control involves the setting of targets for cost centre managers and then monitoring performance against those targets. Performance can be measured using standard costing and variance analysis.

Cost reduction is the reduction in unit cost of goods or services without impairing suitability for the use intended i.e. without reducing value to the customer.

8.1 Cost reduction techniques

Value Analysis is the systematic interdisciplinary examination of factors affecting the cost of product or service, in order to devise means of achieving the specified purpose most economically at the required standard of quality and reliability.

Value Engineering is the redesign of an activity, product or service so that value to the customer is enhanced while costs are reduced or at least increased by less than the resulting price increase.

Work study is a systematic examination of the methods of carrying out activities in order to improve the effectiveness of resources and to set up standards of performance for the activities carried out

Notes

Further practice

Exam kit questions

Test your understanding answers

Test your understanding 1

	J	Y
Gross margin	90 / 300 × 100 = **30.0%**	160 / 550 × 100 = **29.1%**
ROCE	65 / 500 × 100 = **13.0%**	128 / 1,300 × 100 = **9.8%**
Return on sales	65 / 300 × 100 = **21.7%**	128 / 550 × 100 = **23.3%**
Asset turnover	300 / 500 = **0.6**	550 / 1,300 = 0.42

	J $000	Y $000
Sales revenue	300	550
Direct costs of production	(160)	(230)
Indirect costs of production	(50)	(160)
Gross profit	**90**	**160**
Non-production costs	(25)	(32)
Operating profit	**65**	**128**

Test your understanding 2

(a) Current ratio = 1,585/780 = 2.03 times

(b) Acid test/quick ratio = (1,585 – 825)/780 = 0.97 times

Test your understanding 3

(a) Receivable days = receivables ÷ credit sales × 365

= 200/3,000 × 365 = 24.3 days

(b) Payable days = payables ÷ credit purchased × 365

= 280/1,600 × 365 = 63.9 days

(c) Inventory days = inventory ÷ cost of sales × 365

= 300/1,600 × 365 = 68.4 days

Test your understanding 4

B

16,000/38,512 = 41.5%

Test your understanding 5

C

550/75 = 7.33 times

Test your understanding 6

B

The manager of a **profit** centre can exercise control over revenues and controllable costs, but has no influence concerning the capital invested in the centre.

Contribution (i) would be a useful performance measure because a profit centre manager can exercise control over sales revenue and variable costs. Controllable profit (ii) would also be useful as long as any overhead costs charged in deriving the profit figure are controllable by the profit centre manager. Apportioned central costs would not be deducted when calculating controllable profit. Return on investment (iii), and residual income (iv) would not be useful because they require a measure of the capital invested in the division.

Test your understanding 7

B

Original profit	=	£2,000,000 × 12%	=	£240,000
New profit	=	£240,000 + £90,000	=	£330,000
New capital employed	=	£2,000,000 + £500,000	=	£2,500,000
Residual income	=	£330,000 – (10% × £2,500,000)	=	**£80,000**

Test your understanding 8

C

ROI before project	=	360/1,600	=	22.5%
ROI after project	=	385/(1,600 + 130)	=	22.3%

Therefore management would reject this project, if ROI is used as an evaluation criterion.

Residual value before project	=	360 – (1,600 × 0.18)	=	$72,000
Residual value after project	=	385 – (1,730 × 0.18)	=	$73,600

Therefore management would accept this project if residual income is used as an evaluation criterion.

Test your understanding 9

Production/volume ratio	3,502/3,630 × 100 = 96.5%
Capacity ratio	3,471/3,630 × 100 = 95.6%
Efficiency ratio	3,502/3,471 × 100 = 100.9%

Test your understanding 10

	Tick
With financial performance measures there is a risk that managers will take a more short-term view	✓
Financial performance measure tend to be more forward looking than non-financial performance measures	
A disadvantage of non-financial measures is that it can be costly and time consuming to gather the information required.	✓
Non-financial measure are not affected by inflation and are therefore directly comparable year on year	✓
Financial measures are more applicable to manufacturing industries	

Test your understanding 11

Perspective
Financial
Internal business process
Learning and growth
Customer

Performance measure
ROCE
Operational efficiency
Number of new products launched
Repeat customer visits

Test your understanding 12

	Tick
Training days per employee	✓
Employee satisfaction	
Cost income ratio	
Percentage of revenue generated by new products and services	✓
Labour turnover rate	✓

In principle, the more training days and employee receives the more knowledgeable and skilful they become.

A target for the percentage of total sales revenue earned from new products focuses on innovation

Labour turnover rate is the rate at which staff leave and are replaced and could provide a measure of the loss of existing employee skills

Test your understanding 13

Economy	Efficiency	Effectiveness
Salary costs of lecturers	% of lecturer's time spent teaching and undertaking research	% of students achieving the target grade
Cost of books purchased for the library	How often are library books loaned out to students	% of graduates employed within 6 months

Economy is about balancing the cost with the quality of the resources.

Efficiency focuses on the efficient use of any resources acquired.

