CIMA

OFFICIAL

STUDY SYSTEM

2006 EDITION

ONLY TEXT WRITTEN AND ENDORSED BY CIMA

CIMA PUBLISHING

Paper P1

Management Accounting Performance Evaluation

Relevant for **May & November 2006** examinations

- Practice questions throughout
- Complete revision section

Helping you to pass your CIMA exam

CERTIFICATE | **MANAGERIAL** | STRATEGIC

CIMA
PUBLISHING

CIMA's Official
Study System

Managerial Level

Management Accounting – Performance Evaluation

Bob Scarlett

ELSEVIER

AMSTERDAM BOSTON HEIDELBERG LONDON NEW YORK OXFORD
PARIS SAN DIEGO SAN FRANCISCO SINGAPORE SYDNEY TOKYO

CIMA Publishing
An imprint of Elsevier
Linacre House, Jordan Hill, Oxford OX2 8DP
30 Corporate Drive, Burlington, MA 01803

First published 2005

British Library Cataloguing in Publication Data
A catalogue record for this book is available from the British Library

ISBN 0 7506 67117

For information on all CIMA publications visit our website at www.cimapublishing.com

Important Note

A new edition of the *CIMA Official Terminology* is due to be published in September 2005. As this is past the publication date of this Study System the page reference numbers for 'Management Accounting Official Terminology' contained in this Study System are for the 2000 edition. You should ensure that you are familiar with the 2005 *CIMA Official Terminology* (ISBN 0 7506 6827 X) once published, available from www.cimapublishing.com

Typeset by Newgen Imaging Systems (P) Ltd, Chennai, India
Printed in Great Britain

Contents

This Page Intentionally Left Blank

The CIMA *Study System*

Acknowledgements

Every effort has been made to contact the holders of copyright material, but if any here have been inadvertently overlooked the publishers will be pleased to make the necessary arrangements at the first opportunity.

How to use your CIMA *Study System*

This *Performance Evaluation Study System* has been devised as a resource for students attempting to pass their CIMA exams and provides:

- a detailed explanation of all syllabus areas;
- extensive 'practical' materials, including readings from relevant journals;
- generous question practice, together with full solutions;
- an exam preparation section, complete with exam standard questions and solutions.

This Study System has been designed with the needs of home-study and distance-learning candidates in mind. Such students require very full coverage of the syllabus topics, and also the facility to undertake extensive question practice. However, the Study System is also ideal for fully taught courses.

The main body of the text is divided into a number of chapters, each of which is organised on the following pattern:

- *Detailed learning outcomes* expected after your studies of the chapter are complete. You should assimilate these before beginning detailed work on the chapter, so that you can appreciate where your studies are leading.
- *Step-by-step topic coverage*. This is the heart of each chapter, containing detailed explanatory text supported where appropriate by worked examples and exercises. You should work carefully through this section, ensuring that you understand the material being explained and can tackle the examples and exercises successfully. Remember that in many cases knowledge is cumulative: if you fail to digest earlier material thoroughly, you may struggle to understand later chapters.
- *Readings and activities*. Most chapters are illustrated by more practical elements, such as relevant journal articles or other readings, together with comments and questions designed to stimulate discussion.

Question practice. The test of how well you have learned the material is your ability to tackle exam-standard questions. Make a serious attempt at producing your own answers, but at this stage do not be too concerned about attempting the questions in exam conditions. In particular, it is more important to absorb the material thoroughly by completing a full solution than to observe the time limits that would apply in the actual exam.

Solutions. Avoid the temptation merely to 'audit' the solutions provided. It is an illusion to think that this provides the same benefits as you would gain from a serious attempt of your own. However, if you are struggling to get started on a question you should read the introductory guidance provided at the beginning of the solution, and then make your own attempt before referring back to the full solution.

Having worked through the chapters you are ready to begin your final preparations for the examination. The final section of this CIMA Study System provides you with the guidance you need. It includes the following features:

A brief guide to revision technique.

A note on the format of the examination. You should know what to expect when you tackle the real exam, and in particular the number of questions to attempt, which questions are compulsory and which optional, and so on.

Guidance on how to tackle the examination itself.

A table mapping revision questions to the syllabus learning outcomes allowing you to quickly identify questions by subject area.

Revision questions. These are of exam standard and should be tackled in exam conditions, especially as regards the time allocation.

Solutions to the revision questions. As before, these indicate the length and the quality of solution that would be expected of a well-prepared candidate.

If you work conscientiously through this CIMA Study System according to the guidelines above you will be giving yourself an excellent chance of exam success. Good luck with your studies!

Guide to the Icons used within this Text

Key term or definition

Equation to learn

Exam tip to topic likely to appear in the exam

Exercise

Question

Solution

Comment or Note

Study technique

Passing exams is partly a matter of intellectual ability, but however accomplished you are in that respect you can improve your chances significantly by the use of appropriate study and revision techniques. In this section we briefly outline some tips for effective study during the earlier stages of your approach to the exam. Later in the text we mention some techniques that you will find useful at the revision stage.

Planning

To begin with, formal planning is essential to get the best return from the time you spend studying.

Estimate how much time in total you are going to need for each subject that you face. Remember that you need to allow time for revision as well as for initial study of the material. The amount of notional study time for any subject is the minimum estimated time that students will need to achieve the specified learning outcomes set out earlier in this chapter. This time includes all appropriate learning activities, for example, face-to-face tuition, private study, directed home study, learning in the workplace, revision time, etc. You may find it helpful to read *Better Exam Results* by Sam Malone, CIMA Publishing, ISBN: 05066357X. This book will provide you with proven study techniques. Chapter by chapter it covers the building blocks of successful learning and examination techniques.

The notional study time for Managerial level Performance Evaluation is 200 hours. Note that the standard amount of notional learning hours attributed to one full-time academic year of approximately 30 weeks is 1,200 hours.

By way of example, the notional study time might be made up as follows:

	Hours
Face-to-face study: up to	60
Personal study: up to	100
'Other' study – e.g. learning in the workplace, revision, etc.: up to	40
	200

Note that all study and learning-time recommendations should be used only as a guideline and are intended as minimum amounts. The amount of time recommended for face-to-face tuition, personal study and/or additional learning will vary according to the type of course undertaken, prior learning of the student, and the pace at which different students learn.

Now split your total time requirement over the weeks between now and the examination. This will give you an idea of how much time you need to devote to study each week. Remember to allow for holidays or other periods during which you will not be able to study (e.g. because of seasonal workloads).

With your study material before you, decide which chapters you are going to study in each week, and which weeks you will devote to revision and final question practice.

Prepare a written schedule summarising the above – and stick to it!

The amount of space allocated to a topic in the study material is not a very good guide as to how long it will take you. For example, 'Summarising and Analysing Data' has a weight of 25 per cent in the syllabus and this is the best guide as to how long you should spend on it. It occupies 45 per cent of the main body of the text because it includes many tables and charts.

It is essential to know your syllabus. As your course progresses you will become more familiar with how long it takes to cover topics in sufficient depth. Your timetable may need to be adapted to allocate enough time for the whole syllabus.

Tips for effective studying

(1) Aim to find a quiet and undisturbed location for your study, and plan as far as possible to use the same period of time each day. Getting into a routine helps to avoid wasting time. Make sure that you have all the materials you need before you begin so as to minimise interruptions.
(2) Store all your materials in one place, so that you do not waste time searching for items around the house. If you have to pack everything away after each study period, keep them in a box, or even a suitcase, which will not be disturbed until the next time.
(3) Limit distractions. To make the most effective use of your study periods you should be able to apply total concentration, so turn off the TV, set your phones to message mode, and put up your 'do not disturb' sign.
(4) Your timetable will tell you which topic to study. However, before diving in and becoming engrossed in the finer points, make sure you have an overall picture of all the areas that need to be covered by the end of that session. After an hour, allow yourself a short break and move away from your books. With experience, you will learn to assess the pace you need to work at. You should also allow enough time to read relevant articles from newspapers and journals, which will supplement your knowledge and demonstrate a wider perspective.
(5) Work carefully through a chapter, making notes as you go. When you have covered a suitable amount of material, vary the pattern by attempting a practice question. Preparing an answer plan is a good habit to get into, while you are both studying and revising, and also in the examination room. It helps to impose a structure on your solutions, and avoids rambling. When you have finished your attempt, make notes of any mistakes you made, or any areas that you failed to cover or covered only skimpily.
(6) Make notes as you study, and discover the techniques that work best for you. Your notes may be in the form of lists, bullet points, diagrams, summaries, 'mind maps', or the written word, but remember that you will need to refer back to them at a later date, so they must be intelligible. If you are on a taught course, make sure you highlight any issues you would like to follow up with your lecturer.
(7) Organise your paperwork. There are now numerous paper storage systems available to ensure that all your notes, calculations and articles can be effectively filed and easily retrieved later.

The Performance Evaluation syllabus

Examined for the first time in May 2005

Syllabus outline

The syllabus comprises:

Topic	Study Weighting
A Cost Accounting Systems	25%
B Standard Costing	25%
C Budgeting	30%
D Control and Performance Measurement of Responsibility Centres	20%

Learning aims

Students should be able to:

- apply both traditional and contemporary approaches to cost accounting in a variety of contexts and evaluate the impact of 'modern' data processing and processing technologies such as MRP, ERP and JIT;
- explain and apply the principles of standard costing, calculate variances in a variety of contexts and critically evaluate the worth of standard costing in the light of contemporary criticisms;
- develop budgets using both traditional and contemporary techniques, evaluate both interactive and diagnostic uses of budgets in a variety of contexts and discuss the issues raised by those that advocate techniques 'beyond budgeting';
- prepare appropriate financial statements for cost, profit and investment centre managers, calculate appropriate financial performance indicators, assess the impact of alternative transfer pricing policies and discuss the behavioural consequences of management control systems based on responsibility accounting, decentralisation and delegation.

Assessment strategy

There will be a written examination paper of three hours, with the following sections.

Section A – 50 marks
A variety of compulsory objective test questions, each worth between 2 and 4 marks. Mini-scenarios may be given, to which a group of questions relate.

Section B – 30 marks
Six compulsory short answer questions, each worth 5 marks. A short scenario may be given, to which some or all questions relate.

Section C – 20 marks
One question, from a choice of two, worth 20 marks. Short scenarios may be given, to which questions relate.

Learning outcomes and syllabus content

A – Cost Accounting Systems – 25%

Learning outcomes

On completion of their studies students should be able to:

(i) compare and contrast marginal and absorption costing methods in respect of profit reporting and stock valuation;
(ii) apply marginal and absorption costing approaches in job, batch and process environments;
(iii) prepare ledger accounts according to context: marginal or absorption based in job, batch or process environments, including work-in-progress and related accounts such as production overhead control account and abnormal loss account;
(iv) explain the origins of throughput accounting as 'super variable costing' and its application as a variant of marginal or variable cost accounting;
(v) apply standard costing methods within costing systems and demonstrate the reconciliation of budgeted and actual profit margins;

(vi) compare activity-based costing with traditional marginal and absorption costing methods and evaluate its potential as a system of cost accounting;
(vii) explain the role of MRP and ERP systems in supporting standard costing systems, calculating variances and facilitating the posting of ledger entries;
(viii) evaluate the impact of just-in-time manufacturing methods on cost accounting and the use of 'back-flush accounting' when work-in-progress stock is minimal.

Syllabus Content

Marginal (or variable) costing as a system of profit reporting and stock valuation.
Absorption costing as a system of profit reporting and stock valuation.
Throughput accounting as a system of profit reporting and stock valuation.
Activity-based costing as a potential system of profit reporting and stock valuation.
The integration of standard costing with marginal cost accounting, absorption cost accounting and throughput accounting.
Process accounting including establishment of equivalent units in stock, work-in-progress and abnormal loss accounts and the use of first-in-first-out, average cost and standard cost methods of stock valuation.
MRP and ERP systems for resource planning and the integration of accounting functions with other systems, such as purchase ordering and production planning.
Back-flush accounting in just-in-time production environments. The benefits of just-in-time production, total quality management and theory of constraints and the possible impacts of these methods on cost accounting and performance measurement.

B – Standard Costing – 25%

Learning outcomes

On completion of their studies students should be able to:

(i) explain why and how standards are set in manufacturing and in service industries with particular reference to the maximisation of efficiency and minimisation of waste.
(ii) calculate and interpret material, labour, variable overhead, fixed overhead and sales variances;
(iii) prepare and discuss a report which reconciles budget and actual profit using absorption and/or marginal costing principles;
(iv) calculate and explain planning and operational variances;
(v) prepare reports using a range of internal and external benchmarks and interpret the results;
(vi) discuss the behavioural implications of setting standard costs.

Syllabus content

Manufacturing standards for material, labour, variable overhead and fixed overhead.
Price/rate and usage/efficiency variances for materials, labour and variable overhead.
Further subdivision of total usage/efficiency variances into mix and yield components.
(Note: The calculation of mix variances on both individual and average valuation bases is required.)

Fixed overhead expenditure and volume variances. (Note: The subdivision of fixed overhead volume variance into capacity and efficiency elements will not be examined.)
Planning and operational variances.
Standards and variances in service industries, (including the phenomenon of 'McDonaldisation'), public services (e.g. Health) (including the use of 'diagnostic related' or 'reference' groups), and the professions (e.g. labour mix variances in audit work).
Criticisms of standard costing in general and in advanced manufacturing environments in particular.
Sales price and sales revenue/margin volume variances (calculation of the latter on a unit basis related to revenue, gross margin and contribution margin). Application of these variances to all sectors, including professional services and retail analysis.
Interpretation of variances: interrelationship, significance.
Benchmarking.
Behavioural implications of setting standard costs.

C – Budgeting – 30%

Learning outcomes

On completion of their studies students should be able to:

(i) explain why organisations prepare forecasts and plans;
(ii) calculate projected product/service volumes employing appropriate forecasting techniques;
(iii) calculate projected revenues and costs based on product/service volumes, pricing strategies and cost structures;
(iv) evaluate projected performance by calculating key metrics including profitability, liquidity and asset turnover ratios;
(v) describe and explain the possible purposes of budgets, including planning, communication, co-ordination, motivation, authorisation, control and evaluation;
(vi) evaluate and apply alternative approaches to budgeting;
(vii) calculate the consequences of 'what if' scenarios and evaluate their impact on master profit and loss account and balance sheet;
(viii) explain the concept of responsibility accounting and its importance in the construction of functional budgets that support the overall master budget;
(ix) identify controllable and uncontrollable costs in the context of responsibility accounting and explain why 'uncontrollable' costs may or may not be allocated to responsibility centres;
(x) explain the ideas of feedback and feed-forward control and their application in the use of budgets for control;
(xi) evaluate performance using fixed and flexible budget reports;
(xii) discuss the role of non-financial performance indicators and compare and contrast traditional approaches to budgeting with recommendations based on the 'balanced scorecard';
(xiii) evaluate the impact of budgetary control systems on human behaviour;
(xiv) evaluate the criticisms of budgeting particularly from the advocates of techniques that are 'beyond budgeting'.

Syllabus content

Time series analysis including moving totals and averages, treatment of seasonality, trend analysis using regression analysis and the application of these techniques in forecasting product and service volumes.

Fixed, variable, semi-variable and activity-based categorisations of cost and their application in projecting financial results.

What-if analysis based on alternate projections of volumes, prices and cost structures and the use of spreadsheets in facilitating these analyses.

The purposes of budgets and conflicts that can arise (e.g. between budgets for realistic planning and budgets based on 'hard to achieve' targets for motivation).

The creation of budgets including incremental approaches, zero-based budgeting and activity-based budgets.

The use of budgets in planning: 'rolling budgets' for adaptive planning.

The use of budgets for control: controllable costs and variances based on 'fixed' and 'flexed' budgets. The conceptual link between standard costing and budget flexing.

Behavioural issues in budgeting: participation in budgeting and its possible beneficial consequences for ownership and motivation; participation in budgeting and its possible adverse consequences for 'budget padding' and manipulation; setting budget targets for motivation etc.

Criticisms of budgeting and the recommendations of the advocates of the balanced scorecard and 'beyond budgeting'.

D – Control and Performance Measurement of Responsibility Centres – 20%

Learning outcomes

On completion of their studies students should be able to:

(i) discuss the use of cost, revenue, profit and investment centres in devising organisation structure and in management control;

(ii) prepare cost information in appropriate formats for cost centre managers, taking due account of controllable/uncontrollable costs and the importance of budget flexing;

(iii) prepare revenue and cost information in appropriate formats for profit and investment centre managers, taking due account of cost variability, attributable costs, controllable costs and identification of appropriate measures of profit centre 'contribution';

(iv) calculate and apply measures of performance for investment centres (often 'strategic business units' or divisions of larger groups);

(v) discuss the likely behavioural consequences of the use of performance metrics in managing cost, profit and investment centres;

(vi) explain the typical consequences of a divisional structure for performance measurement as divisions compete or trade with each other;

(vii) identify the likely consequences of different approaches to transfer pricing for divisional decision making, divisional and group profitability, the motivation of divisional management and the autonomy of individual divisions.

Syllabus content

Organisation structure and its implications for responsibility accounting.

Presentation of financial information including issues of controllable/uncontrollable costs, variable/fixed costs and tracing revenues and costs to particular cost objects.

Return on investment and its deficiencies; the emergence of residual income and economic value added to address these.

Behavioural issues in the application of performance measures in cost, profit and investment centres.

The theory of transfer pricing, including perfect, imperfect and no market for the intermediate good.

Use of negotiated, market, cost-plus and variable cost based transfer prices. 'Dual' transfer prices and lump sum payments as means of addressing some of the issues that arise.

The interaction of transfer pricing and tax liabilities in international operations and implications for currency management and possible distortion of internal company operations in order to comply with Tax Authority directives.

Transitional arrangements

Students who have passed the Performance Management paper under the Beyond 2000 syllabus will be given a credit for the Performance Evaluation paper under the new 2005 syllabus. For further details of transitional arrangements, please contact CIMA directly or visit their website at www.cimaglobal.com.

This Page Intentionally Left Blank

This text has been structured to be studied independently of the Decision Management (P2) paper, therefore, the reader will notice some unavoidable overlap between the two texts.

This Page Intentionally Left Blank

Cost Accounting Systems

1

Learning Outcomes

After completing this chapter, you should be able to:

- compare and contrast marginal and absorption costing methods in respect of profit reporting and stock valuation;
- apply marginal and absorption costing approaches in job, batch and process environments;
- prepare ledger accounts according to context: marginal or absorption based in job, batch or process environments, including work-in-progress and related accounts such as production overhead control account and abnormal loss account.

1.1 Introduction

In your foundation studies (or equivalent) you should have already encountered the basic principles and concepts involved in cost accounting. Specifically, you should be familiar with the manner in which the costs of objects and activities are determined through an exercise of cost allocation, apportionment and absorption. You should also be familiar with basic cost accounting practices such as stock valuation (LIFO, FIFO and average), profit determination (using marginal and absorption costing conventions), accounting in particular types of production environment (job, batch and process) and the principles of cost behaviour (fixed and variable). Be aware that the CIMA examination scheme is a cumulative one and you should refer back to your earlier studies if you are unfamiliar with any of the topics referred to.

In this chapter we will revisit these basic principles and develop our understanding of their use into more advanced areas. The content of this chapter will lead into an exploration of modern innovations in management accounting systems in Chapter 8.

1.2 The difference between marginal costing and absorption costing

You should already be aware that the difference between marginal costing and absorption costing lies in their treatment of fixed production overhead.

With absorption costing, the fixed production overhead cost is absorbed into the cost of units and all stock items are valued at their full production cost.

In contrast, marginal costing values all stock items at their variable or marginal cost only. Fixed costs are treated as period costs and are written off in full against the profit for the period.

Since the two systems value stock differently, it follows that each will report a different profit figure for the period if stock levels alter.

1.3 Preparing profit statements using each method

The best way to demonstrate how profit statements are prepared for each of the methods is to look at a worked example.

Example

Using the information below, prepare profit statements for June and July using (a) marginal costing and (b) absorption costing.

A company produces and sells one product only which sells for £50 per unit. There were no stocks at the end of May and other information is as follows:

	£
Standard cost per unit:	
Direct material	18
Direct wages	4
Variable production overhead	3
Budgeted and actual costs per month:	
Fixed production overhead	99,000
Fixed selling expenses	14,000
Fixed administration expenses	26,000
Variable selling expenses	10% of sales value

Normal capacity is 11,000 units per month.

The number of units produced and sold was:

	June *units*	*July* *units*
Sales	12,800	11,000
Production	14,000	10,200

1.3.1 Profit statements using marginal costing

A marginal costing will value all units at the variable production cost of £25 per unit (£18 + £4 + £3).

Profit statements using marginal costing

	June		*July*	
	£000	*£000*	*£000*	*£000*
Sales revenue		640		550
Less variable cost of sales:				
Opening stock	–		30	
Variable production cost				
(14,000 × £25)	350			
(10,200 × £25)			255	
	350		285	
Closing stock				
(1,200 × £25)	30			
(400 × £25)			10	
Variable production of sales	320		275	
Variable selling expenses	64		55	
Variable cost of sales		384		330
Contribution		256		220
Less fixed overhead:				
Fixed production overhead	99		99	
Fixed selling expenses	14		14	
Fixed administration expenses	26		26	
		139		139
Profit		117		81

1.3.2 Profit statements using absorption costing

Fixed production overheads are absorbed on the basis of normal capacity which is often the same as budgeted capacity. You should recall that predetermined rates are used partly to avoid the fluctuations in unit cost rates which arise if production levels fluctuate.

$$\text{Fixed production overhead per unit} = \frac{£99{,}000}{11{,}000} = £9 \text{ per unit}$$

$$\text{Full production cost per unit} = £25 \text{ variable cost} + £9 \text{ fixed cost} = £34 \text{ per unit}$$

This full production cost of £34 per unit will be used to value all units under absorption costing.

Since the production level is not equal to the normal capacity in either June or July there will be under- or over-absorbed fixed production overhead in both months. It is probably easier to calculate this before commencing on the profit statements.

	June	*July*
	£000	*£000*
Fixed production overhead absorbed		
(14,000 units × £9)	126	
(10,200 units × £9)		91.8
Fixed production overhead incurred	99	99.0
Over/(under) absorption	27	(7.2)

Profit statements using absorption costing

	June		July	
	£000	*£000*	*£000*	*£000*
Sales revenue		640.0		550.0
Less full production cost of sales:				
Opening stock	–		40.8	
Full production cost				
(14,000 × £34)	476.0			
(10,200 × £34)			346.8	
	476.0		387.6	
Closing stock				
(1,200 × £34)	40.8			
(400 × £34)			13.6	
	435.2		374.0	
(Over-)/under-absorbed fixed production overhead (note 1)	(27.0)		7.2	
Full production cost of sales		408.2		381.2
Gross profit		231.8		168.8
Less selling/admin. expenses:				
Variable selling expenses	64.0		55.0	
Fixed selling expenses	14.0		14.0	
Fixed administration expenses	26.0		26.0	
		104.0		95.0
Net profit		127.8		73.8

Note: If overheads have been over-absorbed then too much has been charged as a cost of production. This amount is therefore deducted to derive the full production cost of sales. If overheads are under-absorbed, the amount is added to increase the production cost of sales.

1.4 Reconciling the profit figures

As well as preparing profit statements using absorption costing and marginal costing, you should also recall how to reconcile the profits given by each method for the same period and by the same method for different periods.

1.4.1 Reconciling the profits given by the different methods

The profit differences are caused by the different valuations given to the closing stocks in each period. With absorption costing, an amount of fixed production overhead is carried forward in stock to be charged against sales of later periods.

If stocks increase, then absorption costing profits will be higher than marginal costing profits. This is because some of the fixed overhead is forward in stock instead of being written off against sales for the period.

If stocks reduce, then marginal costing profits will be higher than absorption costing profits. This is because the fixed overhead which had been carried forward in stock with absorption costing is now being released to be charged against the sales for the period.

A profit reconciliation for the previous example might look like this:

	June	*July*
	£000	*£000*
Marginal costing profit	117.0	81.0
Adjust for fixed overhead in stock:		
Stock increase 1,200 units × £9 per unit	10.8	
Stock decrease 800 units × £9 per unit		(7.2)
Absorption costing profit	127.8	73.8

1.4.2 Reconciling the profits for different periods

You should also recall how to reconcile the profits for different periods using the same method.

(a) For marginal costing, the unit rates and the amount of fixed costs charged each period are constant. Therefore the only thing which could have caused the profit difference was the change in sales volume. The lower sales volume in July resulted in a lower contribution and therefore a lower profit (since the amount of fixed cost remained constant).

The contribution per unit is £20 as follows:

	£ per unit
Selling price	50
Variable production cost	(25)
Variable selling cost	(5)
Contribution	20

The marginal costing profit figures can be reconciled as follows:

	£000
Marginal costing profit for June	117
Decrease in sales volume for July	
1,800 units × £20 contribution	36
Marginal costing profit for July	81

(b) For absorption costing the major part of the profit difference is caused by the change in sales volume. However a further difference is caused by the adjustments for under- and over-absorbed fixed production overhead in each of the two periods.

The profit per unit with absorption costing is £11 as follows:

	£ per unit
Selling price	50
Total production cost	(34)
Variable selling cost	(5)
Profit	11

The absorption costing profit figures can be reconciled as follows:

	£000
Absorption costing profit for June	127.8
Decrease in sales volume for July	
1,800 units × £11 profit	(19.8)
Adjustments for under-/over-absorption	
June	(27.0)
July	(7.2)
Absorption costing profit for July	73.8

This may look confusing because both the under- and over-absorption are deducted. This is because the over-absorption for June made profit for that month higher, therefore it must be deducted to arrive at July's profit. Similarly, the under-absorption in July made July's profit lower than June's, therefore it must also be deducted in the reconciliation.

1.4.3 Profit differences in the long term

The two different costing methods produce profit differences only in the short term when stocks fluctuate. If stocks remain constant then there will be no profit differences between the two methods.

In the long term the total reported profit will be the same whichever method is used. This is because all of the costs incurred will eventually be charged against sales; it is merely the timing of the sales that causes the profit differences from period to period.

1.5 Marginal costing or absorption costing?

There is no absolutely correct answer to when marginal costing or absorption costing is preferable. However it is generally accepted that marginal costing statements provide the best information for the purposes of management decision-making.

Supporters of absorption costing argue that fixed production overheads are a necessary cost of production and they should therefore be included in the unit cost used for stock valuation. SSAP 9 requires the use of absorption costing for external reporting purposes.

If stocks are built up for sale in a future period, for example, in distilling, then absorption costing smooths out profit by carrying forward the fixed production overheads to be matched against the sales as they are made.

Supporters of marginal costing argue that management attention is concentrated on the more controllable measure of contribution. They say that the apportionment of fixed production overhead to individual units is carried out on a purely arbitrary basis, is of little use for decision-making and can be misleading.

However, it is widely accepted that for general accounting purposes (as opposed to business decision-making purposes) both fixed and variable overhead costs should be attributed to cost units in some meaningful way. Absorption costing is therefore in wide use. The problem lies in adopting an appropriate method of attributing overhead costs to cost units.

Modern thinking in this regard is that most costs are actually variable if you take a long enough view of them and understand what they vary with. This issue is pursued further in Chapter 4.

We will now move to a consideration of cost accounting practices in specific business environments. A theme which runs through this is the manner in which overhead costs are absorbed. Be aware that the adoption of absorption costing is implicit in this. For some decision-making purposes, the accountant may wish to exclude some or all of the absorbed overheads from reported product costs, and concentrate his/her attention on variable costs only. Revision Questions 2 and 3 involve particular consideration of this issue.

1.6 Specific order costing

Every organisation will have its own costing system with characteristics which are unique to that particular system. However the basic costing system is likely to depend on the type of activity that the organisation is engaged in. The system would have the same basic characteristics as the systems of other organisations which are engaged in similar activities.

Specific order costing systems are appropriate for organisations which produce cost units which are separately identifiable from one another. Job costing and batch costing are types of specific order costing. In organisations which use these costing methods, each cost unit is different from all others and each has its own unique characteristics.

1.7 Job costing

Job costing applies where work is undertaken according to specific orders from customers to meet their own special requirements. Each order is of relatively short duration. For example, a customer may request the manufacture of a single machine to the customer's own specification. Other examples might be the repair of a vehicle or the preparation of a set of accounts for a client, that is, job costing can also be applied to services.

1.7.1 Job cost cards and databases

The main feature of a job costing system is the use of a job cost card or job card which is used to collect the costs of each job. In practice this would probably be a file in a computerised system (using appropriate coding for each entry) but the essential feature is that each job would be given a specific job number which identifies it from all other jobs. Costs would be allocated to this number as they are incurred on behalf of the job. Since the sales value of each job can also be separately identified, it is then possible to determine the profit or loss on each job.

The job card would record details of the job as it proceeds. The items recorded would include:

job number;
description of the job; specifications, etc.;
customer details;
estimated cost, analysed by cost element;
selling price, and hence estimated profit;
delivery date promised;
actual costs to date, analysed by cost element;
actual delivery date, once the job is completed;
sales details, for example, delivery note no., invoice no.

1.7.2 Collecting the direct costs of each job

Direct labour

The correct analysis of labour costs and their attribution to specific jobs depends on the existence of an efficient time recording and booking system. For example, time sheets may be used to record how each employee's time is spent, using job numbers where appropriate to indicate the time spent on each job. The wages cost can then be charged to specific job numbers (or to overhead costs, if the employee was engaged on indirect tasks).

Direct material

All documentation used to record movements of material within the organisation should indicate the job number to which it relates. For example, a material requisition note should have a space to record the number of the job for which the material is being requisitioned. If any of this material is returned to stores, then the material returned note should indicate the original job number which is to be credited with the cost of the returned material.

Direct expenses

Although direct expenses are not as common as direct material and direct labour costs it is still essential to analyse them and ensure that they are charged against the correct job number. For example, if a machine is hired to complete a particular job, then this is a direct expense of the job. The purchase invoice should be coded to ensure that it is charged to the job. Alternatively, if cash is paid, then the cash book analysis will show the job number which is to be charged with the cost.

1.7.3 Attributing overhead costs to jobs

(a) Production overheads

The successful attribution of production overhead costs to cost units depends on the existence of well-defined cost centres and appropriate absorption bases for the overhead costs of each cost centre. It must be possible to record accurately the units of the absorption base which are applicable to each job. For example, if machine hours are to be used as the absorption base, then the number of machine hours spent on each job must be recorded on the job cost card. The relevant cost centre absorption rate can then be applied to produce a fair overhead charge for the job.

(b) Non-production overheads

The level of accuracy achieved in attributing costs such as selling, distribution and administration overheads to jobs will depend on the level of cost analysis which an organisation uses.

Many organisations use a predetermined percentage (see earlier discussion of absorption costing) to absorb such costs, based on estimated or budgeted levels of activity for the forthcoming period. The following example will demonstrate how this works.

Example

A company uses a predetermined percentage of production cost to absorb distribution costs into the total cost of its jobs. Based on historical records and an estimate of activity and expenditure levels in the forthcoming period, they have produced the following estimates:

Estimated distribution costs to be incurred £13,300
Estimated production costs to be incurred on all jobs £190,000

$$\text{Therefore, predetermined overhead absorption rate for distribution costs} = \frac{£13{,}300}{£190{,}000} \times 100\%$$

$$= 7\% \text{ of production costs}$$

The use of predetermined rates will lead to the problems of under- or over-absorbed overhead which we discussed in the previous section. The rates should therefore be carefully monitored throughout the period to check that they do not require adjusting to more accurately reflect recent trends in costs and activity.

1.7.4 A worked example

The following example will help you to practise presenting a cost analysis for a specific job.

Example

Jobbing Limited manufactures precision tools to its customers' own specifications. The manufacturing operations are divided into three cost centres: A, B and C

An extract from the company's budget for the forthcoming period shows the following data:

Cost centre	*Budgeted production overhead*	*Basis of production overhead absorption*
A	£38,500	22,000 machine hours
B	£75,088	19,760 machine hours
C	£40,964	41,800 labour hours

Job number 427 was manufactured during the period and its job cost card reveals the following information relating to the job:

Direct material requisitioned	£6,780.10
Direct material returned to stores	£39.60
Direct labour recorded against job number 427	
Cost centre A	146 hours at £4.80 per hour
Cost centre B	39 hours at £5.70 per hour
Cost centre C	279 hours at £6.10 per hour
Special machine hired for this job: hire cost	£59.00
Machine hours recorded against job number 427	
Cost centre A	411 hours
Cost centre B	657 hours
Price quoted and charged to customer, including delivery	£17,200

Jobbing Limited absorbs non-production overhead using the following predetermined overhead absorption rates:

Administration and general overhead	10% of production cost
Selling and distribution overhead	12% of selling price

You are required to present an analysis of the total cost and profit or loss attributable to job number 427.

Solution

First we need to calculate the predetermined overhead absorption rates for each of the cost centres, using the basis indicated.

$$\text{Cost centre A} = \frac{£38{,}500}{£22{,}000} = £1.75 \text{ per machine hour}$$

$$\text{Cost centre B} = \frac{£75{,}088}{£19{,}760} = £3.80 \text{ per machine hour}$$

$$\text{Cost centre C} = \frac{£40{,}964}{£41{,}800} = £0.98 \text{ per labour hour}$$

Now we can prepare the cost and profit analysis, presenting the data as clearly as possible.

Cost and profit analysis: job number 427

	£	£
Direct material (note 1)		6,740.50
Direct labour		
Cost centre A 146 hours × £4.80	700.80	
Cost centre B 39 hours × £5.70	222.30	
Cost centre C 279 hours × £6.10	1,701.90	
		2,625.00
Direct expenses: hire of jig		59.00
Prime cost		9,424.50
Production overhead absorbed:		
Cost centre A 411 hours × £1.75	719.25	
Cost centre B 657 hours × £3.80	2,496.60	
Cost centre C 279 hours × £0.98	273.42	
		3,489.27
Total production cost		12,913.77
Administration and general overhead (10% × £12,913.77)		1,291.38
Selling and distribution overhead (12% × £17,200)		2,064.00
Total cost		16,269.15
Profit		930.85
Selling price		17,200.00

Note: The figure for material requisitioned has been reduced by the amount of returns to give the correct value of the materials actually used for the job.

1.7.5 Other applications for job costing

So far we have discussed the use of job costing in the context of jobs carried out on the organisation's own premises for customers external to the business.

The job costing method can also be applied to monitor the costs of internal work done for the organisation's own benefit. For example, job cost cards can be used to collect the costs of property repairs carried out by the organisation's own employees, or they may be used in the costing of internal capital expenditure jobs.

The job costing method can also be applied to services carried out on the customer's own premises. For example, it may be used in the costing of plumbing or cleaning services, where the objective of the costing system is to collect and monitor the cost of each job.

1.8 Batch costing

The CIMA Terminology defines a batch as 'a group of similar articles which maintains its identity throughout one or more stages of production and is treated as a cost unit'. You can probably see that a batch is very similar in nature to the jobs which we have been studying so far in this chapter. It is a separately identifiable cost unit for which it is possible to collect and monitor the costs.

The job costing method can therefore be applied in costing batches. The only difference is that a number of items are being costed together, instead of a single item or service. Once the cost of the batch has been determined, the cost per item within the batch can be calculated by dividing the total cost by the number of items produced.

Batch costing can be applied in many situations, including the manufacture of furniture, clothing and components. It can also be applied when manufacturing is carried out for the organisation's own internal purposes, for example in the production of a batch of components to be used in production.

1.9 Process costing

To remind you of the basics of process costing that you learned about in your foundation studies, have a go at the following example. Work through the equivalent units tables carefully and ensure that you understand where each figure comes from.

Example: basic process costing

Data concerning Process 2 last month was as follows:

Transfer from Process 1	400 kg at a cost of	£2,150
Materials added	3,000 kg	£6.120
Conversion costs		£2,344
Output to finished goods		2,800 kg
Output scrapped		400 kg
Normal loss		10 per cent of materials added in the period

The scrapped units were complete in materials added but only 50 per cent complete in respect of conversion costs. All scrapped units have a value of £2 each.

There was no opening work in progress, but 200 kg were in progress at the end of the month, at the following stages of completion:

80% complete in materials added
40% complete in conversion costs

You are required to write up the accounts for the process.

Solution

The first step is to produce an input/output reconciliation. Notice that the losses are not complete. You will need to take account of this in the equivalent units columns. And remember that the normal loss units do not absorb any of the process costs. They are valued at their scrap value only, so they must not be included as part of the output to absorb costs.

				Equivalent kg to absorb cost		
				Process 1	*Materials*	*Conversion*
Input	*kg*	*Output*	*kg*	*transfer*	*added*	*costs*
Process 1 transfer	400	Finished goods	2,800	2,800	2,800	2,800
Material added	3,000	Normal loss	300	–	–	–
		Abnormal loss[1]	100	100	100	50
		Work in progress	200	200	160	80
	3,400		3,400	3,100	3,060	2,930
		Costs		£	£	£
		Incurred in period		2,150	6,120	2,344
		Scrap value of normal loss[2]		(600)		
				1,550	6,120	2,344
		Cost per unit	£3.30	0.50	2.00	0.80

Notes:

1. The abnormal loss is inserted in the output column as a balancing figure. Losses are 50 per cent complete in conversion costs. Therefore, the 100 kg of abnormal loss represents 50 equivalent complete kg.
2. By convention, the scrap value of normal loss is usually deducted from the first cost element.

For each cost element the costs incurred are divided by the figure for equivalent kg produced. For example: the cost per kg for materials added = £6,120/3,060 = £2 per kg.

The unit rates can now be used to value each part of the output. For example the 160 equivalent kg of materials added in the work in progress are valued at 160 × £2 = £320. The 80 equivalent kg of conversion costs in work in progress are valued at 80 kg × £0.80 = £64.

		Process 1	*Materials*	*Conversion*
	Total	*transfer*	*added*	*costs*
Valuation	£	£	£	£
Finished goods	9,240	1,400	5,600	2,240
Abnormal loss	290	50	200	40
Work in progress	484	100	320	64

It is now possible to draw up the relevant accounts using these valuations of each part of the process output. Remember that the normal loss is valued at its scarp value.

Process 2 account

	kg	£		*kg*	£
Process 1	400	2,150	Finished goods	2,800	9,240
Materials added	3,000	6,120	Normal loss	300	600
Conversion costs		2,344	Abnormal loss	100	290
			Work in progress	200	484
	3,400	10,614		3,400	10,614

Abnormal loss account

	£		£
Process 2	290	Scrap stock	200
		Profit and loss	90
	290		290

Scrap account

	£		£
Process 2	600	Bank/debtors: (300 + 100) × £2	800
Abnormal loss account	200		
	800		800

If you had any difficulty in understanding the workings of this example, you should return now to your study material for *Management Accounting Fundamentals*. You need a thorough understanding of the basics before continuing to study the more advanced aspects of process costing.

1.9.1 Previous process costs

A common problem which students experience when studying process costing is understanding how to deal with previous process costs. An important point that you should understand is that production passes through a number of sequential processes. Unless the process is the last in the series, the output of one process becomes the input of the next. A common mistake is to forget to include the previous process cost as an input cost in the subsequent process.

You should also realise that all of the costs of the previous process (materials, labour and over-head) are combined together as a single cost of 'input material' or 'previous process costs' in the subsequent process.

In the workings for the last example we assumed that the work in progress must be 100 per cent complete in respect of process 1 costs. This is also an important point to grasp. Even if the process 2 work had only just begun on these units, there cannot now be any mote cost to add in respect of process 1. Otherwise the units would not yet have been transferred out of process 1 into process 2.

In the next section we will be going on to see how to account for opening work in progress using the average cost and FIFO methods. For FIFO you will need to determine the amount of work to be done to complete the opening work in progress. If you have grasped the fact that work in progress is complete in respect of previous process costs, then you should understand that no more cost is to be added to this cost element to complete the work in progress. There may still be more materials to be added in this process, but these are treated separately from previous process costs.

1.9.2 Opening work in progress

There are two ways in which opening work-in-progress (WIP) can be accounted for in process costing: average cost and FIFO.

With the average cost method, the cost of the opening WIP is added to the costs incurred in the period. This total cost is then averaged out over all of the units worked on in the period, including the closing work in progress.

With the FIFO method, the opening WIP is dealt with on a strict first in, first out basis. It is assumed that the opening WIP is completed first, before other units are started in the period. The cost of the opening WIP is analysed separately from the cost of the units which are started during the period. The closing work in progress is therefore valued at the unit cost rate incurred during this period. It is not affected by the costs of the previous period which are brought forward in the opening WIP.

The best way to make this difference clear is to work through some examples. The next two examples in this chapter both include some opening work in progress. Work through them carefully, referring back to these paragraphs to help you to understand the differences between the FIFO and average cost methods.

Example 1: opening work in progress

The following information is available for process 3 in June:

			Degree of completion and cost					
			Process 2 input		*Materials added in Process 3*		*Conversion costs*	
	Units	*Cost* £	*%*	*£*	*%*	*£*	*%*	*£*
Opening stock	100	692	100	176	60	300	30	216
Closing stock	80		100		70		55	
Input costs:								
Input from process 2	900	1,600						
Materials added in process 3		3,294						
Conversion costs		4,190						

Normal loss is 10 per cent of input from process 2; 70 units were scrapped in the month, and all scrap units realise £0.20 each.

Output to the next process was 850 units.

You are required to complete the account for process 3 in June.

Solution using the average price method

As before, the first step is to complete an input/output reconciliation and then to extend this to calculate the number of equivalent units for each cost element.

				Equivalent units absorb cost		
Input	*Units*	*Output*	*Units*	*Process2 input*	*Materials added*	*Conversion costs*
Opening stock[1]	100	To process 4	850	850	850	850
Process 2[2]	900	Normal loss	90	–	–	–
		Abnormal gain[3]	(20)	(20)	(20)	(20)
		Closing stock[4]	80	80	56	44
	1,000		1,000	910	886	874
		Costs	£	£	£	£
		Opening stock[5]		176	300	216
		Input costs		1,600	3,294	4,190
		Normal loss value		(18)		
				1,758	3,594	4,406
			£	£	£	£
		Cost per unit	11.029	1.932	4.056	5.041
		Evaluation[6]				
		To process 4	9,375	1,642	3,448	4,285
		Abnormal gain	(221)	(39)	(81)	(101)
		Closing stock	604	155	227	222

Notes:
1. The opening stock is included as part of the input in the input/output reconciliation. The degree of completion of the opening stock is not relevant, because we are going to average its cost over all units produced in the period.
2. Note that we are not told the quantity of material added because it does not affect the number of basic units processed.
3. The number of units scrapped is less then the normal loss. There is thus an abnormal gain.
4. The equivalent units of closing stock takes account of the degree of completion for each cost element.
5. The opening stock is included in the statement of costs, so that its value is averaged over the equivalent units produced in the period.
6. In the evaluation section, the unit rate for each cost element is multiplied by the number of equivalent units in each part of the output. These values can then be used to complete the process account.

Process 3 account

	Units	£		*Units*	£
Opening stock	100	692	Process 4	850	9,375
Process 2	900	1,600	Normal loss	90	18
Materials added		3,294	Closing stock	80	604
Conversion costs		4,190			
Abnormal gain	20	221			
	1,020	9,997		1,020	9,997

Exercise

To give yourself some extra practice, draw up the abnormal gain account and the scrap account.

Solution

Abnormal gain account

	£		£
Scrap stock (20 × £0.20)	4	Process 3	221
Profit and loss account	217		
	221		221

Scrap account

	£		£
Normal loss	18	Bank/debtor: (90 − 20) × £0.20	14
		Abnormal gain	4
	18		18

1.9.3 Solution to Example 1 using the FIFO method

The FIFO method assumes that the opening stock is completed before work is begun on the new input during the period. The input/output reconciliation therefore analyses the 850 units completed to show how much work was done in finishing off the opening stock brought forward.

The 100 units brought forward were complete in process 2 input therefore no equivalent units were produced this period for this cost element. They were 60 per cent complete in material added therefore the remaining 40 per cent (40 units) was completed this period.

They were 30 per cent complete in conversion costs therefore the remaining 70 per cent (70 units) was completed in this period.

				Equivalent units to absorb cost		
				Process 2	*Material*	*Conversion*
Input	*Units*	*Output*	*Units*	*input*	*added*	*cost*
opening stock	100	O.stock completed	100	–	40	70
Process 2	900	CPDP[1]	750	750	750	750
		Normal loss	90	–	–	–
		Abnormal gain	(20)	(20)	(20)	(20)
		Closing stock	80	80	56	44
	1,000		1,000	810	826	844
		Costs	£	£	£	£
		Input costs[2]		1,600	3,294	4,190
		Normal loss value		(18)		
				1,582	3,294	4,190
		Cost per unit	10.905	1.953	3.988	4.964
		Evalution				
		O.stock completed	507	–	160	347
		CPDP	8,179	1,465	2,991	3,723
		Abnormal gain	(218)	(39)	(80)	(99)
		Closing stock	598	156	223	219

Notes:
1. CPDP is an abbreviation for Completely Processed During the Period. These are the 750 units that were both started and finished this month (850 units transferred less 100 unites of opening stock finished off).
2. Since the statement of equivalent units includes only the work done this period, the cost statement must exclude the value of work done last period, i.e. the value of the opening work in progress must not be included.
3. The value of the process 4 transfer must be built up from three pieces of information:

	£
Cost of work done on 100 units of opening stock:	
last period b/f	692
completed this period*	507
Cost of 750 units completely processed during this period*	8,179
	9,378

* These two values are taken from the evaluation statement.