Effectiveness measures the achievement of the organisation's objectives

Notes

Chapter 17

Spreadsheets

Outcome

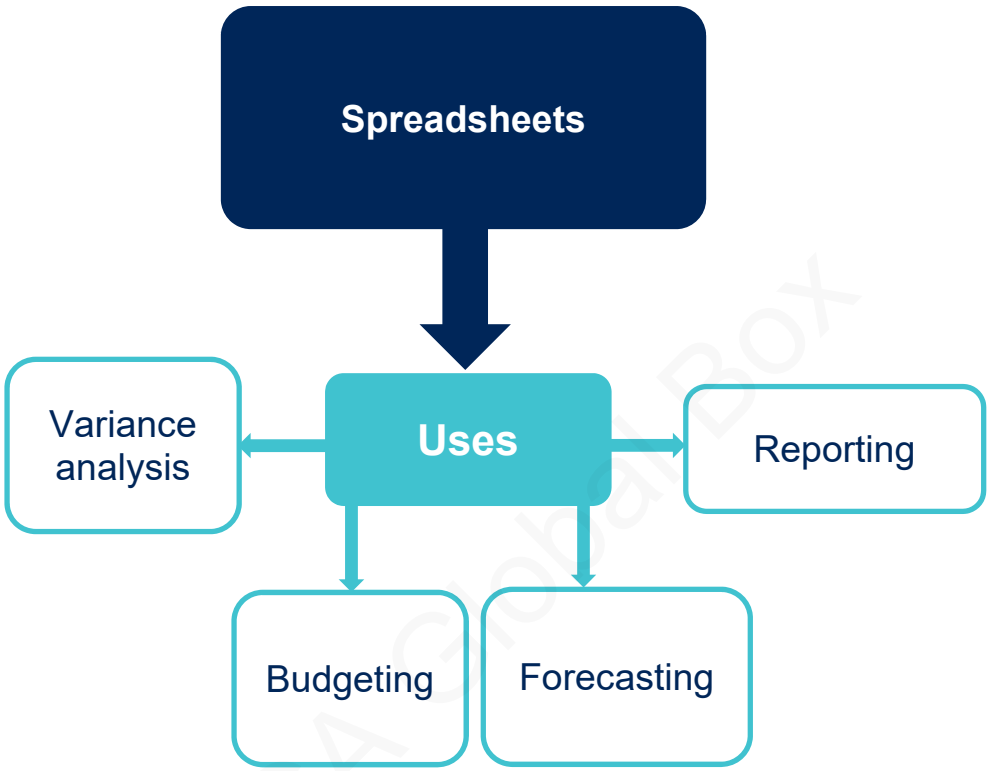
By the end of this session you should be able to:

- explain the role, features and uses of a spreadsheet package.
- identify applications for computer spreadsheets and their use in cost management

and answer questions relating to these areas.

The underpinning detail for this Chapter in your Integrated Workbook can be found in Chapter 17 of your Study Text

Overview



1 Uses of spreadsheets

A spreadsheet is a computer package that is used to manipulate data. Much of the data of a company has is likely to be held on spreadsheets. Spreadsheets can be used for anything with a rows and columns format. One of the most useful functions of a spreadsheet is being able to input formulae to enable calculation to happen automatically when data is input in specific cells.

Spreadsheets are a convenient way of setting up all sorts of charts, records and tables. Uses include:

- 'what if?' analysis
- budgeting and forecasting
- reporting performance
- variance analysis
- inventory valuation.

Notes

2 Statistical functions

The basic commands for statistical functions that operate on lists of values are also very similar throughout the range of spreadsheet packages. Examples of these are:

- SUM – the total of the values in the list
- AVERAGE – the average of the values in the list
- MAX – the highest value in the list
- MIN – the lowest value in the list.

Notes

3 Advantages of spreadsheets

Spreadsheets are designed to analyse data and sort list items, not for long-term storage of raw data. A spreadsheet should be used for 'crunching' numbers and storage of single list items. Advantages of spreadsheets include the following:

- Spreadsheets can be used to manipulate large volumes of data and information
- Spreadsheet functions and formulae enable data to be processed more quickly
- Spreadsheets can be shared between people and locations either in paper format or electronically
- Spreadsheets are often easier to read than hand written tables and include graphing functions that allow for quick reporting and analysis of data.

Notes

4 Disadvantages of spreadsheets

- It can be time consuming to set up a spreadsheet that works effectively
- Spreadsheets are not able to identify data input errors or prevent accidental deletion so training of staff is important
- There can be sharing violations among users wishing to view or change data at the same time.
- It can be difficult to identify an error in the design of the spreadsheet as some formulae are very complicated.
- Spreadsheets are open to cyber-attack through viruses, hackers and general system failure.
- Spreadsheets are restricted to a finite number of records and they may not be a true reflection of the 'real' world. Any report produced will only be as accurate as the data that is input

Illustrations and further practice

Notes

Further practice

Exam kit questions

Notes

Chapter 18

Answers

Chapter 4

Example 1

e.g.

Sector/activity	Cost unit
Accountancy practice	Chargeable hour
Call centre	Telephone call
Baker	Batch of loaves
University	Student

Example 2

Examples of cost centres in relation to a hotel:

Type	Example
Service location	Reception
Function	Cleaning
Activity	Room service

Example 3

The following shows the calculation of the cost for one unit of product X

	$
Direct material	20
Direct labour	10
Direct expenses	15
PRIME COST	45
Variable production overheads	10
TOTAL VARIABLE (MARGINAL) PRODUCTION COST	55
Fixed production overheads	23
TOTAL PRODUCTION (ABSORPTION) COST	78
Non-production cost	22
TOTAL COST	100

Example 4

Consider the following costs for a t-shirt printer:

Number of t-shirts printed	**100**	**200**
Material	$220	$440
Labour	$120	$240
Rent	$550	$550
Electricity	$250	$300

To determine the behaviour of each cost, consider how the cost changes over the different activity levels.

Material: Material is $220 for 100 units ($2.20 per unit), and $440 for 200 units, ($2.20 per unit). This suggests that **material is a variable cost**.

Labour: Labour is $120 for 100 units ($1.20 per unit), and $240 for 200 units, ($1.20 per unit). This suggests that **labour is a variable cost**.

Rent: The total rent cost is $550 for each level of activity. This suggests that **rent is a fixed cost**.

Electricity: Electricity is $250 for 100 units ($2.50 per unit) and $300 for 200 units, ($1.50 per unit). This suggests that **electricity is a semi-variable cost.**

Example 5

Consider the following data for a semi-variable cost:

Month	Activity level (units)	Cost incurred ($)
Quarter 1	10,000	38,300
Quarter 2	12,000	42,700
Quarter 3	9,000	35,700
Quarter 4	14,000	47,200

Calculate the variable cost per unit by selecting the highest and lowest activity levels.

Calculate the variable cost per unit:

$$\textbf{Variable cost} = \frac{\textbf{Change in cost}}{\textbf{Change in activity level}}$$

$$\text{So, variable cost} = \frac{\$47{,}200 - \$35{,}700}{14{,}000 - 9{,}000} = \textbf{\$2.30}$$

Substituting this back in to the data for Quarter 3, we can calculate the fixed cost:

	$
Total cost	35,700
Variable cost (9,000 units × $2.30)	20,700
Therefore, fixed cost	**$15,000**

The total cost at different activity levels can then be estimated:

Total cost = total fixed cost + total variable cost

Total cost for 11,000 units = $15,000 + ($2.30 × 11,000) = $40,300

Chapter 5

Example 1

A business uses 5,000 units of raw material per week and it takes 3 weeks to receive the goods after the order has been placed. The business also keeps additional inventory of 2,500 units in reserve.

Calculate the re-order level.

5,000 units × 3 weeks + 2,500 buffer inventory = 17,500 units

Example 2

A business uses 3,125 units of raw material per annum. It costs $20 to place an order and $0.50 to hold one unit of inventory for one year.

Calculate the EOQ.

$$EOQ = \sqrt{\frac{2 \times 20 \times 3,125}{0.50}} = 500 \text{ units}$$

Example 3

A company has been approached by their supplier who would be willing to offer a discount of 5% on orders over 500 units.

Information regarding current inventory costs is as follows:

Holding cost per unit per annum = 10% of purchase price

Ordering costs = $2 per order

Annual demand = 15,000 units

Purchase price = $15 per unit

Current EOQ quantity = 200 units

The new optimal order quantity is:

Order quantity	**200**	**500**
Purchase costs	15,000 × $15 = $225,000	15,000 × $15 × 95% = 213,750
Ordering costs	$2 × 15,000 / 200 = $150	$2 × 15,000 / 500 = $60
Holding costs	$15 × 10% × 200/2 = $150	$15 × 95% × 10% × 500 / 2 = $356
Total annual cost	$225,300	$214,166

The new optimal order quantity is 500 units

Example 4

Date	Receipts			Issues			Balance	
	Qty	Per unit	Value	Qty	Per unit	Value	Qty	Value
01/08							150	$150
03/08	200	$1.20	$240				350	$390
09/08				150	$1.00	$150		
				100	$1.20	$120		
				250	$1.08	$270	100	$120
13/08	250	$1.30	$325				350	$445
16/08				100	$1.20	$120		
				100	$1.30	$130		
				200	$1.25	$250	150	$195

Example 5

Date	Receipts			Issues			Balance	
	Qty	Per unit	Value	Qty	Per unit	Value	Qty	Value
01/08							150	$150
03/08	200	$1.20	$240				350	$390
09/08				200	$1.20	$240		
				50	$1.00	$50		
				250	$1.16	$290	100	$100
13/08	250	$1.30	$325				350	$425
16/08				200	$1.30	$260	150	$165

Example 6

Date	Receipts			Issues			Balance	
	Qty	Per unit	Value	Qty	Per unit	Value	Qty	Value
01/08							150	$150
03/08	200	$1.20	$240				350	$390
09/08				250	$1.1143	$279	100	$111
13/08	250	$1.30	$325				350	$436
16/08				200	$1.2457	$249	150	$187

Chapter 7

Example 1

SB Ltd has four departments – Assembly, Finishing, Maintenance and Canteen. The following costs are expected to be incurred.

	$
Indirect materials	20,000
Rent	15,000
Electricity	10,000
Machine depreciation	5,000
Building maintenance	10,000

Information on the departments (Basis of apportionment)

	Assembly	Finishing	Maintenance	Canteen	Total
Area (sq m)	1,000	2,000	500	500	4,000
Kw hours consumed	1,000	4,000	Nil	5,000	10,000
Machine value	$45,000	$35,000	$11,000	$9,000	$100,000
Indirect materials consumed	$7,000	$8,000	$3,000	$2,000	$20,000

You are required to complete the table (to the nearest $) to allocate and apportion the overheads in each cost centre. Overheads can be apportioned in 2 ways:

Overhead for department = total overhead ÷ total of chosen basis × basis for that department

OR

Convert the chosen basis into percentages and then calculate the % of the overhead.

Calculate the overhead allocated or apportioned to each department using the most suitable basis.

Overhead	Basis	Assembly $	Finishing $	Maintenance $	Canteen $	Total $
Indirect materials	Allocate	7,000	8,000	3,000	2,000	20,000
Rent	Area	3,750	7,500	1,875	1,875	15,000
Electricity	Kw hours	1,000	4,000	0	5,000	10,000
Machine depreciation	Machine value	2,250	1,750	550	450	5,000
Building maintenance	Area	2,500	5,000	1,250	1,250	10,000
Total		16,500	26,250	6,675	10,575	60,000

Example 2

Direct method

In this method any reciprocal services are ignored. The following information is available:

	Assembly	Finishing	Maintenance	Canteen	Total
Number of staff	20	40	–	–	60
% time spent by maintenance	60%	40%	–	–	100%

Complete the table below (to the nearest $):

	Basis	Assembly	Finishing	Maintenance	Canteen	Total
Overhead	B Fwd	16,500	26,250	6,675	10,575	60,000
Canteen	Number of staff	3,525	7,050		(10,575)	
Maintenance	% time spent	4,005	2,670	(6,675)		
Total		24,030	35,970			60,000

Example 3

Step-down method

A more accurate method is to fully reapportion the service centre that does the most work for the other service centre.