Process 3 account

	units	£		*units*	£
Opening stock	100	692	process 4	850	9,378
Process 2	900	1,600	Normal loss	90	18
Materials added		3,294	Closing stock	80	598
Conversion costs		4,190			
Abnormal gain	20	218			
	1,020	9,994		1,020	9,994

1.9.4 Discussion of Example 1

You can see that with the average cost method the unit to value the process output were higher than with the FIFO method.

This is because the previous costs were higher than the costs for this period. These higher costs were contained in the opening work in progress valuation and with the average price method this is averaged over all units. Therefore the unit costs are higher than with the FIFO method, which analyses the opening work in process separately. Obviously if the previous period costs had been lower then this would have had the opposite effect on the relative valuations.

In our example the differences are not large because costs are not very different between the two periods. However if costs do fluctuate then the choice of method can have a greater effect on the valuation of output.

If it is important for managers to be able to compare the unit costs from one period to the next then FIFO might be the best method to use. This will mean that the costs for each period are analysed separately and no averaging takes place. However if costs fluctuate dramatically from one period to the next and managers wish to even out the effect of these fluctuations then the average price method may be preferable.

1.9.5 Choice of methods and standard costing

Both the practitioner and the student may be required to determine which method of stock valuation (Average or FIFO) is most appropriate in a particular process costing exercise. Be aware that under all but extreme or contrived circumstances it makes little difference to the outcome which method is adopted. Note that in Example 1, average gives a charge to process 4 of £9,375 while FIFO gives a charge of £9,378 – a trivial difference.

However, both methods involve relatively intricate calculations.

These calculations can be avoided by valuing stock at 'standard cost' rather than actual cost. Standard costs will be explored in some depth in the next two chapters and you should have already encountered the concept in your foundation studies. Let us take an example to illustrate the manner in which standard cost stock valuation might be used.

Example 2

Process B takes units from Process A and passes them on to Process C. Relevant operating details for Process B in the current period are:

Opening stock	– 80 units, 60% complete as regards B processing
Closing stock	– 100 units, 40% complete as regards B processing
Transfers from Process A	– 900 units at £4.75 (standard) per unit
Process B costs	– £8,400

Additional information
Normal process losses are 5% of units input (complete at time of loss)
Process losses generate £1.90 scrap income per unit
The standard cost per unit output from process B is

	£
Process A costs	5.00
Process B costs	10.00
Scrap sales	(0.10)
	14.90

Note: Never mind how that standard cost figure has been arrived at, but appreciate its consistency with other information given. 5% of input process losses means that scrap sales from 5 units (£9.50) are absorbed by 95 units of output (£0.10 per unit). 100 units input from A (at £4.75 per unit) are absorbed by 95 units of output (£5.00 per unit).

Requirement
Prepare the process account for the current period.

Solution

Process B account

	Units	£		Units	£
Opening stock	80	872.00	Process C	830	12,367.00
Process A	900	4,275.00	Normal loss	45	85.50
Process B		8,400.00	Abnormal loss	5	74.50
			Closing stock	100	890.00
			Cost variances		130.00
	980	13,547.00		980	13,547.00

Workings for most of the above figures are fairly obvious. For example, the transfers to process C are 830 units × £14.90. The closing stock is 100 units × (£4.90 + (£10 × 40%)).

However, note the £130 transfer to 'cost variances'. The use of standard cost for stock valuation means that there is an under-absorption of costs charged to the Process B account. The process account has to be cleared and this is done by crediting that account with a balancing figure of £130 and charging that amount to a cost variance account.

The cost variances may be used as an instrument of control. This will be explored fully in Chapters 2 and 3.

Note: In practice, minor variations on the above workings might be acceptable on the basis of alternative treatment of detail.

1.9.6 Process costing with opening work in progress

You must try to get as much practice as possible in preparing process cost accounts and you will find it much easier if you use a standard format for the working papers.

Work carefully through the next example – or better still try it for yourself before looking at the suggested solution. Notice that the scrapped units are not complete. You will need to take account of this in the equivalent units calculations.

Example 3

The following information is available for process 2 in October:

			Degree of completion and cost					
		Cost	*Process 1 input*		*Materials added in Process 2*		*Conversion costs*	
	Units	£	%	£	%	£	%	£
Opening stock	600	1,480	100	810	80	450	40	220
Closing stock	350		100		90		30	
Input cost:								
Input from process 1	4,000	6,280						
Materials added in process 2		3,109						
Conversion costs		4,698						

Normal loss is 5 per cent of input from process 1.

300 units were scrapped in the month. The scrapped units had reached the following degrees of completion.

Materials added	90%
Conversion costs	60%

All scrapped units realised £1 each.

Output to the next process was 3,950 units.

You are required to complete the account for process 2 and for the abnormal loss or gain in October.

Solution to Example 3 using the average cost method

The first step is to prepare an input/output reconciliation to see if there was an abnormal loss or abnormal gain. This is found as a balancing figure in the output column.

				Equivalent units to absorb cost		
				Process 1	*Materials*	*Conversion*
Input	*Units*	*Output*	*Units*	*input*	*added*	*costs*
Opening stock	600	To process 3	3,950	3,950	3,950	3,950
Process 1	4,000	Normal loss	200	–	–	–
		Abnormal loss	100	100	90	60
		Closing stock	350	350	315	105
	4,600		4,600	4,400	4,355	4,115
		Costs	£	£	£	£
		Opening stock		810	450	220
		Input costs		6,280	3,109	4,698
		Normal loss value		(200)		
				6,890	3,559	4,918
		Cost per unit	3.578	1.566	0.817	1.195
		Evaluation				
		To process 3	14,133	6,186	3,227	4,720
		Abnormal loss	303	157	74	72
		Closing stock	931	548	257	126

Process 2 account

	units	£		*units*	£
Opening stock	600	1,480	Process 3	3,950	14,133
Process 1	4,000	6,280	Normal loss	200	200
Materials added		3,109	Abnormal loss	100	303
Conversion costs		4,698	Closing stock	350	931
	4,600	15,567		4,600	15,567

Abnormal loss account

	£		£
Process 2	303	Scrap stock	100
		Profit and loss	203
	303		303

Scrap account

	£		£
Normal loss	200	Bank/debtors: (200 + 100) × £1	300
Abnormal loss	100		
	300		300

1.9.7 Solution to Example 2 using the FIFO method

The statement of equivalent units must separately identify the units completely processed this period, form those which were started last period.

				Equivalent units to absorb cost		
				Process 1	*Material*	*Conversion*
Input	*Units*	*Output*	*Units*	*input*	*added*	*cost*
Opening stock	600	O.S completed[1]	600	–	120	360
Process 1	4,000	CPDP	3,350	3,350	3,350	3,350
		Normal loss	200	–	–	–
		Abnormal loss	100	100	90	60
		Closing stock	350	350	315	105
	4,600		4,600	3,800	3,875	3,875
		Costs	£	£	£	£
		Input costs[2]		6,280	3,109	4,698
		Normal loss value		(200)		
				6,080	3,109	4,698
		Cost per unit	3.614	1.600	0.802	1.212
		Evaluation				
		O.stock completed	532	–	96	436
		CPDP	12,107	5,360	2,687	4,060
		Abnormal loss	305	160	72	73
		Closing stock	940	560	253	127

Notes:
1. To complete the opening stock there was a further 20% of work to be done in material added ($600 \times 20\% = 120$) and 60% of work to be done in conversion cost ($600 \times 60\% = 360$). Remember that the opening work in process must always be 100% complete as regards the previous process cost – otherwise it would not be in this process yet!
2. The work done last period on the opening stock has been excluded from the statement of production. Therefore the costs of the opening stock must be excluded from the statement of costs.

Process 2 account

	Units	£		*Units*	£
Opening stock	600	1,480	Process 3*	3,950	14,122
Process1	4,000	6,280	Normal loss	200	200
Materials added		3,109	Abnormal loss	100	305
Conversion costs		4,698	Closing stock	350	940
	4,600	15,567		4,600	15,567

Abnormal loss account

	£		£
Process 2	305	Scrap stock	100
		Profit and loss	205
	305		305

*The amount of £14,122 for the transfer to process 3 has been inserted as a balancing figure. It can be checked as in the last FIFO example:

	£
Work done on opening stock:	
last period	1,480
this period	532
Completely processed this period	12,107
	14,119

The difference of £3 is caused by rounding.

1.9.8 Process losses

In all of the examples we have considered so far, the losses have had a scrap value. You may also come across situations where losses have no value(in which case they are defined as waste) or where losses have a disposal cost. We will now look at how the process accounts are prepared in these situations.

Example: losses in process costing

Process 1 has a normal loss of 10 per cent of input, due to quality control rejections at the end of the process. Output form the process is transferred to process 2.

Process costs in the month were:

Input materials – 1,000 units at a total cost of	£2,000
Conversion costs	£3,000

There were no opening or closing stocks

Output to process 2 was 850 units

Requirement

Prepare the relevant accounts in the following separate situations;

(a) All rejected units are waste and have no value.
(b) All rejected units must be disposed of at a cost of £0.50 per unit.

Solution

(a) An input/output reconciliation can be prepared as in previous examples, but the process costs would not be reduced by the scrap value of the normal loss.

Input	*Units*	*Output*	*Units*	*Units to absorb Process costs*
Input material	1,000	Process 2 transfer	850	850
		Normal loss	100	–
		Abnormal loss	50	50
	1,000		1,000	900

Cost per unit = £(2,000 + 3,000)/900
= £5.556 per unit

This unit rate is used to value the good output and the abnormal loss. The normal loss would be given no value in the process account.

The relevant accounts would look like this:

Process 1 account

	Units	£		*Units*	£
Input material	1,000	2,000	Process 2	850	4,772
Conversion costs		3,000	Normal loss	100	–
			Abnormal loss	50	278
	1,000	5,000		1,000	5,000

Abnormal loss account

	£		£
Process 1	278	Profit and loss	278

The total costs of the abnormal loss is transferred to the profit and loss account. These is no scrap value to offset against it.

(b) The input/output reconciliation would remain unaltered land the number of units to absorb process costs would still be 900. However, the process costs would be increased by the disposal cost of the normal loss and the cost per unit would be calculated as follows:

$$Cost per unit = \frac{£5,000 + (£0.50 \times 100)}{900} = £5.61$$

This unit rate would be used to value the good output and the abnormal loss.
The relevant accounts would look like this:

Process 1 account

	Units	£		Units	£
Input material	1,000	2,000	Process 2	850	4,769
Conversion costs		3,000	Normal loss	100	–
Disposal cost of normal loss		50	Abnormal loss	50	281
	1,000	5,050		1,000	5,050

There is no scrap value of normal loss to credit to the process account. Instead there is a debit for the cost of disposing of the normal loss.

Abnormal loss account

	£		£
Process 1	281	Profit and loss	306
Disposal cost (50 × £0.50)	25		
	306		306

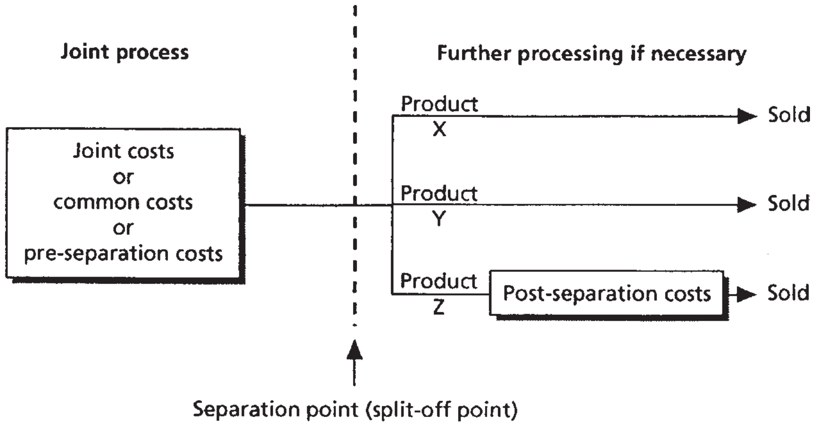
The total cost of the abnormal loss is transferred to the profit and loss account. This is made up of its disposal cost as well as its cost of production.

The main points that you should notice concerning the treatment of losses in all of these examples are as follows:

(a) The normal loss does not absorb any of the production costs.
(b) Abnormal losses and gains are valued at the same unit cost as the good units.
(c) If losses have a scrap value, only the value of the normal loss is credited to the process account. The scrap values of any abnormal losses or gains are offset against their production costs in the abnormal loss or gain account.
(d) If losses haves no value, they are known as waste and the normal loss has zero value.
(e) If losses must be disposed of at a cost, only the cost of disposing of the normal loss is debited to the process account. The normal loss will have zero value. The disposal costs of any abnormal losses or gains are debited or credited in the abnormal loss or gain account respectively.

1.10 Joint products and by-products

Joint products are defined by the CIMA *Official Terminology* as 'two or more products produced by the same process and separated in processing, each having a sufficiently high saleable value to merit recognition as a main product.'



Three joint products are produced, only one of which (product Z) requires further processing before it is sold.

Figure 1.1 Common costs

Examples of joint products could be the output form oil refining: the various grades of petrol, diesel, paraffin and so on. Each of these products has a significant value compared with the others.

In contrast, a by-product is defined as 'output of some value produced incidentally in manufacturing something else (main product)'.

The key word in this definition is probably 'incidentally'. The by-product has some value but the process was not set up primarily for its manufacture. Its value is small and incidental when compared with that of the main product or products.

An example of a by-product could be the sawdust which is produced in a sawmill when timber is being processed. This has a small sales value compared with the value of the main product – the timber.

1.10.1 Joint product costing

Joint products are produced together in one or mare process. The point at which become separately identifiable is known as the separation point or split-off point Any costs incurred in processing the products after this point are called posts-separation point costs or subsequent processing costs. Costs incurred prior to the separation point are called common costs, joint costs or pre-separation point costs. Figure 1.1 demonstrates a possible situation.

The problem with costing joint products is that a basis must be found for apportioning the common costs to the various products. Common costs must be apportioned so that a total cost is available for each product. This total cost can then be used for stock valuation purposes.

1.10.2 Apportioning common costs to joint products

The two methods most commonly used to apportion common costs to joint products are:

(a) The quantity basis, where common costs are apportioned according to the weight or volume of each product at the separation point.
(b) The sales value basis, where common costs are apportioned according to the sales value of each product at the separation point.

The following example will demonstrate how these methods work.

Products A, B and C are produced in a single process. The costs for this process last period amounted to £27,200. Data concerning the output is al follows:

Product	*Output kg*	*Sales value at separation point £ per kg*
A	1,600	7
B	3,890	4
C	1,870	5

(a) Using the quantity basis

Product	*Output kg*		*Common cost apportioned £*
A	1,600	1,600/7,360 × £27,200	5,913
B	3,890	3,890/7,360 × £27,200	14,376
C	1,870	1,870/7,360 × £27,200	6,911
	7,360		27,200

Exercise

As a separate exercise, calculate the gross margin percentage for each of the products if this method of apportionment is used. You should arrive at the following results: Product A 47.2 per cent, Product B 7.6 per cent, Product C 26.1 per cent.

(b) Using the sales value basis

Product	*Output kg*	*Price per kg £*	*Sales value £*		*Common cost apportioned £*
A	1,600	7	11,200	11,200/36,110 × £27,200	8,436
B	3,890	4	15,560	15,560/36,110 × £27,200	11,721
C	1,870	5	9,350	9,350/36,110 × £27,200	7,043
			36,110		27,200

There is no correct way of apportioning common costs to joint products because it is a purely arbitrary exercise. The sales value method has the advantage that it produces the same gross margin percentage for all products. Also it can be applied if the outputs are in different forms, e.g. solids, liquids and gases.

Exercise

You can check for yourself that all three products in our example would produce a gross margin percentage of 24.7 per cent with the sales value method. Contrast this with the widely differing percentages obtained with the quantity basis.

1.10.3 Using notional or proxy sales values for common cost apportionment

If you look back to the situation depicted in Figure 7.1, you will see that product Z was not saleable at the separation point. It required further processing to put it into a saleable state.

If management wished to use the sales value method of apportionment it would be necessary to determine a notional or proxy sales value for product Z at the separation point. An example will demonstrate how this could be accomplished.

Assume that the final sales prices for products X, Y and Z in Figure 7.1 are as follows: product X £5 per litre, product Y £3 per litre, product Z £6.50 per litre.

The following data is available for the latest period:

Costs incurred in common process:	£41,000
Post-separation point costs incurred on product Z:	£11,730

Product	*Output (litres)*
X	4,000
Y	5,700
Z	5,100

There were no stocks at the beginning or end of the period.

If common costs are to be apportioned based on the sales value at the separation point, we need to determine a notional sales price for product Z before further processing:

Post-separation point costs incurred per litre of Z = £11,730/5,100 = £2.30
Notional sales price of Z at separation point = £6.50 final price − £2.30 = £4.20 per litre

The common costs can now be apportioned.

At separation point:

Product	*Output litres*	*Actual or notional sales price* £	*Actual or notional sales value* £		*Common costs apportioned* £
X	4,000	5.00	20,000	20,000/58,520 × £41,000	14,012
Y	5,700	3.00	17,100	17,100/58,520 × £41,000	11,981
Z	5,100	4.20	21,420	21,420/58,520 × £41,000	15,007
			58,520		41,000

1.10.4 The final sales value method of common cost apportionment

Another cost apportionment method that you may encounter is the final sales value method. This method apportions common costs according to the sales values of the products after any further processing, but ignoring the costs of this further processing.

Using the data from Section 7.6.3 the costs would be apportioned as follows based on this method:

Product	*Output litres*	*Actual final sales price* £	*Actual final sales value* £		*Common costs apportioned* £
X	4,000	5.00	20,000	20,000/70,250 × £41,000	11,673
Y	5,700	3.00	17,100	17,100/70,250 × £41,000	9,980
Z	5,100	6.50	33,150	33,150/70,250 × £41,000	19,347
			70,250		41,000

Part of the justification for using any sales value basis of apportionment is to charge high-value products with a high share of the costs – a 'what the market will bear' approach to cost allocation. However, if post-separation costs are significant the use of the final sales value method can cause serious anomalies in the resulting product cost figures.

1.10.5 Using joint product costs for decision-making

As stated earlier, common cost apportionment is necessary so that a total product cost is available for stock valuation purposes. However, the unit product cost obtained is of little use for decision-making purposes because of the arbitrary basis from which it is obtained.

For example, we saw how the apparent profitability of a product could be changed by simply altering the basis of apportionment from a quantity basis to a sales value basis.

As long as the process is undertaken, all of the products will be produced and their relative profitability is irrelevant. What is relevant is what managers decide to do with the products after the separation point, i.e. attention should be focused on post-separation point costs and whether or not they should be incurred. For example, managers may have to decide whether to subject products to further processing instead of selling them at the separation point.

1.10.6 Joint products and the further processing decision: an example

Example

A company manufactures three joint products – Exe, Wye, Zed. Each of the products is processed further after the separation point, although they are all saleable without further processing. Relevant data for the latest period is as follows:

	Exe	*Wye*	*Zed*
Sales price per kg			
After further processing	£15	£22	£18
At separation point	£10	£17	£12
Total product cost per kg, including apportionment of joint costs	£11	£10	£16
Output in kilograms	6,000	3,000	2,000

Joint costs of £77,000 have been apportioned according to the weight of the joint products. There was no work in progress in any process.

Requirement

Which of the products should be sold at the separation point, and not processed further?

Solution

First we need to determine how much of each product's total cost is joint or common costs. This is simply £7 per kg (£77,000/11,000 kg). The balance of the cost must be post-separation point costs:

	Exe £ per kg	*Wye* £ per kg	*Zed* £ per kg
Total cost	11	10	16
Joint cost apportioned	7	7	7
Post-separation point cost	4	3	9
Incremental sales value from further processing	5	5	6
Gain/(loss) From further processing	1	2	(3)

Product Zed should be sold at the separation point and not processed further. Its sales value increased by only £6 per kg (£18−£12) compared with an incremental processing cost of £9 per kg.

1.10.7 Costing by-products

The most common method of costing by-products is to deduct the net realisable value of the by-product from the main process costs. The by-product does not absorb any of the main process costs.

In effect a by-product is treated in the same way as a normal loss. It is valued at net realisable value and does not carry any of the process costs.

An example will show the workings of this method.

Example

A chemical is made in a single process, out of which a by-product, Z, also arises. Information for this process last month is as follows:

Material input = 4,200 units at a cost of	£94,500
Process cost	£58,111
Output of main product	3,800 units
Normal loss	5% of input
Scrap value of all losses	£5 per unit

There was also an output of 100 units of by-product, Z, which, after further processing at a cost of £6 per unit, were sold for £8.40 each.

There were no opening or closing process stocks.

Requirement

Prepare the account for the process for the month.

Solution

We can begin by preparing a simple input/output reconciliation. Since there is no work in process there is no need to perform an equivalent units calculation.

Input	*Units*	*Output*	*Units*	*Units to absorb process costs*
Material input	4,200	Main product	3,800	3,800
		Normal loss	210	–
		By-product	100	–
		Abnormal loss	90	90
	4,200		4,200	3,890

Costs	£
Material input	94,500
Process cost	58,111
Normal loss value	(1,050)
Net realisable value of by-product	(240)
	151,321

Cost per kg = £151,321/3,890 = £38.90 per kg

This rate is used to value the main product and the abnormal loss.

The net realisable value of the by-product is:

100 units × £(8.40 − 6.00)
= £240

Process account

	Units	£		Units	£
Material input	4,200	94,500	Finished goods	3,800	147,820
Process cost		58,111	Normal loss	210	1,050
			By-product	100	240
			Abnormal loss	90	3,501
	4,200	152,611		4,200	152,611

If you look back over the workings of the example, you will see that the treatment of a by-product is very similar to that of a normal loss.

The costs of producing a by-product are borne by the main product, but the process costs are reduced by the net realisable value of the by-product.

1.10.8 Joint and by-products: an example

The last example in this chapter combines joint and by-products. Try it for yourself before looking at the solution.

Example

Products L, M and N are produced together in process 1. A by-product, B, also arises in this process. By-product B can be sold for £4 per kg after further processing and packing at a cost of £2.50 per kg. Products L and N are saleable without further processing, for £6 and £10 per kg respectively. Product M requires further processing in process 2 at a cost of £2 per kg, before being sold for £16 per kg.