The production manager informs us that the 10 maintenance staff eat in the canteen therefore we should reapportion canteen first into maintenance and the production departments. Maintenance should then be reapportioned only into the production departments.

The following information is available:

	Assembly	Finishing	Maintenance	Canteen	Total
Number of staff	20	40	10	–	70
% time spent by maintenance	60%	40%	–	–	100%

Complete the table below (to the nearest $):

	Basis	Assembly	Finishing	Maintenance	Canteen	Total
Overhead	B Fwd	16,500	26,250	6,675	10,575	60,000
Canteen	Number of staff	3,021	6,043	1,511	(10,575)	
Maintenance	% time spent	4,912	3,274	(8,186)		
Total		24,433	35,567			60,000

Example 4

A manufacturing company has two production cost centres (P1 and P2) and two service cost centres (S1 and S2). The following shows the work done by the two service cost centres:

	P1	P2	S1	S2
Work done by S1	55%	35%		10%
Work done by S2	30%	65%	5%	

After the initial allocation and apportionment of overheads, the totals for each cost centre were:

	P1	P2	S1	S2
	$	$	$	$
Overhead cost	150,000	205,000	21,000	15,000

The reapportionment of the service cost centres is shown below:

	P1	P2	S1	S2
	$	$	$	$
Overhead cost	150,000	205,000	21,000	15,000
Reapportion S1	11,550	7,350	(21,000)	2,100
Reapportion S2	5,130	11,115	855	(17,100)
Reapportion S1	470	299	(855)	86
Reapportion S2	26	56	4	(86)
Reapportion S1	3	1	(4)	0
Total overhead	167,179	223,821	0	0

Example 5

Overheads have been allocated, apportioned and reapportioned to 2 production cost centres as below:

	Prod cost centre 1	Prod cost centre 2
Total overheads	$108,802	$102,998
Labour hours	15,000	10,000
Machine hours	20,000	6,000

The overheads of production department 1 would be absorbed on the basis of machine hours as it is more machine hour intensive, while production department 2 would use labour hours as it is more labour intensive.

OAR for production cost centre 1 = $108,802 ÷ 20,000 = $5.44 per machine hour

OAR for production cost centre 2 = $102,998 ÷ 10,000 = $10.30 per labour hour

Example 6

For every machine hour a unit uses in production cost centre 1 it will pick up $5.44 and for every labour hour a unit uses in production cost centre 2, it will pick up $10.30.

Consider the following data for product XX:

	Prod cost centre 1	Prod cost centre 2
Labour hours per unit	5	3
Machine hours per unit	2	4

The overhead one unit of product XX will pick up is:

Production cost centre 1: 2 machine hours × $5.44 = $10.88

Production cost centre 2: 3 labour hours × $10.30 = $30.90

Remember: this is the overhead, or indirect cost, to be picked up by each unit of XX. To find the total cost of a unit of XX the direct costs must be added on.

Example 7

Consider the following data:

Budgeted labour hours	12,000
Budgeted overheads	$175,000
Actual labour hours	11,500
Actual overheads	$182,000

Calculate the over or under absorption of overheads.

Step one – calculate the OAR

Labour hour overhead absorption rate = $175,000 ÷ 12,000 = $14.58 per hour.

Step two – calculate the overhead absorbed

Overhead absorbed = $14.58 × 11,500 = $167,670

Step three – compare the actual cost with the absorbed overhead

Absorbed > Actual = Over absorbed

Absorbed < Actual = Under absorbed

	$
Overhead incurred	182,000
Overhead absorbed	167,670
Under-absorption	14,330

Example 8

Production overhead account

	$		$
Actual overhead incurred	24,000	Absorbed overhead (WIP)	24,000
	24,000		24,000

At the end of the period the production overhead cost is absorbed into work in progress costs using the predetermined overhead absorption rate. The amount absorbed is credited in the production overhead account and debited in the work in progress account.

In the above, if we assume $24,000 would be debited to the work in progress account, the balance on the production overhead account would be zero.

Where there is a remaining balance on the production overhead account, this represents the amount of production overhead which is **under absorbed** (debit balance) or **over absorbed** (credit balance).

Example 9

If $28,500 of overheads were absorbed into work in progress:

Production overhead account

	$		$
Actual overhead incurred	24,000	Work in progress	28,500
Over absorption	4,500		
	28,500		28,500

Production overhead over absorption account

	$		$
		Production overhead	4,500

To take this over absorption to the statement of profit or loss, the entry would be:

Debit Production overhead over absorption account
Credit Statement of profit or loss

A credit to the statement of profit or loss reduces the cost which makes sense as we have absorbed too much overhead.

Note: If there is no production overhead over absorption account, the over absorption can be taken straight to the statement of profit or loss. The entry to record the over absorption would be:

Debit Production overhead account
Credit Statement of profit or loss

Example 10

If $21,000 of overheads were absorbed into work in progress:

Production overhead account

	$		$
Actual overhead incurred	24,000	Work in progress	21,000
		Under absorption	3,000
	24,000		24,000

Production overhead under absorption account

	$		$
Production overhead	3,000		

To take this under absorption to the statement of profit or loss, the entry would be:

Debit Statement of profit or loss account
Credit Production overhead under absorption account

A debit to the statement of profit or loss increases the cost which makes sense as we have absorbed too little overhead.

Note: If there is no production overhead under absorption account, the under absorption can be taken straight to the statement of profit or loss. The entry to record the under absorption would be:

Debit Statement of profit or loss
Credit Production overhead account

Chapter 8

Example 1

Summary results for Y Ltd for this month are as follows:

		$000
Sales revenue		820
Variable production costs		300
Variable selling costs		105
Fixed production costs		180
Fixed selling costs		110
Production in month	1,000 units	
Opening inventory	0 units	
Closing inventory	150 units	

A Marginal costing profit statement

	$000	$000
Sales		820
Less Cost of sales:		
Opening inventory	0	
Variable production costs	300	
Less Closing inventory	(45)	
		(225)
Less variable selling, admin and distribution costs		(105)
Contribution		460
Less fixed production costs		(180)
Less fixed non-production costs		(110)
Profit/(loss)		170

Example 2

Summary results for Y Ltd for this month are as follows:

		$000
Sales revenue		820
Variable production costs		300
Variable selling costs		105
Fixed production costs		180
Fixed selling costs		110
Production in month	1,000 units	
Opening inventory	0 units	
Closing inventory	150 units	

Absorption costing profit statement

	$000	$000
Sales		820
Less Cost of sales:		
Opening inventory	0	
Production costs	480	
Less Closing inventory	(72)	
		(408)
Gross profit		412
Less non-production costs:		
Variable selling costs		(105)
Fixed selling costs		(110)
Profit/(loss)		197

Example 3

A company produced 3,000 units of their only product in the last period. The unit costs of the product were:

	$
Direct material	20
Direct labour	15
Variable production overhead	8
Fixed production overhead	11
Total production cost	54

The sales for the period were 2,500 units.

There were 50 units of opening inventory.

The fixed production overhead incurred in the last period was $30,000

The profit using absorption costing was $54,250 and marginal costing was $48,750

Reconcile the profits

		$
Absorption costing profit		54,250
(Increase)/decrease in inventory × OAR	= 500 × 11	–5,500
Marginal costing profit		48,750

Closing inventory = 50 + 3,000 – 2,500 = 550

Change in inventory = 50 – 550 = 500 increase

Further explanation

If we consider the production fixed costs....

Absorption costing:

- The opening inventory has been charged with $550 of fixed production costs (50 × $11 = $550).
- The fixed production costs absorbed are $33,000 (3,000 units × $11 = $33,000).
- $6,050 of this has then been deducted from cost of sales as part of the closing inventory value (550 × $11 = $6,050).
- There is an over absorption adjustment of $3,000, reducing the production fixed costs in the statement further
- Therefore only $24,500 of fixed costs has been charged in this period's statement

Marginal costing:

- The statement of profit or loss is charged with the full $30,000 of fixed production costs as none is included in the cost of sales.
- $5,500 more fixed costs has been charged under marginal costing reducing the profit by $5,500

Chapter 9

Example 1

Fresh Walls manufactures paint through a series of processes. The data for the first process during a particular period is as follows:

The first stage is to input the raw materials to make the paint and mix and combine these materials. To do this the manufacturer incurs costs for materials, labour and overheads. By changing or processing the raw materials the value of the raw materials increases due to the cost of the labour and overheads.

We can show this by using a process account.

Process 1 account

	Litres	$		Litres	$
Materials	2,000	3,000	Output to Process 2	2,000	4,000
Labour		570			
Overheads		430			
	2,000	4,000		2,000	4,000

The next stage of this process is to add colour to the mixture. The output from the first process is transferred to the next process and more value is added with extra labour and overhead being added.

Process 2 account

	Litres	$		Litres	$
Input materials from Process 1	2,000	4,000	Output materials to Process 3	2,500	5,650
New materials	500	550			
Labour		600			
Overheads		500			
	2,500	5,650		2,500	5,650

The cost per litre of material input at the start of production = $3,000 ÷ 2,000 = $1.50

The cost per litre at the end of Process 1 = $4,000 ÷ 2,000 = $2.00

The cost per litre at the end of Process 2 = $5,650 ÷ 2,500 = $2.26

Example 2

At the start of a heating process 1,000 kg of material costing $18 per kg is input. Normal loss is expected to be 10% of input which can be sold for $1.80 per kg. Labour costs are $1,800 and overheads are $900. Output was 800 kg.

Step 1 – balance the units and determine any loss/gain

Input = Output + Loss

1,000kg = 800kg + 100kg (NL) + 100kg (AL)

Step 2 – value the normal loss

NL 100kg × $1.80 = $180

Step 3 – calculate the average cost per unit

The cost per unit = net cost of inputs ÷ expected output

Inputs $18,000 + $1,800 + $900 = $20,700

Net costs = $20,700 – $180 = $20,520

Expected output = 1,000kg × 90% = 900kg

The cost per unit = $20,520 ÷ 900kg = $22.80 per unit

Step 4 – value the output and complete the process account

Process account

	Kg	$		Kg	$
Materials	1,000	18,000	Output	800	18,240
Labour		1,800	Normal loss	100	180
Overheads		900	Abnormal loss	100	2,280
	1,000	20,700		1,000	20,700

Step 5 – complete the normal loss (scrap) and abnormal loss accounts

(a) the normal loss is transferred to the normal loss account

(b) the abnormal loss is transferred to the abnormal loss account

(c) the abnormal loss increases the availability of scrap to be sold. It is transferred from the abnormal loss account to the scrap account at the scrap value.

(d) the balancing figure in the abnormal loss account shows the net loss from having lost more than expected.

(e) the balancing figure in the scrap account represents the cash received for the sale of the loss.