Information concerning process 1 for last month is as follows:

Material input		5,600 kg @ £4 per kg
Conversion costs		£14,020
Output:	product L	2,450 kg
	product M	990 kg
	product N	1,960 kg
	product B	200 kg
		5,600 kg

There were no losses in the process, and no opening or closing work in progress. Common costs are apportioned on the basis of sales value at the separation point.

Requirement

Prepare the account for process 1 for last month.

Solution

Since product M is not saleable at the separation point (the end of process 1) we need to use a notional price of £(16 − 2) per kg = £14 per kg.

The common costs are as follows:

	£
Material input 5,600 kg × £4	22,400
Conversion costs	14,020
Less: net realisable value of	
by-product 200 kg × £(4 − 2.50)	(300)
	36,120

This cost is to be apportioned to products L, M and N on the basis of sales value at the separation point.

		Sales value	Cost apportioned
		£	£
Product L	2,450 × £6	14,700	11,025
Product M	990 × £14	13,860	10,395
Product N	1,960 × £10	19,600	14,700
		48,160	36,120

Now the process account can be completed.

Process account

	Kg	£		kg	£
Material input	5,600	22,400	Finished goods:		
Conversion costs		14,020	product L	2,450	11,025
			product N	1,960	14,700
			By-product B	200	300
			Process 2: product M	990	10,395
	5,600	36,420		5,600	36,420

1.11 Summary

In this chapter, we have explored the basic principles that are used in the design and operation of cost accounting systems. In particular, we have considered the extent to which it is appropriate to attribute fixed and variable costs to products, the manner in which product costs may be determined in several different forms of production environment and the manner in which an associated system of ledger accounts is operated.

Reading 1

The article provides background to our exploration of cost accounting in process-based industries. The technology and economics of such industries are often complex since they involve shared processes being used to produce joint products, by-products and waste products. The production of some products would not be viable on a standalone basis and only becomes possible as a result of the processing of other products. The economics of many processes has been affected in recent years by environmental concerns over the use and disposal of by-products and waste.

As you read through the article, focus on the cost implications of the measures described and consider how they would be treated in the process costing system.

Note in particular the reference to the PR aspect of waste product treatment. A conventional cost accounting system does not incorporate every consideration needed to guide the management of a process based industry.

Extract from: Sludge for sale: new process can turn into metallic sheets

Joani Nelson-Horchler, *Industry Week,* May 16, 1988

Despite their glamorous high-tech pro files, the printed-circuit-board, semiconductor, and electronics industries have long been criticised for polluting the environment with toxic heavy-metal sludge.

Now, an end to the industries' public-relations problem may be in sight. In July, Aeroscientific Corp., an Anaheim, Calif., printed-circuit board manufacturer, will pioneer a new 'zero-discharge' technology.

It could revolutionise the way not only electronics manufacturers but also other industries – such as mining and metal-finishing – manage the sludge they generate. The technology was developed by Toxics Recovery Systems International (TRSI) (formerly Scada Systems), Sacramento, Calif.

1990s Challenge

'This project may be the start of a needed trend,' asserts Dr. Bruce Piasecki, associate director for Clarkson University's Hazardous Waste Research Center in Potsdam, N.Y., and a planner of the Aeroscientific project.

'Many professionals in the field consider finding alternatives to dumping heavy-metal sludge to be the environmental management challenge of the 1990s,' he adds. The need for on-site reduction is becoming more critical because of increasingly strict federal and state land-disposal restrictions.

Some industries, such as chemical processing, have been recovering and recycling large parts of their wastes for many years. Other industries, such as mining, metal-finishing, and electronics, still rely heavily on off-site disposal or land dumping.

The Aeroscientific approach is based on the use, reuse, recovery, and recycling of waste materials. The process basically segregates the wastestream into different types of metals and concentration ranges and then uses a synergy of ion-exchange and electrolytic-recovery processes to treat each type of waste, says Dr. Bernard Fleet, president of TRSI. Toxic metals are recovered in the form of solid metallic sheets, which can be sold as scrap or sent to sanitary landfills.

The initial capital investments for a system like Aeroscientific's can run as high as three times the cost of conventional treatment. However, notes Dr. Fleet, because the system reduces water consumption by more than 90%, the annual cost for a company currently using 100,000 gallons of water per day would be the same as for conventional treatment, Aeroscientific, for example, will use 25,000 gallons of water a day instead of the current 250,000 when the system is fully operational.

Furthermore, companies using the zero-discharge system will have no generation of sludge and thus no off-site transport or disposal costs. (Disposing of one ton of sludge currently costs about $1,000, and this cost is expected to spiral). Also, in contrast to companies using conventional sludge treatment, firms using zero-discharge are expected to have lower labor costs, fewer regulatory reporting requirements, and reduced insurance costs.

No permits

And, since the system uses 'in-process' rather than 'end-of-pipe' treatment, it requires no federal or state permits. That's an advantage that can save a company as much as $100,000 in legal fees and a year of time, Dr. Fleet notes.

The system is cost-competitive with conventional systems, says Mark Kowalski, director of facilities at Aeroscientific. 'The biggest advantage is that we'll be free from the enormous liability that companies face every time they ship something out of the plant for off-site disposal.'

No excuses

Aeroscientific believes that the regulatory trend is definitely toward mandating zero-discharge sometime in the 1990s. 'We feel that California will be rewriting some of the regulations around the performance of our system,' says Jim Ryan, environmental manager at Aeroscientific. 'They'll be able to say to companies, 'Hey you can do it – there's no excuse for not doing it.'

What's more, Aeroscientific's system is an 'excellent source of PR with customers and everyone else,' Mr. Ryan says. 'They look at our company and see a state-of-the-art treatment system, nor messy sludge, so they know that this company will be able to run in the face of strict environmental regulations where other firms may have to shut down temporarily.'

Revision Questions 1

Question 1

1.1 The marginal costing convention of profit is more relevant to decision making than the absorption costing convention because:

(A) So long as stock levels are rising, marginal costing gives a more conservative impression of profit than does absorption costing
(B) When stock levels are falling, the profit disclosed by marginal costing is less influenced by costs from the previous period than is the case with absorption costing
(C) Marginal costing provides a version of profit that relates only to those costs the level of which are influenced by the matters being decided upon
(D) Marginal costing provides a valuation of stock that conforms with current accounting standards relevant to the preparation of published accounts

1.2 The use of predetermined overhead absorption rates is generally favoured by management accountants because:

(A) It allows product costs to be determined before the end of a given accounting period
(B) It avoids the over or under absorption of overheads
(C) It provides a more conservative version of product costs
(D) It relates more to the activities that give rise to overhead costs than do more traditional methods of overhead absorption

Scenario common to Questions 1.3–1.6

Details of process 67 for August were:

Materials transferred from process 57 were 10,000 kg valued at £40,500
Labour/overhead costs were £8,424
Output transferred to finished goods was 8,000 kg
Closing WIP was 900 kg

Normal process losses are 10% of material input, 100% complete as to labour/overheads at the time of loss and losses have nil scrap value. Closing WIP is 100% complete as regards materials and 75% complete as regards labour/overheads.

1.3 The process cost per unit for process 67 in August was:

(A) £5.23
(B) £4.67

(C) £5.46
(D) £5.68

1.4 The entry on the abnormal gain/loss account in respect of process 67 for August is:

(A) £nil
(B) £546 debit
(C) £467 credit
(D) £546 credit

1.5 The amount credited to the process 67 account for completions in August is:

(A) £39,139
(B) £43,488
(C) £43,680
(D) £43,977

1.6 The value of closing WIP carried forward on the process 67 account at end August is:

(A) £4,403
(B) £4,698
(C) £4,892
(D) £4,947

1.7 The following details have been extracted from the budget papers of LK plc for June 2003:

Selling price per unit	£124
Variable production costs per unit	£54
Fixed production costs per unit	£36
Other variable costs per unit	£12
Sales Volume	12,500 units
Production volume	13,250 units
Opening stock of finished items	980 units

If budgeted profit statements were prepared by using absorption costing and then by using marginal costing.

(A) marginal costing profits would be higher by £27,000.
(B) absorption costing profits would be higher £27,000.
(C) absorption costing profits would be higher £35,000.
(D) absorption costing profits would be higher £62,000.

1.8 Q Plc operates a process that converts a mix of chemicals into paint. A normal process loss equal to 15% of material input is expected in the process. The following data relates to April.

Opening work in process	4,050 litres, completes as to materials but only 60% converted
Materials input	45,600 litres
Output	39,460 litres
Closing work in process	7,630 litres, complete as to materials but only 35% converted

The total number of equivalent material units to be used to calculate the cost per unit using a FIFO basis of valuation is

(A) 36,760
(B) 38,760
(C) 40,810
(D) 42,810

1.9 In a period when finished stock levels increase, the profit and closing stock valuations shown under marginal costing and absorption costing would be

	Profit	*Closing stock valuations*
(A)	Marginal higher than absorption costing	Marginal lower than absorption costing
(B)	Marginal lower than absorption costing	Marginal higher than absorption costing
(C)	Marginal higher than absorption costing	Marginal higher than absorption costing
(D)	Marginal lower than absorption costing	Marginal lower than absorption costing

Question 2

The following budgeted profit statement has been prepared using absorption costing principles:

	January–June		*July–December*	
	£000	*£000*	*£000*	*£000*
Sales		540		360
Opening stock	100		160	
Production costs				
Direct materials	108		36	
Direct labour	162		54	
Overhead	90		30	
	460		280	
Closing stock	160		80	
		300		200
GROSS PROFIT		240		160
Production overhead				
(Over)/under absorption	(12)		12	
Selling costs	50		50	
Distribution costs	45		40	
Administration costs	80		80	
		163		182
Net profit/(loss)		77		(22)
Sales units		15,000		10,000
Production units		18,000		6,000

The members of the management team are concerned by the significant change in profitability between the two six-month periods. As management accountant, you have analysed the data upon which the above budget statement has been produced, with the following results:

1. The production overhead cost comprised both a fixed and a variable element, the latter appears to be dependent on the number of units produced. The fixed element of the cost is expected to be incurred at a constant rate throughout the year.
2. The selling costs are fixed.

3. The distribution cost comprises both fixed and variable elements, the latter appears to be dependent on the number of units sold. The fixed element of the cost is expected to be incurred at a constant rate throughout the year.
4. The administration costs are fixed.

Requirements

(a) Present the above budgeted profit statement in marginal costing format **(10 marks)**
(b) Reconcile each of the six-monthly profit/loss values reported respectively under marginal and absorption costing. **(4 marks)**
(c) Reconcile the six-monthly profit for January to June from the absorption costing statement with the six-monthly loss for July to December from the absorption costing statement **(4 marks)**
(d) Calculate the annual number of units required to break even. **(3 marks)**
(e) Explain briefly the advantages of using marginal costing as the basis of providing managers with information for decision-making. **(4 marks)**

(Total marks = 25)

? Question 3

XYZ Inc has scheduled production of 20,000 Units (a new product) in the coming period and has budgeted for £200,000 of production costs (50% fixed). XYZ executives TW (Management Accountant), IS (Financial Accountant) and HF (Sales Manager) meet to consider the following market research data for the coming period:

Unit selling price (£)	*Sales volume (Units)*
15	20,000
20	16,000
25	11,500

TW advocates adopting a Unit selling price of £20 because this will maximise contribution. IS advocates a Unit selling price of £25 because this will maximise of profit calculated according to normal accounting practice. HF advocates a Unit selling price of £15 because this will result in all output being sole and maximise market share.

Requirement

Explain each of these three points of view with supporting figures. Having regard to whatever facts you consider relevant, state which of the three points of view you consider to be correct. **(25 marks)**

? Question 4

A company manufactures four products form an input of a raw material to process 1. Following this process, product A is processed in process 2, product B in process 3, product C in process 4 and product D in process 5.

The normal loss in process 1 is 10% of input and normal losses in all the other processes are nil. Scrap value in process 1 is £0.50 per litre. The costs incurred in process 1 are apportioned to each product according to the volume of output of each product. Production overhead is absorbed as a percentage of direct wages.

Data in respect of the month of October is as follows:

Process	*1*	*2*	*3*	*4*	*5*	*Total*
£'000						
Direct materials @ £1.25 per litre	100					
Direct wages	48	12	8	4	16	88
Production overhead						66

Product	*A*	*B*	*C*	*D*
Output ('000 litres)	22	20	10	18
Selling price per litre (£)	4.00	3.00	2.00	5.00
Estimated sales value at end of process 1 (£)	2.50	2.80	1.20	3.00

Requirements

(a) Calculate the profit or loss for each product and for the company in total in October assuming all output is sold at the normal selling price. **(9 marks)**

(b) Suggest and evaluate an alternative production strategy which would maximise profit for the month, assuming process 1 output is fixed. State and comment on any critical assumptions included in your supporting evaluation. **(11 marks)**

(c) Suggest what management should devote its attention to, if it is to achieve the alternative strategy indicated in (b). **(5 marks)**

? Question 5

PQR plc is a chemical processing company. The company produces a range of solvents passing materials through a series of processes. The company uses the First In First Out (FIFO) valuation method.

In Process 2, the output from Process 1 (XP1) is blended with two other materials (P2A and P2B) to form XP2. It is expected that 10% of any new input to Process 2 (i.e. transfers from Process 1 plus Process 2 materials added) will be immediately lost and that this loss will have no resale value. It is also expected that in addition to the loss, 5% of any new input will from a by-product, Z, which can be sold without additional processing for \$2.00 per litre.

Data from Process 2 for April 2003 was as follows:

Opening work in process

Process 2 had 1,200 litres of opening work in process. The value and degree of completion of this was as follows:

	\$	*% degree of completion*
XP1	1,560	100
P2A	1,540	100
P2B	750	100
Conversion costs	3,790	40
	7,640	

Input

During April, the inputs to Process 2 were:

		\$
XP1	5,000 litres	15,679
P2A	1,200 litres	6,000
P2B	3,000 litres	4,500
Conversion costs		22,800

Closing work in process

At the end of April, the work in process was 1,450 litres. This was fully complete in respect of all materials but only 30% complete for conversion costs.

Output

The output from Process 2 during April was:

Z	460 litres
XP2	7,850 litres

Requirement

(a) Prepare the Process 2 account for April 2003. **(16 marks)**

The output from Process 2 (XP2) is readily identifiable as three different grades of solvent (P, Q and R). For reporting purposes, the costs of Process 2 are apportioned to the three products in the ratio of their output volumes. The output volumes for April were:

Product P	2,700 litres
Product Q	3,300 litres
Product R	1,850 litres

The Managers of PQR plc are currently deciding, for each individual product, whether they should sell it at the end of Process 2 or refine it further. The respective selling prices and further processing costs per litre are as follows:

Product	*Selling price per litre at the end of Process 2* $	*Selling price per litre after further processing* $	*Further processing costs per litre* $
P	11.20	14.90	1.60
Q	9.20	12.60	2.40
R	6.50	8.60	1.20

The further processing costs are purely variable and they vary directly with the input volume. They are stated before any adjustment for revenue from further processing losses.

Further processing losses

When product P is processed further, there is is an expected loss of 15% of input. This loss can be sold for $8.00 per litre.

When product Q is processed further, there is an expected loss of 20% of input. This loss has no scrap value.

There is no loss expected when product R is processed further.

Requirement

(b) Prepare a numerical statement that shows whether each of the products should be further processed. State clearly your conclusion in respect of each product. **(10 marks)**

The standard input mix of materials XP1, P2A and P2B and their standard costs per litre are as follows:

	% mix	*Cost per litre*
XP1	50	$2.75
P2A	20	$6.00
P2B	30	$1.40

At this point you may also care to attempt Question 4 from the MAPE Pilot Paper.

Solutions to Revision Questions

1

Solution 1

1.1 Answer: (C)

(A), (B) and (C) are all correct statements under most circumstances, but it is (C) that explains why the marginal costing convention is most applicable to decision making. (D) is a false statement since it is absorption costing that is consistent with current accounting standards.

1.2 Answer: (A)

(B), (C) and (D) are all false statements.

1.3 Answer: (C)

Normal output from 10,000 kg input is 9,000 kg, giving a material cost per unit of £4.50 (i.e. £40,500/9,000 kg) and a labour cost of £0.96 (i.e. £8,424/(8,000 kg completed + 100 kg abnormal losses + 675 equivalent kg WIP). This gives a cost per unit for the period of £5.46.

1.4 Answer: (B)

The abnormal loss for the period is 100 kg (being 10,000 kg × 90%) normal output minus 8,000 kg completions minus 900 kg closing WIP). Hence the abnormal loss is valued at £546 (£5.46 × 100 kg) which is a debit to the abnormal gain/loss account.

1.5 Answer: (C)

That is, 8,000 kg × £5.46.

1.6 Answer: (B)

WIP is (900 kg × 4.50) + (675 equivalent kg × £0.96), = £4,698.

1.7 Finished goods stock increases during the period by 750 unit
Fixed overhead absorbed per unit = £36
Difference in profits = 750 units × Fixed overhead absorbed per unit
Difference in profits = £27,000
When stock levels increase higher profits are reported under absorption costing.
Therefore the answer is (B)

1.8

Output – started and finished	35,410
Closing work in process	7,630
Abnormal gain	(4,280)
Total	38,760

Opening work in process	4,050	Output	39,460
Materials input	45,600	Closing work in process	7,630
Abnormal gain	4,280	Normal loss	6,840
Totals	53,930		53,930

Therefore the answer is (B)

1.9 Answer: (D)

Solution 2

The emphasis in your MAPE syllabus is on the use of marginal costing information for performance evaluation. Ensure that you can produce a clear and complete answer to part (e).

A common mistake is to include selling and distribution costs in stock valuations. Remember that stocks are valued at production cost only: variable production cost with marginal costing and total production cost with absorption costing, including absorbed fixed production overhead.

(a) The unit cost structure is the same in each six-month period.

	£	£
Selling price		36
Direct materials	6	
Direct labour	9	
Variable overhead[2]	3	
Distribution cost[3]	1	
		19
Contribution		17

Notes:

1. Overhead January–June:
   £90,000 − £12,000 over-absorbed = £78,000
   Overhead July–December:
   £30,000 + £12,000 under-absorbed = £42,000

2. (£78,000 − £42,000)/12,000 = £3 variable
   £78,000 − (18,000 × £3) = £24,000 fixed

3. (£45,000 − £40,000)/5,000 = £1 variable
   £45,000 − (15,000 × £1) = £30,000 fixed

	January–June		*July–December*	
	£000	*£000*	*£000*	*£000*
Sales		540		360
Variable costs		285		190
Contribution		255		170

Fixed costs				
Production overhead	24		24	
Selling costs	50		50	
Distribution costs	30		30	
Administration	80		80	
		184		184
Profit		71		(14)

(b) Distribution costs are not included in stock valution. Therfore, marginal cost unit stock valution = £19 − £1 = £18 per unit.

	£
Marginal cost unit stock valuation	18
Absorption cost unit stock valuation	20

	January–June	*July–December*
	£000	*£000*
Absorption profit	77	(22)
c/fwd of fixed overhead in stock:		
(3,000 3 £2)	6	
(4,000 3 £2)		(8)
Marginal profit	71	(14)

(c) Absorption-based gross profit per unit is £400,000/25,000 = £16

	£000
Profit from January–June	77
Reduction in sales volume (5,000 × £16)	(80)
Difference in overhead recovery (12,000 × £2)	(24)
Reduction in distribution cost	5
Profit/(loss) from July–December	(22)

(d) Fixed costs per annum £184,000 × 2 = £368,000

Contribution per unit £17
Annual breakeven sales in units £368,000/17 = 21,647 units

(e) Marginal costing is based on an understanding of cost behaviour, and attempts to model the real cash flows which will be the consequence of using resources and generating income. It can be represented graphically, giving simple, flexible and clear models of different scenarios. Marginal costing is closely associated with incremental costing and opportunity costing, which form a powerful grouping of financial modelling techniques which have common roots in the understanding of cost behaviour.

☑ Solution 3

Profit can be calculated according to two alternative conventions. The first of these is the marginal costing convention being advocated by TW.

XYZ profit – marginal costing convention

£			
Unit sp	15	20	25
Sales	300,000	320,000	287,500
Variable costs	100,000	100,000	100,000
Stock	0	20,000	42,500
Cost of Sales	100,000	80,000	57,500
Contribution	200,000	240,000	230,000
Fixed costs	100,000	100,000	100,000
Profit	100,000	140,000	130,000

The second is the absorption costing convention advocated by IS.

XYZ profit – absorption costing convention

£			
Unit sp	15	20	25
Sales	300,000	320,000	287,500
Costs	200,000	200,000	200,000
Stock	0	40,000	85,000
Cost of Sales	200,000	160,000	115,000
Profit	100,000	160,000	172,500

The two are distinguished by their treatment of fixed production costs in the stock valuation. The marginal costing convention adopts a stock valuation based on variable cost only – £5 per unit. The absorption costing convention adopts a stock variation based on full cost (including absorbed fixed costs) – £10 per unit. This latter method effectively allows a part of the fixed costs incurred in the current period to be carried forward into a subsequent period.

The absorption costing convention does give a maximum profit with a Unit selling price of £25. However, this involves carrying £42,500 of current period fixed costs forward into a subsequent period where they will have no impact on costs actually to be incurred. Those fixed costs are therefore 'decision relevant' to the current period and cannot be simply excluded from the decision before us.

The marginal costing convention charges all fixed costs to profit in the period in which they are incurred. Variable costs can be carried forward in the stock valuation – however, those variable costs will impact on the costs to be incurred in the subsequent period. Units produced in period 1 and sold in period 2 will allow production in period 2 to be reduced and associated variable costs avoided.

Both sets of calculations given above assume that the stock will be marketable in the subsequent period. Were this not the case then the closing stock would have nil value and it would it would be appropriate to adopt a revenue maximising strategy. That would suggest a Unit selling price of £20. So, the Unit sales maximising strategy advocated by HF is unlikely to be appropriate – unless one wishes to maximising market share as part of some long term marketing concept.

The contribution maximising Unit selling price of £20 is therefore probably most appropriate in all the circumstances.