Normal loss (scrap) account

	Kg	$		Kg	$
(a) Process account (NL)	100	180	(e) Cash/Bank	200	360
(c) Abnormal loss	100	180			
	200	360		200	360

Abnormal loss

	Kg	$		Kg	$
(b) Process account (AL)	100	2,280	(c) Normal loss	100	180
			(d) SoPL		2,100
	100	2,280		100	2,280

Note: the normal loss is sold for cash so the bank account is debited with the normal loss proceeds of $180. The abnormal loss is also sold for scrap at $1.80 per kg so a further 100 × $1.80 = $180 would be debited to the bank account.

The net effect is that the abnormal loss is valued at $2,280 – $180 = $2,100

Example 3

At the start of a heating process 1,000 kg of material costing $18 per kg is input. Normal loss is expected to be 10% of input which can be sold for $1.80 per kg. Labour costs are $1,800 and overheads are $900. Output was 950 kg.

Step 1 – balance the units and determine any loss/gain

Input = Output + Loss

1,000kg + 50kg (AG) = 950kg + 100kg (NL)

Step 2 – value the normal loss

NL 100kg × $1.80 = $180

Step 3 – calculate the average cost per unit

The cost per unit = net cost of inputs ÷ expected output

Inputs $18,000 + $1,800 + $900 = $20,700

Net costs = $20,700 – $180 = $20,520

Expected output = 1,000 units × 90% = 900 units

The cost per unit = $20,520 ÷ 900 units = $22.80 per unit

Step 4 – value the output and complete the process account

Process account

	Kg	$		Kg	$
Materials	1,000	18,000	Output	950	21,660
Labour		1,800	Normal loss	100	180
Overheads		900			
Abnormal gain	50	1,140			
	1,050	21,840		1,050	21,840

Step 5 – complete the normal loss (scrap) and abnormal loss accounts

(a) the normal loss is transferred to the normal loss account

(b) the abnormal gain is transferred to the abnormal gain account

(c) the abnormal gain reduces the availability of scrap to be sold. It is transferred from the abnormal gain account to the scrap account at the scrap value.

(d) the balancing figure in the abnormal gain account shows the net gain from having lost less than expected.

(e) the balancing figure in the scrap account represents the cash received for the sale of the remaining loss.

Normal loss (scrap) account

	Kg	$		Kg	$
(a) Process account (NL)	100	180	(c) Abnormal gain	50	90
			(e) Cash/Bank	50	90
	100	180		100	180

Abnormal gain

	Kg	$		Kg	$
(c) Normal loss	50	90	(b) Process account (AG)	50	1,140
(d) SoPL		1,050			
	50	1,140		50	1,140

Note: The abnormal gain reduces the amount of scrap available to be sold so the value of the scrap debited to the bank account will be $180 – (50 × $1.80) = $90

The net effect is that the abnormal gain is valued at $1,140 – $90 = $1,050

Example 4

At the beginning of September, the opening work-in-process in Process 2 was 15,000 kilos. The degree of completion of the work, and the value of the opening WIP, were as follows:

	Degree of completion	Value
		$
Direct materials	100%	79,800
Conversion cost	40%	20,500
Total value		100,300

During September, 30,000 kilos of materials were input to the process from Process 1 and 38,000 kilos of completed units were output to Process 3. Closing work-in-process was 7,000 kilos, which were 100% complete for materials and 80% complete for conversion costs.

The cost of the materials transferred from Process 1 was $154,200 and conversion costs in Process 2 in the month were $145,180.

There are no losses or gains in the process.

Using the AVCO method, calculate the cost of output transferred to Process 3 in the period and the value of closing WIP. Prepare the ledger account for Process 2.

Step 1 – balance the units

OWIP + Input = Output units + CWIP

15,000 + 30,000 = 38,000 + 7,000

Step 2 – calculate the EUs for each element of cost

		Equivalent units			
	Physical units	Direct materials		Conversion costs	
Finished output	38,000	100%	38,000	100%	38,000
Closing WIP	7,000	100%	7,000	80%	5,600
Total EU			45,000		43,600

Step 3 – calculate the total cost for each element of cost

	Direct Materials $	Conversion costs $
Opening WIP	79,800	20,500
Current period	154,200	145,180
	234,000	165,680

Step 4 – calculate the cost per EU

Direct materials = $234,000 ÷ 45,000 EU = $5.20 per EU

Conversion costs = $165,680 ÷ 43,600 EU = $3.80 per EU

Step 5 – value the completed units and closing WIP

The cost of finished output can be calculated as follows:

	$
Completed units = 38,000 EU × $9.00	342,000
Closing WIP = 7,000 EU × $5.20 + 5,600 EU × $3.80	57,680

Step 6 – complete the ledger accounts

Process 2 account

	Kilos	$		Kilos	$
Opening WIP	15,000	100,300	Output	38,000	342,000
Materials	30,000	154,200	Closing WIP	7,000	57,680
Conversion cost		145,180			
	45,000	399,680		45,000	399,680

Example 5

At the beginning of September, the opening work-in-process in Process 2 was 15,000 kilos. The degree of completion of the work, and the value of the opening WIP, were as follows:

	Degree of completion	Value
		$
Direct materials	100%	79,800
Conversion cost	40%	20,500
Total value		100,300

During September, 30,000 kilos of materials were input to the process from Process 1 and 38,000 kilos of completed units were output to Process 3. Closing work-in-process was 7,000 kilos, which were 100% complete for materials and 80% complete for conversion costs.

The cost of the materials transferred from Process 1 was $154,200 and conversion costs in Process 2 in the month were $146,640.

There are no losses or gains in the process.

Using the FIFO method, calculate the cost of output transferred to Process 3 in the period and the value of closing WIP. Prepare the ledger account for Process 2

Step 1 – balance the units

OWIP + Input = Output units + CWIP

15,000 + 30,000 = 38,000 + 7,000

Step 2 – calculate the EUs for each element of cost

		Equivalent units			
	Physical units	Direct materials		Conversion costs	
Finished output					
Opening WIP	15,000	0%	0	60%	9,000
Completed units	23,000	100%	23,000	100%	23,000
Closing WIP	7,000	100%	7,000	80%	5,600
Total EU			30,000		37,600

Step 3 – calculate the total cost for each element of cost

	Direct Materials $	Conversion costs $
Current period only	154,200	146,640

Step 4 – calculate the cost per EU

Direct materials = $154,200 ÷ 30,000 EU = $5.14 per EU

Conversion costs = $146,640 ÷ 37,600 EU = $3.90 per EU

Step 5 – value the completed units and closing WIP

The cost of finished output can be calculated as follows:

	$
Completed units	
Opening WIP	
Value b/fwd	100,300
Cost to complete = 9,000 EU × $3.90	35,100
Units started and completed = 23,000 EU × $9.04	207,920
	343,320
Closing WIP = 7,000 EU × $5.14 + 5,600 EU × $3.90	57,820

Step 6 – complete the ledger accounts

Process 2 account

	Kilos	$		Kilos	$
Opening WIP	15,000	100,300	Output	38,000	343,320
Materials	30,000	154,200	Closing WIP	7,000	57,820
Conversion cost		146,640			
	45,000	401,140		45,000	401,140

Example 6

Clare plc produces two products, X and Y, in a single joint process.

Last month the joint costs were $50,000.

5,000 units of Product X and 7,500 units of Product Y were produced.

Additional processing costs were $10,000 for Product X and $5,000 for Product Y.

Product X sells for $15, and Product Y sells for $8.

The Market value method of apportioning joint costs:

Calculate the total market value:

X: 5,000 × $15 = $75,000

Y: 7,500 × $8 = $60,000

Total market value = $135,000

Calculate the joint cost allocation:

X: $50,000 ÷ 135,000 × $75,000 = $27,778

Y: $50,000 ÷ 135,000 × $60,000 = $22,222

Physical units method of apportioning joint costs:

Total units = 5,000 + 7,500 = 12,500 units

X: $50,000 ÷ 12,500 units × 5,000 units = $20,000

Y: $50,000 ÷ 12,500 units × 7,500 units = $30,000

The net realisable value method of apportioning joint costs:

Calculate the total net realisable value:

X: (5,000 units × $15) – $10,000 = $65,000

Y: (7,500 units × $8) – $5,000 = $55,000

Total net realisable value = $120,000

Calculate the joint cost allocation:

X: $50,000 ÷ $120,000 × $65,000 = $27,083

Y: $50,000 ÷ $120,000 × $55,000 = $22,917

Chapter 12

Example 1

Using the following data we will calculate a (the fixed cost) and b (the variable cost). The numbers in the calculations can get big so the figures are shown in 000s.

	Activity level	Cost		
	x	**y**	**x^2**	**xy**
Quarter 1	10	38.3	100	383
Quarter 2	12	42.7	144	512.4
Quarter 3	9	35.7	81	321.3
Quarter 4	14	47.2	196	660.8
	45	163.9	521	1,877.5

$$\mathbf{b} = \frac{\mathbf{n\sum xy - \sum x \sum y}}{\mathbf{n\sum x^2 - (\sum x)^2}} = \frac{(4 \times 1{,}877.5) - (45 \times 163.9)}{(4 \times 521) - 45^2} = \frac{134.5}{59} = \mathbf{2.28}$$

(**$a = \bar{y} - b\bar{x}$ =** $(163.9 \div 4) - 2.28 \times (45 \div 4) =$ **15.325)**

Regression uses all of the observations rather than just the highest and lowest so gives a better estimation of a and b.

Example 2

	Activity level	Cost			
	x	y	x^2	xy	y^2
Quarter 1	10	38.3	100	383	1,466.89
Quarter 2	12	42.7	144	512.4	1,823.29
Quarter 3	9	35.7	81	321.3	1,274.49
Quarter 4	14	47.2	196	660.8	2,227.84
	45	163.9	521	1,877.5	6,792.51

$$r = \frac{(4 \times 1{,}877.5) - (45 \times 163.9)}{\sqrt{((4 \times 521) - 45^2)((4 \times 6{,}792.51) - 163.9^2)}} = \frac{134.5}{134.5} = 1$$

This suggests perfect positive correlation.

Example 3

Calculate the 3 point moving total and the trend for the set of data below.

Month	Actual Sales	3 month moving total	Trend
Jan	12		
Feb	26	57(W1)	19 (W2)
Mar	19	60	20 (W3)
Apr	15	63	21
May	29	66	22
Jun	22	69	23
Jul	18	72	24
Aug	32	75	25
Sept	25		

Working 1

12 + 26 + 19 = 57

Working 2

57/3 = 19 this represents the trend value for February

Working 3

(26 + 19 + 15)/3 = 20 this represents the trend value for March

Example 4

The trend for a set of data is as follows:

Month	Trend
Jan	85
Feb	89
March	93
April	97
May	101
June	105

What is the trend figure for September?

Trend is increasing by 4 each month 89 – 85 = 4, 93 – 89 = 4 etc

There are 3 increments (months) between June and September therefore:

105 + (4 × 3) = 117

Example 5

The trend for a set of data is as follows:

Month	Trend
Jan	100
Feb	102
March	106
April	111
May	114
June	118

What is the trend figure for September?

Average trend

= (last known trend – first known trend) / (number of sets of data – 1)

= (118 – 100) / (6 – 1) = 3.6

Trend for September = 118 + (3.6 × 3) = 128.8

Example 6

Calculate the seasonal variation for the following set of data using the additive model.