☑ Solution 4

(a) General workings:

Process 1 Account

	Litres	*Cpu (£)*	*£*	*Notes*
Inputs				
Direct materials	80,000	1.25	100,000	
Direct wages			48,000	
Production overhead			36,000	(a)
Total	80,000		184,000	
Outputs				
A	22,000	2.50	55,000	(b)
B	20,000	2.50	50,000	(b)
C	10,000	2.50	25,000	(b)
D	18,000	2.50	45,000	(b)
Normal loss (scrap)	8,000	0.50	4,000	(b)
Abnormal loss	2,000	2.50	5,000	(b), (c)
Total	80,000		184,000	

Notes:

(a) Production o/h	£66000 × (48/88)
(b) cpu	(£184000 − £4000)/72000 litres
(c) Abn. Loss scrap	£1000, credited to Abn. Loss Account

Profit & Loss Statement

Product £	*A*	*B*	*C*	*D*	*Total*
Sales	88,000	60,000	20,000	90,000	
Joint costs apportioned	55,000	50,000	25,000	45,000	
Post separation costs	21,000	14,000	7,000	28,000	
Product profit/loss	12,000	−4,000	−12,000	17,000	13,000
Abnormal Losses					4,000
Profit					9,000

(b) Assuming the 'post-separation costs' are wholly, the position may be analysed as follows:

Production Analysis

Product £	*A*	*B*	*C*	*D*
Sales (with processing)	88,000	60,000	20,000	90,000
Sales (no processing)	55,000	56,000	12,000	54,000
Difference	33,000	4,000	8,000	36,000
Post separation costs	21,000	14,000	7,000	28,000
Gain from processing	12,000	−10,000	1,000	8,000

On this basis, the further processing of B should be ended. However, the critical assumptions in this analysis are (i) that the post-separation costs are wholly variable and avoidable and (ii) the absorption basis used for production overheads is meaningful.

(c) The critical issues relate to the cost structure of the operation. How far does the accounting treatment of the various costs reflect the way in which costs are actually incurred?

The analysis shown above suggests that C processing should be continued even though it is a loss-making product. This is correct, provided that all the costs in process 1 are fixed and will be incurred regardless of whether of not C is produced. Further, the absorption of process costs on the basis of litre volumes may not be entirely meaningful.

The possible limitations of the analysis is regard to B production are discussed above.

The company might wish to review the accounting treatment of its costs and, perhaps, adopt a more sophisticated system such as ABC.

✓ Solution 5

(a)

Process 2 Account

	litres	*\$*		*litres*	*\$*
Opening work in process	1,200	7,640	Waste	920	nil
XP1	5,000	15,679	By-product Z	460	920
P2A	1,200	6,000	XP2	7,850	51,450
P2B	3,000	4,500			
Conversion cost		22,800			
Abnormal gain	280	1,753	Closing work in process	1,450	6,002
	10,680	58,372		10,680	58,372

Workings:

Equivalent Units Table

	Process 1 and materials added	*Conversion*
Output:		
Started & finished this period	6,650	6,650
Completion of opening work in process	nil	720
Abnormal Gain	(280)	(280)
Closing work in process	1,450	435
	7,820	7,525
	$	$
Period costs	26,179	22,800
By product value	(920)	
	25,259	22,800
Cost per equivalent unit	$3.23	$3.03

Valuation Statement

Finished joint product output:

		$
Started and finished 6,650 litres × ($3.23 + $3.03)	=	41,629
Opening work in process:		
Cost brought forward	=	7,640
Cost of completion 720 litres × $3.03	=	2,181
		51,450

Abnormal Gain

280 litres × ($3.23 + $3.03) = $1,753

Closing work in process:		
1,450 litres × $3.23	=	$4,684
435 litres × $3.03	=	$1,318
		$6,002

(b)

Product	*P*	*Q*	*R*
	$	$	$
Revenue per litre at the end of process 2	11.20	9.20	6.50
Gross revenue per litre input at the end of further processing	12.66	10.08	8.60
Scrap revenue per litre input at the end of further processing	1.20*	0.00	0.00
	13.86	10.08	8.60
Incremental processing cost per litre input	1.60	2.40	1.20
Net revenue per litre input after further processing	12.26	7.68	7.40
Further processing Decision (Yes/No)	Yes	No	Yes

*$8.00 × 0.15 litres

The Theory and Practice of Standard Costing

2

Learning Outcomes

After completing this chapter, you will be able to:

- explain why and how standards are set in manufacturing and service industries with particular reference to the maximisation of efficiency and minimisation of waste;
- calculate and interpret material, labour, variable overhead, fixed overhead and sales variances;
- prepare and discuss a report which reconciles budget and actual profit using absorption and/or marginal costing principles.

2.1 Introduction

You should be familiar with the basic principles of standard costing and variance analysis from your foundation (or equivalent) studies. The initial content of this chapter amounts to a revision of these basic principles. You are advised to devote adequate time to this revision. The CIMA examination scheme is cumulative and MAPE examination questions in this particular area may draw heavily on material from foundation studies.

Standard costing and variance analysis represent a particular approach to performance evaluation. The concept that underpins them is that efficiency can be monitored by periodically comparing actual costs incurred with standard costs for output achieved. This concept is not valid under all circumstances. In subsequent chapters, the text goes on to explore both the practice and limitations of standard costing.

2.2 The theory and practice of standard costing

CIMA's *Terminology* defines standard costing as follows:

Standard costing: A control technique which compares standard costs and revenues with actual results to obtain variances which are used to stimulate improved performance.

You will see from this definition that there are very close relationships between standard costing and budgetary control (the practice of making continuous comparison between budget and actual results). They both compare the actual results with the expected performance to identify any variances. The difference is that with standard costing the comparison is usually made at a unit level, that is, the actual cost per unit is compared with the standard cost per unit. The resulting variances may be analysed to show their causes and we will see how this is done later in this chapter.

In order to be able to apply standard costing it must be possible to identify a measurable cost unit. This can be a unit of product or service but it must be capable of standardising: for example, standardised tasks must be involved in its creation. The cost units themselves do not necessarily have to be identical: for example, standard costing can be applied in some job costing situations where every cost unit is unique. However, the jobs must include standardised tasks for which a standard time and cost can be determined for monitoring purposes.

2.3 What is a standard cost?

A standard cost is a carefully predetermined unit cost which is prepared for each cost unit. It contains details of the standard amount and price of each resource that will be utilised in providing the service or manufacturing the product.

The standard cost may be stored on a standard cost card like the one shown below but nowadays it is more likely to be stored on a computer, perhaps in a database. Alternatively, it may be stored as part of a spreadsheet so that it can be used in the calculation of variances.

The standard cost may be prepared using either absorption costing principles or marginal costing principles. The example which follows is based on absorption costing.

Example: Standard cost card: product 176

		£ per unit
Direct materials	40 kg @ £5.30	212.00
Direct wages:		
Bonding	48 hours @ £2.50	120.00
Finishing	30 hours @ £1.90	57.00
Prime cost		389.00
Variable production overhead:		
Bonding	48 hours @ £0.75	36.00
Finishing	30 hours @ £0.50	15.00
Variable production cost		440.00
Fixed production overhead		40.00
Total production cost		480.00
Selling and distribution overhead		20.00
Administration overhead		10.00
Total cost		510.00

For every variable cost the standard amount of resource to be used is stated, as well as the standard price of the resource. This standard data provides the information for a detailed variance analysis, as long as the actual data is collected in the same level of detail.

Standard costs and standard prices provide the basic unit information which is needed for valuing budgets and for determining total expenditures and revenues.

2.4 Performance levels

2.4.1 A standard

CIMA's *Terminology* defines a standard:

Standard: A benchmark measurement of resource usage, set in defined conditions.

The definition goes on to describe a number of bases which can be used to set the standard, including:

a prior period level of performance by the same organisation;
the level of performance achieved by comparable organisations;
the level of performance required to meet organisational objectives.

Use of the first basis indicates that management feels that performance levels in a prior period have been acceptable. They will then use this performance level as a target and control level for the forthcoming period.

When using the second basis management is being more outward looking, perhaps attempting to monitor their organisation's performance against 'the best of the rest'.

The third basis sets a performance level which will be sufficient to achieve the objectives which the organisation has set for itself.

2.4.2 Ideal standard

Standards may be set at ideal levels, which make no allowance for normal losses, waste and machine downtime. This type of ideal standard can be used if managers wish to highlight and monitor the full cost of factors such as waste, etc., however, this type of standard will almost always result in adverse variances since a certain amount of waste, etc., is usually unavoidable. This can be very demotivating for individuals who feel that an adverse variance suggests that have performed badly.

2.4.3 Attainable standard

Standards may also be set at attainable levels which assume efficient levels of operation, but which include allowances for factors such as normal loss, waste and machine downtime. This type of standard does not have the negative motivational impact that can arise with an ideal standard because it makes some allowance for unavoidable inefficiencies. Adverse variances will reveal whether inefficiencies have exceeded this unavoidable amount.

2.4.4 Basic standard

A basic standard is one which is kept unchanged over a period of time. It is used as the basis for preparing more up-to-date standards for control purposes. A basic standard may be used to show the trend in costs over a period of time.

2.5 Setting standard costs

You have already seen that each element of a unit's standard cost has details of the price and quantity of the resources to be used. In this section we shall list some of the sources of information that may be used in setting the standard costs.

2.5.1 Standard material price

The sources of information include the following:

(a) Quotations and estimates received from potential suppliers.
(b) Trend information obtained from past data on material prices.
(c) Details of any bulk discounts which may be available.
(d) Information on any charges which will be made for packaging and carriage inwards.
(e) The quality of material to be used: this may affect the price to be paid.
(f) For internally manufactured components: the predetermined standard cost for the component will be used as the standard price.

2.5.2 Standard material usage

The sources of information include the following:

(a) The basis to be used for the level of performance.
(b) If an attainable standard is to be used, the allowance to be made for losses, wastage, etc. Work study techniques may be used to determine this.
(c) Technical specifications of the material to be used.

2.5.3 Standard labour rate

The sources of information include the following:

(a) The personnel department for the wage rates for employees of the required grades with the required skills.
(b) Forecasts of the likely outcome of any trades union negotiations currently in progress.
(c) Details of any bonus schemes in operation.

2.5.4 Standard labour times

The sources of information include the following:

(a) The basis to be used for the level of performance.
(b) If an attainable standard is to be used, the allowance to be made for downtime, etc.
(c) Technical specifications of the tasks required to manufacture the product or provide the service.
(d) The results of work study exercises which are set up to determine the standard time to perform the required tasks and the grades of labour to be employed.

2.5.5 Production overhead costs

Overhead absorption rates represent the standard hourly rates for overhead in each cost centre. They can be applied to the standard labour hours or machine hours for each cost unit.

The overheads will usually be analysed into their fixed and variable components so that a separate rate is available for fixed production overhead and for variable production overhead.

2.6 Updating standards

The main purpose of standard costs is to provide a yardstick against which actual performance can be monitored. If the comparison between actual and standard cost is to be meaningful then the standard must be valid and relevant. It follows that the standard cost should be kept as up to date as possible. This may necessitate frequent updating of standards to ensure that they fairly represent the latest methods and operations, and the latest prices which must be paid for the resources being used.

2.7 Standard costing in the modern industrial environment

There has recently been some criticism of the appropriateness of standard costing in the modern industrial environment. The main criticisms include the following:

(a) Standard costing was developed when the business environment was more stable and operating conditions were less prone to change. In the present dynamic environment, such stable conditions cannot be assumed.
(b) Performance to standard used to be judged as satisfactory, but in today's climate constant improvement must be aimed for in order to remain competitive.
(c) The emphasis on labour variances is no longer appropriate with the increasing use of automated production methods.

An organisation's decision to use standard costing depends on its effectiveness in helping managers to make the correct decisions.

Standard costing may still be useful even where the final output is not standardised. It may be possible to identify a number of standard components and activities for which standards may be set and used effectively for planning and control purposes. In addition, the use of demanding performance levels in standard costs may help to encourage continuous improvement.

2.8 What is variance analysis?

A variance is the difference between the expected standard cost and the actual cost incurred. A unit standard cost contains detail concerning both the usage of resources and the price to be paid for the resources. Variance analysis involves breaking down the total variance 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.

These variances can be combined to reconcile the total cost difference revealed by the comparison of the actual and standard cost.

A variance is said to be favourable if it causes actual profit to be greater than budget; it is said to be adverse if it causes actual profit to be less than budget.

2.9 Variable cost variances

We will use a simple example to demonstrate how the variances are calculated for direct material, direct labour and variable overhead.

Exercise

A company manufactures a single product for which the standard variable cost is:

		£ per unit
Direct material	81 kg × £7 per kg	567
Direct labour	97 hours × £4 per hour	388
Variable overhead	97 hours × £3 per hour	291
		1,246

During January, 530 units were produced and the costs incurred were as follows.

Direct material:	42,845 kg purchased and used; cost £308,484
Direct labour:	51,380 hours worked; cost £200,382
Variable overhead:	cost £156,709

Calculate the variable cost variances for January.

2.9.1 Direct material cost variances

Solution

(a) Direct material total variance

	£	
530 units should cost (× £567)	300,510	
But did cost	308,484	
Total direct material cost variance	7,974	adverse

Note that this is an adverse variance because actual cost exceeds standard, hence causing actual profit to be less than budget.

This variance can now be analysed into its 'price' and 'quantity' elements.

(b) Direct material price variance
The direct material price variance reveals how much of the direct material total variance was caused by paying a different price for the materials used.

	£	
42,845 kg purchased should have cost (× £7)	299,915	
But did cost	308,484	
Direct material price variance	8,569	adverse

The adverse price variance indicates that expenditure was £8,569 more than standard because a higher than standard price was paid for each kilogram of material.

π *Material price variance:* (Actual quantity of material purchased × standard price) − actual cost of material purchased.

(c) Direct material usage variance

The direct material usage variance reveals how much of the direct material total variance was caused by using a different quantity of material, compared with the standard allowance for the production achieved.

	kg	
530 units produced should have used (× 81 kg)	42,930	
But did use	42,845	
Variance	85	favourable
× standard price per kg (£7)		
Direct material usage variance	£595	favourable

The favourable usage variance indicates that expenditure was £595 less then standard. This was because a lower amount of material was used compared with the standard expected for this level of output.

π *Material usage variance:* (Actual production × standard material cost per unit) − (actual material used × standard cost per unit of materials).

Check: £8,569 adverse + £595 favourable = £7,974 adverse (the correct total variance).

2.9.2 The direct material price variance and stock valuation

One slight complication sometimes arises with the calculation of the direct material price variance. In this example the problem did not arise because the amount of material purchased was equal to the amount used.

However when the two amounts are not equal then the direct material price variance could be based either on the material purchased or on the material used. In the example we used the following formula (we will call it method A):

(A) Direct material price variance:

	£
Material *Purchased* should have cost	X
But did cost	X
Direct material price variance	X

Alternatively we could have calculated the variance as follows (we will call it method B):

(B) Direct material price variance:

	£
Material *used* should have cost	X
But did cost	X
Direct material price variance	X

Obviously if the purchase quantity is different from the usage quantity then the two formulae will give different results. So how do you know which formula to use? The answer lies in the stock valuation method.

If stock is valued at standard cost then method A is used. This will ensure that all of the variance is eliminated as soon as purchases are made and the stock will be held at standard cost.

If stock is valued at actual cost then method B is used. This means that the variance is calculated and eliminated on each bit of stock as it is used up. The remainder of the stock will then be held at actual price, with its price variance still 'attached', until it is used and the price variance is calculated.

2.9.3 Direct labour cost variances

Exercise

Using the data from the previous exercise, calculate the direct labour cost variances for January.

Solution

(a) Direct labour total variance:

	£	
530 units should cost (× £388)	205,640	
But did cost	200,382	
Total direct labour cost variance	5,258	favourable

Note that this is a favourable variance because actual cost is less than standard

This variance can now be analysed into its 'price' and 'quantity' elements. The 'price' part is called the labour rate variance and the 'quantity' part is called the labour efficiency variance.

(b) Direct labour rate variance:

The direct labour rate variance reveals how much of the direct labour total variance was caused by paying a different rate for the labour hours worked.

	£	
51,380 hours should have cost (× £4)	205,520	
But did cost	200,382	
Direct labour rate variance	5,138	favourable

The favourable rate variance indicates that expenditure was £5,138 less than standard because a lower than standard rate was paid for each hour of labour.

Labour rate variance: (Actual hours paid × standard labour rate per hour) − (actual hours paid × actual direct labour rate per hour).

(c) Direct labour efficiency variance:

The direct labour efficiency variance reveals how much of the direct labour total variance was caused by using a different number of hours of labour, compared with the standard allowance for the production achieved.

	Hours	
530 units produced should take (× 97 hours)	51,410	
But did take	51,380	
Variance	30	favourable
× standard labour rate per hour (£4)		
Direct labour efficiency variance	£120	favourable

The favourable efficiency variance of £120 is the saving in labour cost (at standard rates) resulting from using fewer labour hours than the standard expected for this level of output.

Labour efficiency variance: (Actual production in standard hours × standard direct labour rate per hour) − (actual direct labour hours worked × standard direct labour rate per hour).

Check: £5,138 favourable + £120 favourable = £5,258 favourable (the correct total variance).

2.9.4 Variable overhead cost variances

Exercise

Using the data as before, calculate the variable overhead cost variances for January.

Solution

(a) Variable overhead total variance:

	£	
530 units should cost (× £291)	154,230	
But did cost	156,709	
Total variable overhead cost variance	2,479	adverse

This variance can now be analysed into its 'price' and 'quantity' elements. The 'price' part is called the variable overhead expenditure variance and the 'quantity' part is called the variable overhead efficiency variance.

(b) Variable overhead expenditure variance:
The variable overhead expenditure variance reveals how much of the variable overhead total variance was caused by paying a different hourly rate of overhead for the hours worked.

	£	
51,380 hours of variable overhead should cost(× £3)	154,140	
But did cost	156,709	
Variable overhead expenditure variance	2,569	adverse

The adverse expenditure variance indicates that expenditure was £2,569 more than standard because a higher than standard hourly rate was paid for variable overhead.

Variable overhead expenditure variance: Actual overhead cost incurred − (actual hours worked × standard variable production overhead absorption rate per hour).

(c) Variable overhead efficiency variance:
The variable overhead efficiency variance reveals how much of the variable overhead total variance was caused by using a different number of hours of labour, compared with the standard allowance for the production achieved. Its calculation is very similar to the calculation of the labour efficiency variance.

Variance in hours (from labour efficiency variance)	30	favourable
× standard variable overhead rate per hour (£3)		
Variable overhead efficiency variance	£90	favourable

The favourable efficiency variance of £90 is the saving in variable overhead cost (at standard rates) resulting form using fewer labour hours than the standard expected for this level of output.

π *Variable overhead efficiency variance:* (Actual hours worked × standard variable production overhead absorption rate per hour) − (actual production in standard hours × standard variable overhead absorption rate per hour).

check: £2,569 adverse + £90 favourable = £2,479 adverse (the correct total variance).

2.10 Fixed production overhead variances

In this section you will learn about the fixed production overhead variances in an absorption costing system. The variances in a marginal costing system will be covered in a later section.

The most important point to grasp about fixed production overhead variances is in an absorption costing system:

π *Total fixed production overhead variance:* This is equal to the under- or over-absorbed fixed production overhead for the period.

When you are analysing the total fixed production overhead variance you are therefore trying to explain the reasons for the over- or under-absorption. Factors which could lead to underabsorption will cause adverse fixed overheads variances. Factors which could lead to over-absorption will cause favourable fixed overhead variances.

2.10.1 The reasons for under- or over-absorption of overhead

There are basically two reasons why fixed overheads are under- or over-absorbed, and they are both linked to the calculation of the overhead absorption rate:

$$\text{Overhead absorption rate} = \frac{\text{Budget fixed overhead}}{\text{Budgeted output}}$$

The overhead will be under- or over-absorbed for either or both of the following reasons:

(a) The actual overhead expenditure was different from budget (this difference is expressed by the overhead expenditure variance).
(b) The actual output was different from budget (this difference is expressed by the overhead volume variance).

It is easiest to look at an example to see how the variances are calculated.

Example

A company manufactures a single product. Budget and actual data for the latest period are as follows:

Budget. Fixed production overhead expenditure £103,000. Production output 10,300 units, in 25,750 hours.

Actual. Fixed production overhead expenditure £108,540 Production output 10,605 units, in 26,700 hours.

2.10.2 The fixed production overhead total variance

This is equal to the over- or under-absorption of overhead.

$$\text{Predetermined overhead absorption rate} = \frac{£103{,}000}{\text{Budgeted output}} = £10 \text{ per unit}$$

	£	
Overhead absorbed during period £10 × 10,605 Units	106,050	
Actual overhead incurred	108,540	
Fixed production overhead total variance	2,490	adverse

This variance represents an under-absorption of fixed overheads.

2.10.3 The fixed production overhead expenditure variance

This is the amount of the total variance which is caused by the expenditure on overheads being different form the budgeted amount.

	£	
Budgeted fixed production overhead expenditure	103,000	
Actual fixed production overhead expenditure	108,540	
Fixed production overhead expenditure variance	5,540	adverse

π *Fixed overhead expenditure variance:* Budgeted fixed overheads − actual fixed overheads.

Stop for a moment and look at the difference between the expenditure variances for fixed overhead and for variable overhead. With the variable overhead expenditure variance an allowance is made for the actual number of hours worked (i.e. the budget is flexed to the actual activity level). With the fixed overhead expenditure variance the allowance is not flexed because fixed overhead expenditure should not change if activity levels alter.

2.10.4 The fixed production overhead volume variance

This is the amount of the total variance which is caused by the volume of output being different form the budget.

	Units	
Actual output	10,605	
Budgeted output	10,300	
Difference	305	
× fixed production overhead absorption rate (£10)		
Fixed production overhead volume variance	£3,050	favourable

π *Fixed overhead volume variance:* (Actual production in standard hours × fixed overhead absorption rate) − budgeted fixed overhead.

In this case the volume variance is favourable because a higher output than budget was achieved, which would potentially lead to over-absorption.

Check: £5,540 adverse + £3,050 favourable = £2,490 adverse (the correct total variance).

2.10.5 Analysing the fixed production overhead volume variance

We have seen that the fixed production overhead volume variance is the amount of over- or under-absorption caused by the volume of output being different form the budget.

There are two possible reasons why the volume of output might be different form the budget:

- the number of hours worked might be more than or fewer than budgeted;
- operations might be carried out more efficiently or less efficiently than standard, resulting in a higher or lower output than expected for the hours worked.

The volume variance can be analysed into two component parts, which explain the potential under- or over-absorption arising due to these two causes.

- The *fixed production overhead capacity variance* measures she under- or over-absorption that arose due to working fewer or more hours than budgeted.
- The *fixed production overhead efficiency variance* measures the under- or over-absorption that arose due to working more or fewer hours than would be expected for the actual output produced.

We can now return to our example and analyse the overhead volume variance into its constituent parts. However, this analysis is provided as background knowledge only. The MAPE Syllabus states that the actual analysis of a fixed overhead volume variance into efficiency and capacity components will not be examined.