Month	Value	Trend	Seasonal variation
Jan	12		
Feb	26	19	26 – 19 = +7
Mar	19	20	19 – 20 = –1
Apr	15	21	15 – 21 = –6
May	29	22	29 – 22 = +7
Jun	22	23	22 – 23 = –1
Jul	18	24	18 – 24 = –6
Aug	32	25	32 – 25 = +7
Sept	25		

Example 7

Calculate the seasonal variation for the following set of data using the multiplicative model.

Month	Value	Trend	Seasonal variation
Jan	12		
Feb	26	19	7/19 × 100 = +37% or 137%
Mar	19	20	–1/20 × 100 = –5% or 95%
Apr	15	21	–6/21 × 100 = –29% or 71%
May	29	22	7/22 × 100 = + 32% or 132%
Jun	22	23	–1/23 × 100 = –4% or 96%
Jul	18	24	–6/24 × 100 = –25% or 75%
Aug	32	25	7/25 × 100 = +28% or 128%
Sept	25		

Example 8

The average prices of four commodities, along with the number of units used annually by a company, are given in the following table:

	Year 1	Year 2	
Commodity	**Price per unit**	**Price per unit**	**Quantity**
	$	$	Units
A	10	11	10
B	20	24	1
C	50	52	5
D	100	105	4

Calculate a weighted price index for year 2 based on year 1 using the quantities given as weights.

Price index	**Quantity weighting**	**Total Price index × Quantity**
A 11/10 = 1.1	10	11
B 24/20 = 1.2	1	1.2
C 52/50 = 1.04	5	5.2
D 105/100 = 1.05	4	4.2
	20	21.6

Weighted price index = 21.6 / 20 × 100 = 108

Chapter 13

Example 1

A company planned to produce and sell 1,000 units and had a direct material budget of $5,000 but they only produced and sold 900 units with a direct material cost of $4,800.

It looks like the company has spent less on material than it had budgeted,

Budget	Actual	Variance
$5,000	$4,800	**$200 favourable**

However, this is not comparing like with like, the actual cost must be compared to the **flexed budget**.

Budgeted material cost per unit = $5,000/1,000 = $5 per unit

Total flexed budget material cost = $5 × 900 = $4,500

Budget	Flexed budget	Actual	Variance
1,000 units	900 units	900 units	**0 units**
$5,000	$4,500	$4,800	**$300 adverse**

The difference between the actual and the flexed budget is known as the **budget variance**.

Chapter 14

Example 1

Company X has a policy of only accepting projects that give a pay back of four years or less. A machine is available for purchase at a cost of $150,000. We expect it to have a life of five years and to have a scrap value of $20,000 at the end of the five-year period.

We have estimated that it will generate net cash flows over its life as follows:

	$000
1st year	40
2nd year	75
3rd year	60
4th year	30
5th year	10

Step 1 – set up a table with columns for year, cash flow, and cumulative balance.

Step 2 – put in the figures and calculate the cumulative balance until we get a positive figure (have paid back the investment).

Year	Cash flow	Cumulative cash flow
	$000	$000
0	(150)	(150)
1	40	(110)
2	75	(35)
3	60	25
4	30	
5	30	

Step 3 – work out what fraction of a year was required in the last year of payback.

$35,000 ÷ $60,000 × 12 = 7 months or
$60,000 ÷ 12 = $5,000 a month, $35,000 ÷ $5,000 = 7 months
Payback period – 2 years and 7 months therefore accept

Example 2

X plc has the following estimated net cash flows for a new project.

X's cost of capital is 10% per annum (round answers to the nearest $000).

	Year 0	Year 1	Year 2	Year 3
	$000	$000	$000	$000
Capital expenditure	500			
Disposal proceeds				50
Revenue		400	500	300
Operating costs		100	150	110
Discount factors	1.000	0.909	0.826	0.751

Calculate the net present value for the project.

	Year 0	Year 1	Year 2	Year 3
	$000	$000	$000	$000
Capital expenditure/disposal	–500			50
Revenue		400	500	300
Operating costs		–100	–150	–110
Net cash flows	–500	300	350	240
PV factors	1.000	0.909	0.826	0.751
Discounted cash flows	–500	273	289	180
Net present value	242			

Example 3

A project has an NPV of $4,400 at a discount rate of 10% and an NPV of –$31,000 at 20%. Calculate the IRR (to 2 decimal places)

You need to remember the rules of maths. Remove the brackets first, then deal with and division or multiplication and finally addition and subtraction (BODMAS)

IRR = 10 + [4,400 ÷ (4,400 – –31,000)] × (20 – 10)

IRR = 10 + (4,400 ÷ 35,400) × 10

IRR = 10 + 0.1243 × 10

IRR = 10 + 1.243 = 11.24%

Chapter 15

Example 1

A standard cost card for a product, showing the variable elements of production cost per unit, might look like this:

Standard cost card: XX1

	$
Direct materials: 10 kg @ $5	50
Direct labour: 12 hours @ $11	132
Prime cost	182
Variable production overhead: 12 hours @ $9	108
Variable production cost	290

For each of the variable costs, the standard amount and the standard price are given.

Direct material	standard quantity (10kg) × standard price ($5 per kg)
Direct labour	standard hours (12 hours) × standard rate ($11 per hour)
Variable production overheads	standard hours (12 hours) × standard rate ($9 per hour)

Note: The standard hours for labour and overheads are usually the same as we normally assume that variable overheads are absorbed on the basis of labour hours.

These standard data provide the information for a detailed variance analysis, as long as the actual data are collected at the same level of detail.

Chapter 18