2.10.6 Fixed production overhead capacity variance

	Hours	
Actual hours worked	26,700	
Budget hours of work	25,750	
Capacity variance in hours	950	favourable
× fixed production overhead per hour (£4*)		
Fixed production overhead capacity variance	£3,800	favourable

$$\text{* Standard fixed production overhead per hour} = \frac{£103{,}000}{25{,}750} = £4$$

π *Fixed overhead capacity variance:* (Actual hours worked − budget hours worked) × standard fixed overhead absorption rate.

In this case the capacity variance is favourable because more hours were worked than budgeted, which led to a potential over-absorption.

2.10.7 Fixed production overhead efficiency variance

	Hours	
10,605 units produced should take (× 25,750/10,300)	26,512.5	
But did take	26,700.0	
Variance in hours	187.5	adverse
× fixed production overhead per hour (£4)		
Fixed production overhead efficiency variance	£750	adverse

π *Fixed overhead efficiency variance:* (Actual hours taken − standard hours for output achieved) × standard fixed overhead absorption rate.

Check total	£	
Fixed production overhead capacity variance	3,800	favourable
Fixed production overhead efficiency variance	750	adverse
Fixed production overhead volume variance	3,050	favourable

2.11 Sales variances

In this section we shall be continuing with the study of variances form the viewpoint of reconciling budget and actual profits in an absorption costing system. There are two main variances for sales: the selling price variance and the sales volume variance. These variances can be demonstrated using the following data.

Example

A company manufactures a single product. Budget and actual data for the latest period is as follows:

Budget		
Sales and production volume	81,600	units
Standard selling price	£59	per unit
Standard variable cost	£24	per unit
Standard fixed cost	£4	per unit
Actual results		
Sales and production volume	82,400	units
Actual selling price	£57	per unit
Actual variable cost	£23	per unit
Actual fixed cost	£6	per unit

This data will be used to calculate the sales variances below.

2.11.1 The selling price variance

This variance calculates the profit difference which is caused by charging a different selling price from the standard.

	£	
Selling price per unit should have been	59	
But was	57	
Selling price variance per unit sold	2	adverse
× units sold (82,400)		
Selling price variance	164,800	adverse

π *Selling price variance:* (Actual sales volume × standard selling price per unit) − actual sales revenue.

The adverse variance indicates that the actual selling price was lower than the standard price.

2.11.2 The sales volume variance

This variance calculates the profit difference which is caused by selling a different quantity from that budgeted.

	Units	
Budgeted sales volume	81,600	
Actual sales volume	82,400	
Sales volume variance	800	favourable
× standard profit per unit (£59 − £24 − £4 = £31)		
Sales volume variance	£24,800	favourable

Sales volume (profit) variance: (Budgeted sales units × standard profit per unit) − (actual sales units × standard profit per unit).

The favourable variance indicates that the increased sales volume could have increased profit by £24,800 (if the selling price and the cost per unit had been equal to the standards).

An important point to note from this example is that the sales variances did not make use of the data on actual costs. All of the cost differences are analysed in the cost variances which you have already learned about in this chapter. The sales volume variance is expressed in terms of the *standard* profit lost or gained as a result of the change in sales volume.

2.11.3 The sales volume profit variance

The sales volume variance in an absorption costing system is sometimes called the sales volume profit variance. This helps to emphasise that it measures the change in standard profit caused by the change in sales volume.

2.12 Reconciling the actual and budget profit

Now that you have seen how to calculate all the main operating variances, you should be in a position to produce a statement which reconciles the actual and budget profit for the period.

First, to get some important practice, you should calculate all of the operating variances using the data given in the following exercise. Then you can learn to put all the variances together in a reconciliation statement like the one shown at the end of the solution.

Exercise

A company produces and sells one product only, the standard cost for which is:

	£ per unit
Direct material: 11 litres at £2	22
Direct wages: 5 hours at £6	30
Variable overhead	10
Fixed production overhead	20
Total standard production cost	82
Standard gross profit	38
Standard selling price	120

The variable overhead is incurred in direct proportion to the direct labour hours worked.

The unit rate for fixed production overhead is based on an expected annual output of 24,000 units produced at an even rate throughout the year. Assume that each calendar month is equal and that the budgeted sales volume for May was 2,000 units.

The following were the actual results recorded during May.

Number of units produced and sold: 1,750 units

	£	£
Sales revenue		218,750
Directs materials: 19,540 litres purchased and used	41,034	
Direct labour: 8,722 hours	47,971	
Variable overhead	26,166	
Fixed production overhead	37,410	
		152,581
Gross profit		66,169

Calculate the operating variances and present them in a statement which reconciles the budget and actual gross profit for May.

☑ Solution

Direct material price variance:

	£	
19,540 litres purchased should have costs (× £2)	39,080	
But did cost	41,034	
Direct material price variance	1,954	adverse

Direct material usage variance:

	Litres	
1,750 units produced should have used (× 11 litres)	19,250	
But did use	19,540	
Variance	290	adverse
× standard price per litre (£2)		
Direct material usage variance	£580	adverse

Direct labour rate variance:

	£	
8,722 hours should have cost (× £6)	52,332	
But did cost	47,971	
Direct labour rate variance	4,361	favourable

Direct labour efficiency variance:

	Hours	
1,750 units produced should take (× 5 hours)	8,750	
But did take	8,722	
Variance	28	favourable
× standard labour rate per hour (£6)		
Direct labour efficiency variance	£168	favourable

Variable overhead expenditure variance:

	£	
8,722 hours of variable overhead should cost (× £2)	17,444	
But did cost	26,166	
Variable overhead expenditure variance	8,722	adverse

Variable overhead efficiency variance:

Variance in hours (from labour efficiency variance)	28	favourable
× standard variable overhead rate per hour (£2)		
Variable overhead efficiency variance	£56	favourable

Fixed overhead expenditure variance:

	£	
Budgeted fixed overhead (2,000 units × £20)	40,000	
Actual fixed overhead	37,410	
Fixed overhead expenditure variance	2,590	favourable

Fixed overhead volume variance:

	Units	
Actual activity level	1,750	
Budgeted activity level	2,000	
Difference	250	
× fixed production overhead absorption rate (£20)		
Fixed overhead volume variance	£5,000	adverse

Fixed overhead capacity variance:

	Hours	
Actual hours worked	8,722	
Budgeted hours of work (2,000 units × 5 hr)	10,000	
Capacity variance in hours	1,278	adverse
× Fixed production overhead per hour (£20/5 hr) × £4		
Fixed overhead capacity variance	£5,112	adverse

Fixed overhead efficiency variance w/f:

Variance in hours (from labour efficiency variance)	28	favourable
× fixed production overhead per hour(£4)		
Fixed overhead efficiency variance	£112	favourable

Selling price variance:

	£	
Selling price per unit should have been	120	
But was (£218,750/1,750)	125	
Selling price variance per unit sold	5	favourable
× units sold (1,750)		
Selling price variance	£8,750	favourable

Sales volume variance:

	Units	
Budgeted sales volulme	2,000	
Actual sales volume	1,750	
Sales volume variance in units	250	adverse
× standard profit per unit (£38)		
Sales volume variance	£9,500	adverse

A reconciliation statement begins with the original budgeted profit. It then adds favourable or subtracts adverse variances to arrive at the actual profit for the month.

Profit reconciliation statement for May

		£	£	£
Original budgeted profit:				
2,000 units × £38				76,000
Sales volume variance				(9,500)
Standard gross profit from actual sales				66,500
Selling price variance				8,750
				75,250
Cost variances				
Direct material:	price		(1,954)	
	usage		(580)	
				(2,534)
Direct labour:	rate		4,361	
	efficiency		168	
				4,529
Variable overhead:	expenditure		(8,722)	
	efficiency		56	
				(8,666)
Fixed overhead:	expenditure		2,590	
	capacity	(5,112)		
	efficiency	112		
	volume		(5,000)	
				(2,410)
Actual gross profit				66,169

Note: variances in brackets are adverse.

2.13 Standard marginal costing

You should not be surprised to learn that the only variances in a marginal costing system which are different from those in an absorption costing system are those which involve fixed overheads. You are reminded that when a marginal costing system is in use, all fixed overheads are charged direct to profit without any attempt to attribute to units produced.

2.13.1 The fixed overhead volume variance

This variance does not arise in a marginal costing system. In an absorption costing system it represents the value of the under- or over-absorbed fixed overhead due to a change in production volume. When marginal costing is in use there is no overhead volume variance, because marginal costing does not absorb fixed overhead.

2.13.2 The fixed overhead expenditure variance

This is the only variance for fixed overhead in a marginal costing system. It is calculated in exactly the same way as in an absorption costing system.

2.13.3 The sales volume contribution variance

The sales volume variance in a marginal costing system is sometimes called by this longer name to distinguish it from the sales volume variance in an absorption costing system.

It calculates the standard contribution gained or lost as a result of an increase or decrease in sales volume.

In the previous example the standard contribution per unit is £58.

	£ per unit
Standard selling price	120
Standard variable cost	62
Standard contribution	58

The sales volume variance in a marginal costing system is calculated as follows:

	Units	
Budgeted sales volume	2,000	
Actual sales volume	1,750	
Sales volume variance	250	adverse
× standard contribution per unit (£58)		
Sales volume variance	£14.500	adverse

2.13.4 Reconciling the actual and budget profit

The marginal costing variances can now be put together in a reconciliation statement. You should spend some time studying the statement which follows, noting the difference between this statement and the one prepared using absorption costing. Think carefully about the reasons for the differences and ensure that you understand each figure in the statement. The format of the statement is not prescriptive but it is a useful layout because it focuses the reader's attention on the contribution for the period.

Profit reconciliation statement for May: standard marginal costing

		£	£
Original budgeted contribution: 2,000 units × £58			116,000
Sales volume variance			(14,500)
Standard contribution from actual sales			101,500
Selling price variance			8,750
			110,250
Variable cost variances			
Direct material:	Price	(1,954)	
	Usage	(580)	
			(2,534)
Direct labour:	Rate	4,361	
	Efficiency	168	
			4,529
Variable overhead:	Expenditure	(8,772)	
	Efficiency	56	
			(8,666)
			103,579
Actual contribution			
Fixed production overhead			
Budget		(40,000)	
Expenditure variance		2,590	
			(37,410)
Actual gross profit			66,169

Note: variances in brackets are adverse.

2.14 Idle time variances

You may come across a situation where idle time has occurred. Idle time is defined by CIMA as:

Idle time: The period for which a workstation is available for production but is not used due to, e.g., shortage of tooling, material or operators (BS 5191).

During idle time, direct labour wages are being paid but no output is being produced. The cost of this can be highlighted separately in an idle time variance, so that it is not 'hidden' in an adverse labour efficiency variance. In this way, management attention can be directed towards the cost of idle time.

Variable overhead variances can also be affected by idle time. It is usually assumed that variable overhead expenditure is incurred in active hours only – for example, only when the machines are actually running, incurring power costs, etc. – therefore variable overhead expenditure is not being incurred during idle hours. The variable overhead efficiency variance is affected in the same way as the labour efficiency variance.

Example

To demonstrate this, suppose that in the previous exercise you were given the following additional information about the actual results recorded during May.

Of the 8,722 hours of direct labour paid for, 500 hours were idle because of a shortage of material supplies.

An idle time variance could be calculated as follows:

Idle hours × standard labour rate per hour
= 500 = £6
= £3,000 adverse

This is the standard cost of wages incurred during the idle time.

These idle hours must be eliminated from the calculation of the labour efficiency variance, so that the efficiency of labour is being measured only during the hours when they were actually working. This gives a much more meaningful measure of labour efficiency.

Direct labour efficiency variance

	Hours	
1,750 units produced should have taken (× 5 hours)	8,750	
But did take (active hours)	8,222	
Variance	528	favourable
× standard labour rate per hour (£6)		
Direct labour efficiency variance	£3,168	favourable

The total of these two variances is the same as the original labour efficiency variance (£168 favourable). The effect on the variable overhead variances would be as follows:

Variable overhead expenditure variance:

	£	
8,222 active hours of variable overhead should cost (× £2)	16,444	
But did cost	26,166	
Variable overhead expenditure variance	9,722	adverse

Variable overhead efficiency variance

	Hours	
1,750 units produced should have taken (× 5 hours)	8,750	
But did take (active hours)	8,222	
Variance	528	favourable
× standard variable overhead rate per hour (£2)		
Variable overhead efficiency variance	£1,056	favourable

The total of £8,666 adverse for the two variable overhead variances is not affected by the idle time (you should check this for yourself). However, we have now measured efficiency during active hours only, and we have allowed variable expenditure only for active hours.

2.14.1 Expected idle time

Some organisations may experience idle time on a regular basis. For example, if demand is seasonal or irregular, but the organisation wishes to maintain and pay a constant number of workers, they will experience a certain level of 'expected' or 'normal' idle time during less busy periods.

In this situation the standard labour rate may include an allowance for the cost of the expected idle time. Only the impact of any unexpected or abnormal idle time would be included in the idle time variance.

Example

IT plc experiences seasonal demand for its product. During the next period the company expects that there will be an average level of idle time equivalent to 20 per cent of hours paid. This is incorporated into the company's standard labour rate, which is £9 per hour before the adjustment for idle time payments.

The standard time to produce one unit of output is 3 active (productive) hours.

Actual results for the period were as follows:

Number of units produced	3,263
Actual hours paid for	14,000
Actual active (productive hours)	10,304

Requirement

Calculate the following variances for the period:

(i) the idle time variance;
(ii) the labour efficiency variance

Solution

The basic standard rate per hour must be increased to allow for the impact of the idle time:

$$\text{Standard rate per hour worked} = \frac{£9.00}{0.8} = £11.25$$

The variances can now be evaluated at this increased hourly rate.

Idle time variance

	Hours	
Expected idle time = 2% × 14,000 hours paid	= 2,800	
Actual idle time = 14,000 − 10,304 hours	= 3,696	
	896	
× standard rate per hour worked (£11.25)		
Idle time variance	£10,080	adverse

Efficiency variance

	Hours	
3,263 units should have taken (× 3)	9,789	
But did take (productive hours)	10,304	
Variance	515	adverse
× standard rate per hour worked (£11.25)		
Efficiency variance (to the nearest £)	£5,794	adverse

2.15 Calculating actual data from standard cost details and variances

An excellent way of testing whether you really understand the reasons for and the calculation of operating variances is to 'work backwards' from standard cost data to arrive at the actual results.

Try the following example for yourself before looking at the solution. If you have great difficulty in solving it then you should go back and reread this chapter to obtain a better understanding of variance analysis.

Exercise

Q Limited operates a system of standard costing and in respect of one of its products, which is manufactured within a single cost centre, the following information is given.

For one unit of product the standard material input is 16 litres at a standard price of £2.50 per litre. The standard wage rate is £5 per hour and six hours are allowed in which to produce one unit. Fixed production overhead is absorbed at the rate of 120 per cent of direct wages cost. During the last four week accounting period the following occurred:

The material price variance was extracted on purchase and the actual price paid was £2.45 per litre.
Total direct wages cost was £121,500.
Fixed production overhead incurred was £150,000.
Variances were as follows:

	Favourable	*Adverse*
	£	£
Direct material price	8,000	
Direct material usage		6,000
Direct labour rate		4,500
Direct labour efficiency	3,600	
Fixed production overhead expenditure		6,000

Calculate the following for the four-week period:

(a) budgeted output in units;
(b) number of litres purchased;
(c) number of litres used above standard allowed;
(d) actual units produced;
(e) actual hours worked;
(f) average actual wage rate per hour.

Solution

The best thing to do as a first step is to pull together all of the standard cost information to calculate a standard cost per unit.

A point of departure is to calculate the standard cost per unit, as follows:

	£
Direct material: 16 litres × £2.50 per litre	40
Direct labour: 6 hours × £5 per hour	30
Fixed production overhead: £30 × 120%	36
Total	106

Calculating the required figures is now just a series of exercises in logic. These exercises can seem difficult to the novice – but the logic becomes simple and obvious with familiarity.

(a) If actual fixed overhead was £150,000 and the fixed overhead expenditure variance was £6,000 adverse then it follows that the budget fixed overhead was £144,000. From this it follows that the budget must have been 4,000 units (that is, £144,000 budgeted overhead ÷ £36 standard overhead per unit).

(b) If the standard material purchase price was £2.50 per litre and the actual purchase price was £2.45 then it follows that the selling price variance per litre is £0.05 per litre favourable. We are told that the material price variance was £8,000 favourable, so it follows that 160,000 litres must have been purchased (that is, £8,000 price variance ÷ £0.05 price variance per litre).

(c) If the direct material usage variance was £6,000 adverse and the standard price of materials is £2.50 per litre then it follows that the number of litres used above the standard allowance is 2,400 (£6000 ÷ £2.50/litre).

(d) If the actual direct wages paid was £121,500 and labour cost variances totalling £900 adverse (£4,500 adverse rate plus £3,600 favourable efficiency) were experienced then the standard wages for the output achieved was £120,600. It follows that the units produced were 4,020 (that is, £120,600 standard labour cost ÷ £30 standard labour cost per unit).

(e) The total hours actually worked is 24,120 standard hours worked (that is, 4,020 units produced × 6 standard hours per unit) minus the 720-hour favourable labour efficiency variance (that is, £3,600 efficiency variance ÷ £5 standard rate per hour). The gives a total of 23,400 actual hours worked.

(f) If the actual wages paid was £121,500 and the actual hours worked was 23,400 then it follow that the actual wage rate per hour was £5.1923.

2.16 Example: Preparing a reconciliation statement

By way of illustration and revision, a report reconciling budgeted and actual profit via variance analysis will be prepared from the data below.

Kenden Limited is a small company producing a single product, the 'flixten'. Flixtens have the following production specifications:

Component	*Standard quantity*	*Standard unit price* £
FLIX	15	75
TEN	10	75

The standard direct labour hours to produce a flixten are 75; the standard wage rate is £10.50 per hour.

The fixed overhead budget for the year is divided into calendar months, on the basis of equal production per month. The budgeted annual fixed overheads are £645,750 for the budgeted output of 2,460 flixtens per annum. The budgeted annual variable overhead, absorbed on the basis of labour hours, is £184,500.

The above data has been used to arrive at a standard cost for a flixten of £3,000, as shown below:

Flixten standard product cost

	£
Direct materials:	
FLIX (15 × £75)	1,125.0
TEN (10 × £75)	750.0
	1,875.0
Direct labour: (75 hours at £10.50 per hour)	787.5
Variable production overheads:	
(£184,500/2,460 units = £75 per unit or £1 per direct labour hour)	75.0
Fixed production overheads: (£645,750/2,460 units)	262.5
Standard product cost	3,000.0

The budgeted sales of flixtens for March were 205 units at a standard selling price of £3,500 each, giving a £500 gross profit per unit and a budgeted profit for the month as follows:

	£	£
Sales		717,500
Cost of sales		
Direct materials	384,375.0	
Direct labour	161,437.5	
	545,812.5	
Variable production overheads	15,375.0	
Fixed production overheads	53,812.5	
		615,000
Gross profit (205 units × £500)		102,500
Administration expenses		(13,000)
Selling and distribution expenses		(21,000)
Net profit		68,500

Information relating to Kenden's actual costs and revenues for the month of March is shown below:

	£	£
Sales		612,000
Cost of sales		
Direct materials	342,864	
Direct labour	140,400	
	483,264	
Variable production overheads	14,000	
Fixed production overheads	53,250	
		550,514
Gross profit		61,486
Administration expenses		(13,938)
Selling and distribution expenses		(21,613)
Net profit		25,935

Despite the budgeted sales figure of 205 units, actual sales of flixtens in March were only 180 units, at a selling price of £3,400 each.

The company operates a JIT system (explored later in this text), so that there are no components or finished goods stocks. Works in progress is negligible.

The actual direct material cost represents the use of 2,850 FLIXs, which had been acquired at a cost of £199,500, and 1,838 TENs, which had been acquired at a cost of £143,364.

The actual number of direct labour hours worked in March was 14,625, considerably lower than the production manager had budgeted.

2.16.1 Reconciliation of budgeted and actual profit

From the standard cost information given above, you should have noted that the company employs absorption costing, and the variances appropriate to that particular system are used in the analysis. Adverse variances are shown in brackets, where appropriate.

	£	£
Budgeted gross profit		
205 units × £500 gross profit per unit		102,500
Sales variances		
Sales price variance 181 × (£3,400 − £3,500)	(18,000)	
Sales volume variance		
(205 − 180) × (£3,500 − £3,000)	(12,500)	
		(30,500)
Standard gross profit on actual sales		72,000

	Favourable £	*Adverse* £	
Cost variances			
Materials usage			
FLIX		11,250.0	
TEN		2,850.0	
Material price			
FLIX	14,250.0		
TEN		5,514.0	
Direct wage rate	13,162.5		
Labour efficiency		11,812.5	
Variable overhead efficiency		1,125.0	
Variable overhead expenditure	625.0		
Fixed overhead expenditure	562.5		
Fixed overhead efficiency		3,937.5	
Fixed overhead capacity		2,625.0	
	28,600.0	39,114.0	(10,514)
Actual gross profit			61,486
Budgeted administration and selling costs (total cost)			(34,000)
Administrative cost variance			(938)
Selling and distribution cost variance (marketing)			(613)
Actual net profit			25,935

As you are aware, cost variances involve a comparison of the standard cost of production with the actual cost of production. In this example, as the company does not hold stocks of finished goods or work in progress, the actual units *produced* are equal to the actual units *sold*. The total cost variance of £10,514A in the above reconciliation can be reconciled in turn as follows:

	£
Standard cost of production: 180 × £3,00	540,000
Actual cost of production	550,514
Total cost variance	(10,514)

It is assumed that users of this text will be familiar with the calculation of all the summary variances listed in the reconciliation above. However, for purposes of revision, details of these calculations are provided below. Confident readers may omit this section!

2.16.2 Calculation of cost variances shown in reconciliation above

Hitherto, we have explained the individual variances using a narrative logic. You may have noticed that the definitions of the variances taken from Chapter 6 of CIMA's *Official Terminology* use a rather more sparse algebraic logic. You may find it best to use either of these approaches or a mix of the two for your own working purposes – it all depends on how your mind works. The notes below tend to follow an algebraic reasoning but in appropriate cases a narrative explanation is also given.

Material variances:

Direct material usage variances: (standard quantity − actual quantity) × standard price

FLIX: ((180 × 15) − 2,850) × £75 £11,250A

TEN: ((180 × 10) − 1,838) × £75 £2,850A

Direct material price variances: (standard price − actual price) × actual quantity

FLIX: (£75 × 2,850) − £199,500 £14,250F

TEN: (£75 × 1,838) − £143,364 £5,514A

FLIXs used cost £199,500 (given). At standard price, FLIXs used should have cost £213,750 (that is, 2,850 FLIXs × £75). The FLIX material price variance is £14,250 favourable (i.e. £213,750 minus £199,500), Exactly the same reasoning can be applied to usage of TENs.

Labour variances:

Labour efficiency variance (standard hours − actual hours) × standard rate

(180 × 75 hours − 14,625 hours) × £10.50 £11,812.5A

Output of 180 units involves a standard labour requirement of 13,500 hours (180 units × 75 hours per unit), whereas 14,625 hours were used. The labour efficiency variance is therefore 1,125 hours, which has a cost of £11,812.50 adverse (that is 1,125 hours × £10.50).

Wage rate variance: (standard rate − actual rate) × actual hours

(£10.50 × 14,625) − £140,400 £13,162.5F

Overhead variances:
From standard cost sheet, variable overhead absorption rate is £1 per direct labour hour

Variable overhead efficiency variance: (standard − actual labour hours) × variable overhead absorption rate
1,125 (see labour efficiency variance above) × £1 £1,125A

Variable overhead expenditure variance: budgeted variable overhead for actual hours worked – actual variable overhead incurred
14,625 × £1 − £14,000 £625F

Fixed production overhead expenditure: budgeted fixed overhead − actual fixed overhead
£53,812.5 − £53,250 £562.5F

Fixed production overhead efficiency: 1,125 hours (see labour efficiency variance above) × £3.50* per hour £3,937.5A

Fixed production overhead capacity: (actual hours worked − budgeted hours worked) × standard fixed overhead per hour
(14,625 − 15,375) × £3.50* per hour £2,625A

*£645,750 budgeted fixed overheads ÷ 184,500 budgeted direct labour hours.

2.17 Some miscellaneous ideas

As with any technique, certain refinements and special considerations often have to be considered in the application of standard costing. To illustrate this point, let us consider two examples.

When an operation is producing a wide range of products, it may be inconvenient to base a variance analysis report on a detailed set of calculations relating to each product. The exercise may be simplified by expressing each product in terms of the standard hours required to produce it. Thus one may produce various volumes of 100 different products in a period and express output in terms of the standard hours required to produce the total output concerned. In effect, the standard hour becomes the unit of output and the accountant can base his/her cost variance analysis on the difference between the standard costs for the standard hours work produced and the actual costs of those standard hours.

A full variance analysis requires calculation and use of an average material usage per standard hour and an average selling price per standard hour. The use of such an approach requires a little imagination but involves nothing fundamentally different to the ideas we have explored in this chapter. The general idea is incorporated in Revision Questions 1.3 and 1.4.

Circumstances may arise where a variance is known and you have to work back to one or more of the figures that gave rise to it. Again, this requires a little imagination but involves no new ideas.

Example

Labour efficiency variance = £3,000 favourable
Standard hours required for output achieved = 2,400
Actual hours worked = 2,200

Requirement

What is the standard hourly rate?

Solution

The efficiency variance in hours is 200 favourable (2,400 standard hours minus 2,200 actual hours). Therefore the standard hourly rate must be £15 (that is, £3,000/200 hours).

The general idea is incorporated in Revision Question 7.

2.18 Summary

In this chapter we have explored the means by which performance can be measured by comparison of actual results with the standards used to compile the budget. The technique known as variance analysis involves systematic reconciliation of the budget and actual profit for a given period through calculation of specific cost and sales variances. The concept is that a study of variances allows the manager to identify problems or opportunities on the 'principle of exception' basis.

At the core of this concept is the idea that where there is no exception then there is no problem or opportunity. Some observers consider that this idea may lack substance in the modern economic environment – a proposition that we will consider further as we progress through this text.

This Page Intentionally Left Blank

Readings

2

Standard costing is one of the most ubiquitous of management accounting techniques. It is important to appreciate that it is rooted in the tradition of Taylorism and Scientific Management. The core concept in this tradition is that there is an optimum method of carrying out any task and that standard times and material requirements follow from this. Hence, one obtains a meaningful measurement of efficiency by comparing actual resource usage with standard resource usage. Standard resource usage thus provides an internal benchmark against which performance can be measured. The limitation of a traditional standard cost is that it may be arrived at through an exercise which is wholly internal to the process or activity in question. The modern trend seems to be towards a more outward-looking approach to benchmarking.

The second item in these selected Readings ('What is a fair day's work') describes the traditional approach to standards.

However, at this stage it is useful to consider a little about the background to standard costing.

From A G Puxty and D Lyall, *Cost Control into the 1990s: A Survey of Standard Costing and Budgeting Practices in the UK, CIMA, 1989*

Standard costs

Standard cost systems are still widely used through UK industry; 76 per cent of the respondent companies report their use. . . .

Industry sectors differed somewhat. All report use of standard costing systems within a band between 66 per cent (general components/industrial engineering) and 87 per cent (chemicals and pharmaceuticals). . . .

Change of use of standard cost systems

Only eight companies reported having abandoned standard costing systems altogether, for varied reasons. However, 64 per cent of the respondents indicated that their systems over the past ten years had changed. . . .The main reason given for the change was 'to improve the effectiveness of the control system'. . . .

Revision of standards

It is perhaps not surprising that as many as 71 per cent of respondent companies revise their standards annually. Perhaps it is a little surprising that as many as 13 per cent report a regular revision of standards that is more frequent than this, half of these revising quarterly. Our figure of 71 per cent resembles that of the US study of Laudeman and Schaeberle (69 per cent) but not that of the previous UK study by Williams (40 per cent).

Basis of standards

It is now well known that for many years there has been a difference between academic recommendations and actual practice, where the former argue for variable costing and the latter tends to use absorption costing. This is borne out in our study; 70 per cent of the survey's respondents base their standards on absorption costing . . . there was no perceptible difference between companies with older-established systems and newer ones: that is, we can find no trace of a change towards variable costing-based systems.

Variance analysis

Not surprisingly, the great majority of respondents (90 per cent) produce variance analysis reports with the periodic internal control reports. About half of the rest also report regularly, but separately.

Turning to the investigation of these variances, we may compare the results of this survey with those of Laudeman and Schaeberle and of Williams.

	This study	*Laudeman and Schaeberle*	*Williams*
	%	%	%
Investigation in all cases	9	N/A	22
Variance beyond a certain monetary figure	36	54	54
Variance beyond a certain percentage	26	43	32
Dependent on managerial judgement	81	72	35

Unsurprisingly, total variance reporting is normally common than detailed variance reporting. However, the difference is not so great perhaps as to justify the conclusion that systems have now been pared down to the minimum in reports. . . .

An interesting finding is that material price variance is more commonly reported than total material variance. It is also noteworthy that one-fifth of companies that run a standard costing system do not consider it worthwhile to report materials price variances.

Standard costing and variance analysis remain important, especially in manufacturing. Puxty and Lyall report the widespread use of absorption costing systems, and Dugdale's research in twenty manufacturing companies confirms the view that UK costing systems have been dominated by the requirements of financial accounting. The traditional academic recommendation – variable costing systems – is rarely used. Given the widespread use of standard costing systems the use of variance analysis is a natural corollary, but variances may be reported in total rather than broken down in great detail.

Exercise

Traditional standard costing and variance analysis have been made less relevant in recent years by changes in manufacturing technology and the business environment. The fact that these techniques remain in such widespread use reflects the inherent conservatism of the accounting profession.

Comment by an academic accountant

Prepare a memorandum explaining and critically appraising the opinion expressed above. Different views on this opinion are possible and therefore no one 'model' answer is appropriate. However, in preparing your memorandum you should draw on the article reproduced above.

Extract from 'What is a fair day's work?'

Gene Gagnon, ***Transport & Distribution,*** **29:12, November 1998**

From the darkest days of tyranny to the most advanced concepts of self-measurement, supervisors and workers alike have had to determine 'What is a fair day's work?' The problem of standards for a fair day's work has troubled the gainfully employed from the dawn of civilisation. It is only in the last century, however, that systematic techniques have been used to establish these standards. In the last century these techniques have developed to the point where two engineers, given the same data, consistently arrive at comparable results. To trace the arrival of these sophisticated techniques, we must step back in time.

In 1884, Frederick Winslow Taylor, a foreman with Bethlehem Steel, was in charge of a system that brought coal and coke to the furnace. He determined that there were three things needed to maximise warehouse productivity: a definite task, proper method, and a time for completion of the task. He made observations about the proper size shovel and wheelbarrows in order to develop the best method. He was primarily interested in the information so he could establish the right crew size and not have to send anyone home, but the whole area of 'working smarter, not harder' sparked his interest. He expanded the concept to include what we now call Work Simplification. In 1911, he wrote Scientific Management which discussed management's role in dealing with workers.

In the early 1900s, Frank Gilbreth was watching bricklayers and determined that their task was, in reality, a conglomeration of small motions. He installed a number of methods improvements and reduced the tasks of the bricklayer from 18 to five. He called each of these small tasks a 'therblig' which became the first scientific classification of motions. In 1920 he used a movie camera to document the time that certain motions took. By counting the frames he could estimate a length of time for each motion.

The expansion of the ideas of these measurement pioneers resulted in what we known today as 'predetermined times', tables that have predetermined time values for a given body motion or combinations of motions. This is the basis of the standard costing techniques now widely used in manufacturing industries.

In the early 1940s, the Westinghouse Electric Corporation sponsored a series of studies into sensitive drill press work. These duties yielded a predetermined time value system known as MTM (Methods Time Measurement). This system was much too detailed for long-cycled or non-repetitive operations so it was simplified.

The simplification was named the Master Standard Data (MSD) and is applicable to any type of work. It can measure work that has never before been considered measurable from an economic standpoint. MSD clearly identifies the exact work content of each element of an activity. The engineers stated 'in literally thousands of instances, it was accurate well within the accepted work measurement consistency limits of plus or minus five per cent.' That, in my opinion, is quality.

Taylor's measurement of work using the time study method and Gilbreth's counting movie frames seem very primitive when compared to MSD and its capabilities, but it was the same need that fueled both systems. From the beginning of time, management and worker alike have wrestled with the problem 'What is a fair day's work?' Now, by fine-tuning Taylor's and the other pioneers' work, we have a much better answer to the question.

Having explored the technical minutiae of standard costing and variance analysis it is now useful to consider a practical case study. The case draws on some topics relating to budgeting which are introduced in Foundation level studies and explored further in this chapter.

The Leader Group

1. The Leader Group

1. A fuel division – Leader Fuels;
2. An engineering division – Leader Engineering;
3. A textile yarns division – Leader Yarns.

The group has evolved over the past 80 years from being a large textile weaving factory situated on a five-acre site on the outskirts of Belfast. It is a family-controlled private company which has diversified considerably over the past 40 years. In 1960 the then managing director of Leader Weavers Ltd, George Leader, felt that the future outlook for the weaving textile business would be very uncertain. As a result, he bought one coal lorry and one oil tanker and formed a fuel company, Leader Fuels Ltd. The company became very prosperous, with twelve oil tankers and four coal lorries delivering domestic fuel throughout Northern Ireland.

A spinning mill eight miles from Belfast near Carrickfergus has recently been modernised. This division (Leader Yarns) supplies 10 per cent of its output to Leader Weavers Ltd, with the remaining 90 per cent being exported. Jennifer Leader, who is the daughter of George, has been appointed Production Director.

Leader Engineering was established five years ago by Michael Leader, who is the son of George and Joan. Michael graduated as a mechanical engineer and initially worked for a large aerospace engineering group. After four years he approached his father and suggested that they form a new company to take advantage of the large amount of sub-contracting work which the aerospace group was placing to outside suppliers. George suggested to Michael that rather than start up from scratch he should look around and evaluate the possibility of taking over an established engineering company, as the engineering sector was in a recessionary environment and it might be possible to take over an existing company cheaply. As a result of this initiative, the Leader Group purchased PAG General Engineers Ltd, a jobbing engineering company with orders form local tobacco factories and three local man-made fibre plants of major UK and European organisations. The Group also agreed to take over the ninety employees. The three directors, who were major shareholders, agreed to be bought out and leave the Board. Joan, the wife of George, agreed to fund the purchase in part and became a non-executive director of the Group. However, the managing director of PAG Engineers Ltd requested that his only nephew, Johnny Cima, be offered a job with the Leader Group as a trainee accountant. Johnny, who was 22 years of age, had a BA(Hons) in Business Studies from a local university and had spend his 'year out', which was part of the degree programme, at the aerospace engineering group in which Michael had worked. It was agreed by George and Michael Leader that Johnny Cima be given a three-year contract which would be reviewed at the end of third year. Johnny had recently become a registered student of the Chartered Institute of Management Accountants.

Jennifer requested that Johnny Cima spend the next year with Leader Yarns at Carrickfergus as she wished to install a system of budgeting and standard costing. She agreed that Johnny would contribute to management accounting work for the other companies in the Group, provided that such work did not unduly delay the installation of the budgeting and standard costing systems at Leader Yarns. This was agreed, and Johnny was located at Carrickfergus, where the total labour force was 190.

The case study centres round some of the personalities and problems of Leader Yarns. Each problem is divided into parts and fully discussed. Students can increase their knowledge of the case study and each problem if they play a role and see themselves as doing the work of Johnny Cima, Jennifer Leader, Michael Leader or the members of the team, so that they get inside the case study and look at the cost accounting, marketing and general management aspects of each problem.

2. Leader Yarns Ltd – budgeting and a standard costing system introduced

Jennifer Leader requested Johnny Cima to provide her and the proposed budget team with some explanations and ground rules for the establishment of a budgeting system. To begin with, Jennifer required that the sales budget report should be a monthly statement which gave the following information:

(i) Last year's actual month-by-month sales.
(ii) The budgeted sales for the current budget period.
(iii) The actual sales for the current budget period as and when they happened.
(iv) The cumulative budgeted sales for the months to date.
(v) The cumulative actual sales for the months to date.
(vi) The variances between:
- budgeted monthly sales and actual monthly sales, and
- cumulative budgeted monthly sales and cumulative actual sales to date.

Sales budget

A sales budget was agreed at 100,000 units for the year 20. . . for 25 PAG yarn at a sales price of £23.50 per unit. The monthly sales were budgeted as follows:

Monthly sales budget for 20. . .

Month	*Sales units*	*Sales price per unit* £	*Sales value* £
January	7,000	23.50	164,500
February	7,500		176,250
March	7,500		176,250
April	8,000		188,000
May	8,000		188,000
June	8,500		199,750
July	8,500		199,750
August	9,000		211,500
September	10,000		235,000
October	9,000		211,500
November	8,500		199,750
December	8,500		199,750
	100,000		2,350,000

Exercise 1

Put yourself in the position of Johnny Cima and set out some ground rules for the establishment of a budgeting system, highlighting the advantages of installing such a system at Leader Yarns.

Solution

A budget is a plan or target in quantities and/or money values prepared for a future budget period of time. The budget attempts to forecast and plan what Leader Yarns wants to achieve in the budget period and how it proposes to achieve the plan or target.

Budget team

It is important that the relevant members of the management team who have an influence on the achievement of the budgeted plan have an input or say on the final agreed budget. The suggested budget team is as follows:

Jennifer Leader – budget team chairperson
Kim Sellwell – marketing manager
Stanley Clarke – engineer
Jim Dennis – production manager
Joan Gamble – personnel manager

Stages in setting budgets

(a) Firstly the budget should be a plan or target that is realistic and that can be achieved with some effort – that is to say, it is *not* an *'easy-to-obtain' target* or an *'impossible-to-achieve' target*.
(b) The budget period should be an appropriate time period in which to achieve the target or plan – three months, six months, one year, three years as appropriate.
(c) The budget should be in units and/or money values.
(d) The plan or targets should be communicated to the persons responsible after they are agreed.
(e) The actual results should be compared with budget and differences highlighted and reported for management attention and action (this could be on a weekly or monthly basis).

It is thus important that there is consultation and co-ordination among various members of the management team in agreeing targets, and that there is a reporting system that records actual results and spotlights variances that require attention and action.

Some advantages of having a budgeting system at Leader Yarns

1. Budgeting compels planning for the future.
2. Realistic budgeted figures provide yardsticks with which to measure actual results and provide a basis for information and management action.
3. Budgets give 'early warning' of possible problems, e.g. overspending (from a cash budget), increases in material prices or material usage (from purchases and production budgets).

4. Budgeting assists communication and co-ordination in various management functional areas, for example between:
   – production and sales;
   – purchasing and production;
   – purchasing and sales.
5. Budgeting assists in capital assets planning (from capital expenditure budget).
6. Budgeting assists in identifying resources required for various revenue and capital spending operations and assists in priority planning in the use of resources.
7. Budgets give early warning of possible opportunities, e.g. investment of surplus cash, which could be invested short term on the money market.

Exercise 2

Devise a format for the monthly sales statement requested by Jennifer, incorporating the budget sales for the coming twelve months.

Solution

A possible format is shown below, incorporating the budgeted sales revenue for the months of January to December, with the actual sales in 20. . . for the months of January to June.

Leader Yarns: monthly sales statement – January to June 20. . .

Last year	*Month*		*Current Month*				*Cumulative Months*		
actual	*20. . .*	*Actual*	*Budget*	*Fav*	*Adv*	*Actual*	*Budget*	*Fav*	*Adv*
£		£	£	£	£	£	£	£	£
125,000	Jan	159,800	164,500		4,700	159,800	164,500		4,700
140,000	Feb	173,900	176,250		2,350	333,700	340,750		7,050
160,000	Mar	180,950	176,250	4,700		514,650	517,000		2,350
175,000	Apr	199,500	188,000	11,500		714,150	705,000	9,150	
185,000	May	204,250	188,000	16,250		918,400	893,000	25,400	
190,000	Jun	213,750	199,750	14,000		1,132,150	1,092,750	39,400	
190,000	July		199,750						
190,000	Aug		211,500						
195,000	Sept		235,000						
190,000	Oct		211,500						
180,000	Nov		199,750						
180,000	Dec		199,750						
2,100,000			2,350,000						

Notes:
1. Additional information could be included in the statement, for example by providing an additional column for comments or by including variance analysis in the statement.
2. The original budget gave sales units as well as sales revenue. It might be useful if this information could be included. For example, if the sales in April, May and June were at £23.75 instead of £23.50 and the volumes were April 8,400 units, May 8,600 units, June 9,000 units, the statement would reveal that the volume is above standard despite the fact that the unit price has increased.
3. You should complete the statement using your own sales information, or design another statement bringing in your own ideas as to your information needs if you were the managing director of Leader Yarns.

Exercise 3

After Jennifer had received the information on budgets and the stages in setting budgets she suggested that Johnny prepare a paper on the procedures necessary for the installation and operation of a system of direct material yarn cost and variance analysis. She also suggested that he should discuss some of the problems that might arise in reporting on material usage or material yield variances. This was particularly necessary because some of the yarns use a single raw material grade, which might have fluctuating material quality standards.

Solution

To: Managing director
From: J Cima

The procedures necessary for the installation and operation of a system of direct material yarn cost and variance analysis.

Standard costing

The procedures necessary would be as follows:

1. Agree the standard material specifications for each type of yarn.
2. Agree review procedures for the material specifications. Allowance must be made for the fact that many of the yarns are made from natural fibres. These may vary in quality as a result of variations in climatic conditions; for example, an exceptionally dry period or exceptionally wet period during growing can have an effect on raw material quality. Yarns predominantly manufactured from chemical fibres are not affected by climatic conditions.
3. Agree pricing procedures.
4. Agree pricing review procedures.
5. Ensure inspection inward to the mill is adequate for the setting up of a standard costing system.
6. Ensure stores and stores accounting procedures are suitable for the receiving, storing and issue of raw materials.
7. Agree quality standards so that scrap, waste and yields are properly evaluated and controlled.

Variance analysis

1. Agree defined areas of responsibility in a standard costing environment, e.g. who is responsible for the price variance, who is responsible for the usage variance and what responsibility they had in the original standard-setting procedures.
2. It is important to communicate the variances promptly to the manager responsible.
3. Agree that managerial action (or no action) decisions are properly recorded.
4. Ensure that when standards for usage or prices are revised, all those responsible share in the discussions and are aware of the revised control standards and their effect on their areas of responsibility.

Problems

There may be problems in reporting on material usage or material yield variances for yarns where raw materials are used, because of possible fluctuations in quality standards. This situation could arise quite often in the mill where the raw material is flax or a combination of flax and chemical fibres. After standard usages and standard yields have been set and agreed, then these can be affected by a new raw material intake. It would be necessary to process and spin samples to determine revised or new standards to obtain a reliable yardstick with which to compare actual results. It is thus essential to keep raw materials separate in the raw materials store and to sample standards as a normal practice, including sampling of new batches of raw material or a new year's crop. If this is not done, there is a danger that material standards will not reflect current conditions and thus usage and yield variances will be inappropriate. In other words, the standard product cost and the standard profit margin will not reflect current conditions. Thus selling prices may require alteration if market conditions permit, because we may have to use more raw material to produce acceptable finished yarn quality.

A standard cost, variance analysis and batch output problem on high-quality linen yarn

Jennifer Leader has recently returned from a business trip to Europe. While in Italy she met Georgio Sorrento, an old friend of her grandfather. Georgio's business interests include textile-printing factories and three large stores situated in Naples, Milan and Rome. Georgio suggested to Jennifer that there was a good market for high-quality linen yarns for the apparel business in Italy, and gave her some sample cloths from his own factories to take back with her.

On her return to Northern Ireland, Jennifer called her production manager, her marketing manager, Johnny Cima and Johnny's new part-time assistant Joyce Pya to a meeting to discuss the possibility of spinning a new high-quality yarn for the apparel market in Italy. It was decided to call the yarn HQL, which stood for high-quality linen. The following are the details of the raw material mix and the standard cost for a batch of 500 output units:

Direct materials	H	1000 kg at £2/kg
	QL	500 kg at £3/kg
Direct labour		50 hours at £6 per hour
Variable overheads		50 hours at £20 per hour
Fixed production hours		50 hours at £30 per hour

Jennifer agreed to send a trial batch of 500 output units to Georgio. He agreed to pay for them if they were up to his required standard. The yarn was to be woven and dyed in Italy. Jennifer felt that a reasonable pricing policy would be direct marginal cost plus a contribution margin of 40 per cent, as she believed that there could be a good market for the HQL provided Leader Yarns got the quality right. She and her management team believed that they had machinery and labour available to produce and sell 4,500 units per month, which would mean the mill would be working at near full capacity.

Johnny was required to prepare the following:

(a) The standard cost of a batch of 500 units of HQL.
(b) The standard cost and standard profit of 1 unit of HQL.

Exercise 4

Put yourself in Johnny's position and prepare the necessary calculations.

Solution

(a) The standard cost of 1 batch

	£
Direct materials	
H – 1,000 kg at £2 per kg	2,000
QL – 500 kg at £3 per kg	1,500
Direct labour 50 hours at £6 per hour	300
Variable overheads 50 hours at £20 per hour	1,000
Standard marginal cost	4,800
Contribution 40% (of sales value)	3,200
Total sales value of 1 batch	8,000

The standard cost of a batch is £6,300, which is the standard marginal cost of £4,800 plus the standard fixed costs of £1,500 (50 hours × £30). Contribution is 40 per cent of sales, or 66.67 per cent of standard marginal cost.

(b) The standard cost and standard profit of 1 unit of HQL yarn could be taken from the batch cost for 500 units as follows:

	Batch cost £
Total standard marginal cost	4,800
Total standard fixed cost	1,500
	6,300
Total standard profit	1,700
	8,000

	£
Standard cost per unit	12.60
Standard profit per unit	3.40
Standard sales price per unit	16.00

Alternatively, the standard cost and standard cost per unit could be calculated as follows:

	£
Direct materials	
H2 kg at £2 per kg	4.00
QL1 kg at £3 per kg	3.00
Direct labour	
6 standard minutes at £6 per hour	0.60
Variable overheads:	
6 standard minutes at £20 per hour	2.00
Standard marginal cost	9.60
Sales price (Standard marginal cost + 66.6% is 40% on sales price)	16.00
Contribution	6.40
Fixed costs	
6 standard minutes at £30 per hour	3.00
Standard profit	3.40
The standard cost is	£12.60 (9.60 + 3.00)
The standard profit is	3.40
The standard selling price is	16.00

Georgio was well pleased with the quality of the yarn and the quality of the cloth. He agreed to place an initial order for 4,500 units or 9 batches of HQL yarn at a price of £17.00 per unit, as there had been a major shortage of raw material H and Leader Yarns had had to pay a substantially increased price for it. The following were the actual costs and sales information of the 4,500 units.

	£	£
Sales: 4,500 units at £17.00		76,500
Direct material		
H – 9,250 kg	20,350	
QL – 4,600 kg	13,260	
Direct labour (440 hours)	2,860	
Variable overheads	9,240	
Fixed overheads	14,290	
		60,000
Actual net profit		16,500

Jennifer requested that production cost variances should be calculated for the 4,500 units to confirm whether the extra £1 selling price that Georgio had agreed to pay actually covered the extra costs of the H raw material.

Exercise 5

Calculate the required variances and comment on your results.

Solution

Variances

Material usage		
H: 4,500 units required 9,250 kg but should have required 9,000 kg.		
Adverse usage variance at £2 per kg	£500	adverse
QL: 4,500 units required 4,600 kg but should have required 4,500 kg		
Adverse usage variance at £3 per kg	£300	adverse
Material price		
H: 9,250 kg actually cost	£20,350	
but should have cost	£18,500	(9,250 × £2)
	£1,850	adverse
QL: 4,600 kg actually cost	£13,260	
but should have cost	£13,800	(4,600 × £3)
	£540	favourable
Labour rate		
440 actual hours cost	£2,860	
but should have cost	£2,640	(440 × £6)
	£220	adverse
Labour efficiency		
4,500 units actually took 440 hours but should have taken 450 hours i.e 10 hours less at £6 per hour	£60	favourable
Variable overhead expenditure		
440 actual hours cost	£9,240	
but should have cost	£8,800	
	£440	adverse
Variable overhead efficiency		
4,500 units actually took 440 hours but should have taken 450 hours i.e 10 hours less at £20 per hour	£200	favourable

Fixed overhead expenditure

The actual cost was	£14,290	
The standard cost for 9 batches would have been	£13,500	
	£790	adverse

Sales variances

Since there was no budgeted volume actually set other than the nine batches, there is no sales volume variance. Measured against the original standard, the selling price variance is £(17 − 16) × 4,500 units = £4,500 favourable.

A summary of the total standard costs for 4,500 units compared with the actual costs reveals that the actual profit per unit of the HQL yarn and the percentage of profit to sales are as follows:

	Actual	*Standard*
Profit per unit	£3.67	£3.40
P/S% (profit to sales)	21.57%	21.25%
Sales price	£17.00	£16.00

Comments on variances

The major adverse variance are H material price at £1,850 adverse and fixed overhead expenditure variance at £790. The increase in selling price of £1 more than covered the extra material cost of H material – the H material cost an extra £1,850 for 4,500 units or approximately £0.41 per unit, but Georgio has agreed to pay £1 per unit.

The fixed overhead expenditure variance seems high and should be investigated, although there may be special costs in developing and the setting up of machinery for this high-quality yarn.

The overall position is satisfactory, mainly because Jennifer has negotiated an increased sale price of £1 per unit. Nevertheless, all standards should be reviewed, because if Leader Yarns produce substantial quantities in the future a good selling price should not be an excuse for loose or sloppy standards. The material usage standards for both H and the QL raw material should be thoroughly investigated.

3. Leader Yarns – fixed and flexible budgets, standards, standard costing and variance analysis

Jennifer Leader has requested Johnny Cima to prepare a fixed master budget and flexible master budget for their new 25 PAG yarn to be spun in Spinning Room No. 1, together with a standard cost for one unit of this yarn for budget period 1,20. . . .

The budget information and data that have been agreed is as follows:

Sales	100,000	units at £23.50 per units
Direct labour	100,000	standard hours at £5 per std hour
Direct material	500,000	kg at £2.00 per kg
Overheads		
Variable	£200,000	
Fixed	£400,000	

It was agreed that the fixed budget should be for 100,000 units of 25 PAG yarn and that the flexible budget should be 100,000 units ±10,000, in steps of 5,000 units. Production will be sufficient to meet sales orders each week, and no yarn stocks will be held.

The standard specification for one unit of 25 PAG yarn is agreed to be as follows:

Direct material	5 kg at £2.00 per kg
Direct labour	1 std hour at £5.00 per std hour
Variable overheads	1 std hour at £2.00 per std hour
Fixed overheads	1 std hour at £4.00 per std hour

Exercise 6

Prepare the budgets required by Jennifer.

Solution

Fixed master budget for budget period 1, 20. . .

The fixed budget is at one level of sales or production output. This fixed budget is a fixed master budget which shows the budgeted profit for a sales and production level of 100,000 units in budget period 1 in 20. . .

	One unit	*100,000 units*
	£	£
Sales at £23.50 per unit	23.50	2,350,000
Production costs		
Direct labour – 1 std hour	5.00	500,000
Direct materials – 5 kg	10.00	1,000,000
Variable overheads – 1 std hour	2.00	200,000
Standard marginal cost	17.00	1,700,000
Fixed cost	4.00	400,000
	21.00	2,100,000
Standard profit	2.50	250,000
	23.50	2,350,000

The standard unit profit of £2.50 and total budgeted profits of £250,000 are dependent on the actual volume being 100,000 units, and the actual selling price and all the actual costs for labour, materials variable overheads and fixed overheads being exactly as budgeted. This would be very unusual, and in practice one or more variances will arise.

Leader Yarns Ltd: flexible master budget – period 1, 20 . . . (25 PAG yarns)

	Per unit	*90,000 units*	*95,000 units*	*100,000 units*	*105,000 units*	*110,000 units*
	£	£	£	£	£	£
Sales	23.50	2,115,000	2,232,500	2,350,000	2,467,500	2,585,000
Labour	5.00	450,000	475,000	500,000	525,000	550,000
Materials	10.00	900,000	950,000	1,000,000	1,050,000	1,100,000
Var. overheads	2.00	180,000	190,000	200,000	210,000	220,000
Std. marg. cost	17.00	1,530,000	1,615,000	1,700,000	1,785,000	1,870,000
Fixed cost		400,000	400,000	400,000	400,000	400,000
Total cost		1,930,000	2,015,000	2,100,000	2,185,000	2,270,000
Total profit		185,000	217,500	250,000	282,500	315,000
Profit per unit		£2.06	£2.29	£2.50	£2.69	£2.86
Additional information						
Fixed cost per unit		£4.44	£4.21	£4.00	£3.81	£3.64
Sales volume change from 100,000 units BASE		−10%	−5%	BASE	+5%	+10%
Profit change from 100,000 units BASE		−26%	−13%	BASE	+13%	+26%

Flexible budget

From the flexible budget, Leader Yarns has determined the profit at varying sales levels. The important levels in this case study are the 100,000 unit level with a budgeted profit of £250,000, and the 110,000 unit level where the budgeted profit is £315,000. The actual profit compared with these two different budgeted profits gives two alternative profit variances. This shows the importance of using the flexible budget as a control mechanism rather than the fixed budget where the sales level and output is 10 per cent higher, and thus from a variance analysis point of view Leader Yarns is not comparing like with like.

The flexible budget also demonstrates the impact of fixed costs at various output levels – the standard marginal or standard variable cost is £17.00 per unit on all flexible budget levels, but the fixed cost per unit varies depending on the output level. In businesses with a high level of fixed costs the impact can be quite dramatic – in this case study, fixed costs represent £4 out of £21 total costs at a 100,000 unit level, that is, about 19 per cent. If the fixed costs were 50 per cent or more of total costs at the 100,000 unit level, then the profit movements above and below the base figure of 100,000 units would be much higher. The actual results for budget period 1 for 25 PAG yarn were as follows:

Sales		110,000
Units		
Revenue		£2,640,000
Production		
Labour	– Actual hours worked	105,000
	– Actual wages bill	£577,500
Meterial	– Actual usage kg	540,000
	– Actual cost	£1,230,000
Overhead	– Variable	£250,000
	– Fixed	£450,000

Workings

Variances from a fixed budget of 100,000 units:

	£
Budgeted profit 100,000 × £2.50	250,000
Actual profit	132,500
Difference in profit (profit variance)	117,500

The actual profit is:

	£	£
Actual sales revenue		2,640,000
less actual costs of		
Labour	577,500	
Material	1,230,000	
Overheads – variable	250,000	
Overheads – fixed	450,000	
		2,507,500
Actual profit		132,500

Notes:

1. The difference in profit or profit variance is £117,500, and because actual profit is less than budgeted profit, the profit variance is adverse. However, it should be remembered that we are not comparing like with like because the fixed budget was based on a sales unit level of 100,000 units, whereas the actual sales were 110,000 units.

2. If we compare the budgeted profit from 110,000 sales units, the budgeted profit moves up to £315,000, the actual profits earned remain the same at £132,500, and the profit variance jumps to £182,500 adverse. It makes more sense to compare the results for the actual sales of 110,000 units with those for the flexible budget sales units of 110,000.
3. It is worth remembering that in our flexible master budget there are two distinct behavioural patterns – sales revenue and costs, which move in direct sympathy with volume increases and decreases, and those costs that do not move, i.e. the costs that remain fixed or relatively fixed within given volume parameters. In this case study we are considering only two behavioural patterns, but in most situations there is a third – a semi-fixed or semi-variable (i.e. the costs are partly fixed and partly variable). Examples of such costs are power and telephone charges, where there is a fixed element, plus a variable element based on units consumed.

Exercise 7

Prepare a variance analysis statement, showing variances between actual outcomes and:

(a) the fixed budget;
(b) the flexible budget, with sales of 110,000 units.

Explain the variance you have calculated.

Solution

The statement shows the variance from a fixed budget level of 100,00 units of 25 PAG yarn and those calculated from a flexible budget level of 110,000 units.

Variance analysis statement: budget period 1 (25 PAG yarn)

	From fixed budget 100,000 units		*From flexible budget 110,000 units*	
Sales	£		£	
Volume: 10,000 units at £2.50	25,000	fav	NIL	
Price: 110,000 units at 50p	55,000	fav	55,000	fav
	80,000	fav	55,000	fav
Labour				
Rate 105,000 hours at 50p	52,500	adv	52,500	adv
Efficiency 5,000 hours at £5.00	25,000	fav	25,000	fav
	27,500	adv	27,500	adv
Materials				
Usage 10,000 kg at £2.00	20,000	fav	20,000	fav
Price 1,230,000 – 1,080,000	150,000	adv	150,000	adv
	130,000	adv	130,000	adv
Variable overheads				
Efficiency 5,000 hours at £2.00	10,000	fav	10,000	fav
Expenditure 250,000 – 210,000	40,000	adv	40,000	adv
	30,000	adv	30,000	adv
Fixed overheads				
Expenditure	50,000	adv	50,000	adv
Volume 10,000 units at £4	40,000	fav	NIL	
	10,000	adv	50,000	adv
Total variance	117,5000	adv	182,500	adv

Explanation of variances shown on variance analysis statement

Sales volume profit

At the fixed budget level, Leader Yarns planned to sell 100,000 units of 25 PAG yarn. In fact they sold 10,000 units more, a favourable variance of £25,000 (10,000 units at the profit per unit, or 10,000 × £2.50).

At a flexible budget level of 110,000 sales units there is no sales volume variance, since actual budget sales of 110,000 units equals flexible sales units of 110,000.

Selling price

The actual sales price was £24 (£2,640,000 ÷ 110,000 units), which is £0.50 above the standard price. The overall gain is 110,000 × 50p, which results in a favourable selling price variance of £55,000.

Labour rate

The actual hours worked were 105,000 and the actual wages bill was £577,500. If the 105,000 hours had been paid at the standard labour rate of £5 per hour, then the wages bill would have been £525,000 (105,000 × £5), thus giving a lobour rate or wages rate variance of £52,500 (adverse, because the actual rate was higher).

Labour efficiency

The actual total of labour hours taken to produce 110,000 units was 105,000, whereas the allowed or standard figure was 110,000 (110,000 × 1). There is thus a favouable effiency variance of 5,000 hours or £25,000 (5,000 × £5 std rate).

Material usage

The actual usage was 540,000 kg for 110,000 units of 25 PAG, whereas the standard usage should have been 550,000 kg (110,000 × 5 kg), thus giving a favourable usage variance of 10,000 kg or £20,000 (10,000 × £2).

Material price

The actual cost of 540,000 kg was £1,230,000, but the standard cost of 540,000 kg should have been £1,080,000, thus giving a material price variance adverse of £150,000, i.e. actual cost of actual usage (£1,230,000) less standard cost of actual usage (£2 × 540,000).

Variable overhead efficiency

Since the variable overhead hours follow the labour hours, then the labour hours efficiency will be the same for variable overheads (i.e. 5,000 hours). Then 5,000 hours × std rate per hour of £2 is £10,000 favourable.

Variable overhead expenditure

The actual expenditure on variable overhead was £250,000. The standard cost of variable overheads was £210,000 (105,000 actual hours × variable overhead rate per hour of £2). As a result there is an adverse expenditure variance of £40,000 (£250,000 actual expenditure less £210,000 standard cost of the actual hours).

Fixed overhead expenditure

The actual expenditure was £450,000, whereas the budgeted expenditure for either 100,000 units or 110,000 units was £400,000, giving an adverse expenditure variance of £50,000.

Note that fixed overhead expenditure is not dependent on volume, as can be clearly seen from the flexible budget.

Fixed overhead volume

The budgeted volume from the fixed budget is 100,000 units, whereas the actual volume was 110,000, giving a volume variance of £40,000 favourable (10,000 × £4). In other words, we recovered £4 per unit on every unit produced, an over-recovery of £40,000 fixed overheads. From the flexible budget the fixed volume at 110,000 units is the same as the actual volume, so there is not variance for fixed overheads.

Summary of variances

	Fixed budget		*Flexible budget*	
	£		£	
Sales	80,000	Fav	55,000	Fav
Production cost	197,500	Adv	237,500	Adv
	117,500	Adv	182,500	Adv

The variance analysis statement indicates that materials is the major adverse element in the production cost variances, with an overall adverse variance of £130,000. The major part of the variance is the material price variance of £150,000 adverse, which may be due to poor purchasing policy or a shortage of material.

The difference between the two budgets is £65,000, reflected in a sales volume variance of £25,000 favourable and a fixed overhead volume variance of £40,000 favourable, when variances are calculated from the fixed budget. The flexible budget shows no volume variance for either of these two variances, since the effect of volume changes has been eliminated by flexing the budget.

This Page Intentionally Left Blank

Revision Questions 2

Question 1

The following data is to be used to answer questions 1.1 and 1.2 below **(2 marks)**

SD plc is a new company. The following information relates to its first period:

	Budget	*Actual*
Production (units)	8,000	9,400
Sales (units)	8,000	7,100
Break-even point (units)	2,000	
Selling price per unit	£125	£125
Fixed costs	£100,000	£105,000

The actual unit variable cost was £12 less than budgeted because of efficient purchasing.

1.1 If SD plc had used standard absorption costing, the fixed overhead volume variance would have been

(A) £15,638(F)
(B) £17,500(F)
(C) £25,691(F)
(D) £28,750(F)

1.2 If SD plc had used marginal costing, valuing finished goods stock at actual cost, the profit for the period would have been nearest to

(A) £335,200
(B) £337,600
(C) £340,200
(D) £450,400

(3 marks)

The following data is to be used to answer questions 1.3 and 1.4 below

W plc uses a standard absorption costing system. The absorption rate is based on labour hours. The following data relates to April 2003:

	Budget	*Actual*
Labour hours worked	10,000	11,135
Standard hours produced	10,000	10,960
Fixed overhead cost	£45,000	£46,200

1.3 The fixed overhead capacity variance to be reported for April 2003 is nearest to

(A) £5,110 (A)
(B) £4,710 (A)
(C) £4,710 (F)
(D) £5,110 (F)

1.4 The fixed overhead efficiency variance to be reported for April 2003 is nearest to

(A) £710 (A)
(B) £730 (A)
(C) £740 (A)
(D) £790 (A)

1.5 A passenger transport company has developed the following formula to forecast the fuel cost to be included in its monthly budget:

$$Y = 10M - 0.4P + 5{,}000$$

where Y is the total fuel cost ($) per month,
M is the number of miles travelled per month,
P is the number of passengers carried per month,

The budgeted and actual miles travelled and passengers carried for April were as follows:

	Budget	*Actual*
Miles travelled	10,000	9,450
Passengers	6,000	6,050

The actual total cost of the fuel for April was $99,035.
The total fuel cost variance to be reported for April is

(A) $3,565 (F)
(B) $1,955 (F)
(C) $1,955 (A)
(D) $3,565 (A)

? Question 2

You are the management accountant of T plc. The following computer printout shows details relating to April 20X8.

	Actual		*Budget*	
Sales volume	4,900	units	5,000	units
Selling price per unit	£11.00		£10.00	
Production volume	5,400	units	5,000	units
Direct materials				
Quantity	10,600	kg	10,000	kg
Price per kg	£0.60		£0.50	
Direct labour				
Hours per unit	0.55		0.50	
Rate per hour	£3.80		£4.00	
Fixed overhead				
Production	£10,300		£10,000	
Administration	£3,100		£3,000	

T plc uses a standard absorption costing system.

There was no opening or closing work in progress.

Requirements

(a) Prepare a statement that reconciles the budgeted profit with the actual profit for April 20X8, showing individual variances in as much detail as the above data permits. **(20 marks)**

(b) Explain briefly the possible causes of:
   (i) the material usage variance;
   (ii) the labour rate variance;
   (iii) the sales volume profit variance; **(6 marks)**

(c) Explain the meaning and relevance of interdependence of variances when reporting to managers. **(4 marks)**

(Total marks = 30)

Question 3

A local restaurant has been examining the profitability of its set menu. At the beginning of the year the selling price was based on the following predicted costs:

		£
Starter	*Soup of the day*	
	100 g of mushrooms @ £3.00 per kg	0.30
	Cream and other ingredients	0.20
Main course	*Roast beef*	
	Beef 0.10 kg @ £15.00 per kg	1.50
	Potatoes 0.2 kg @ £0.25 per kg	0.05
	Vegetables 0.3 kg @ £0.90 per kg	0.27
	Other ingredients and accompaniments	0.23
Dessert	*Fresh tropical fruit salad*	
	Fresh fruit 0.15 kg @ £3.00 per kg	0.45

The selling price was set at £7.50, which produced on overall gross profit of 60 per cent.

During October 20X8 the number of set menus sold was 860 instead of the 750 budgeted: this increase was achieved by reducing the selling price to £7.00. During the same period an analysis of the direct costs incurred showed:

	£
90 kg of mushrooms	300
Cream and other ingredients	160
70 kg of beef	1,148
180 kg of potatoes	40
270 kg of vegetables	250
other ingredients and accompaniments	200
140 kg of fresh fruit	450

There was no stock of ingredients at the beginning or end of the month.

Requirements

(a) Calculate the budgeted profit for the month of October 20X8. **(2 marks)**

(b) Calculate the actual profit for the month of October 20X8. **(3 marks)**

(c) Prepare a statement that reconciles your answers to (a) and (b) above, showing the variances in as much detail as possible. **(14 marks)**

(d) Prepare a report, addressed to the restaurant manager, that identifies the two most significant variances and comments on their possible causes. **(6 marks)**

(Total marks = 25)

Question 4

The following profit reconciliation statement summarises the performance of one of SEW's products for March 20X7.

			£	
Budgeted profit			4,250	
Sales volume variance			850	A
Standard profit on actual sales			3,400	
Selling price variance			4,000	A
			(600)	
Cost variances	*Adverse*	*Favourable*		
	£	£		
Direct material price		1,000		
Direct material usage	150			
Direct labour rate	200			
Direct labour efficiency	150			
Variable overhead expenditure	600			
Variable overhead efficiency	75			
Fixed overhead expenditure		2,500		
Fixed overhead volume		150		
	1,175	3,650	2,475	F
Actual profit			1,875	

The budget for the same period contained the following data:

Sales volume	1,500	units
Sales revenue	£20,000	
Production volume	1,500	units
Direct materials purchased	750	kg
Direct material used	750	kg
Direct material cost	£4,500	
Direct labour hours	1,125	
Direct labour cost	£4,500	
Variable overhead cost	£2,250	
Fixed overhead cost	£4,500	

Additional information

Stocks of raw materials and finished goods are valued at standard cost.
During the month the actual number of units produced was 1,550.
The actual sales revenue was £12,000.
The direct materials purchased were 1,000 kg.

Requirements

(a) Calculate:
- (i) the actual sales volume;
- (ii) the actual quantity of materials used;
- (iii) the actual direct material cost;
- (iv) the actual direct labour hours;
- (v) the actual direct labour cost;
- (vi) the actual variable overhead cost;
- (vii) the actual fixed overhead cost.

(19 marks)

(b) Explain the possible causes of the direct materials usage variance, direct labour rate variance, and sales volume variance. **(6 marks)**

(Total marks = 25)

? Question 5

The following details have been extracted from the standard cost card for product X:

	£/unit
Variable overhead	
4 machine hours @ £8.00/hour	32.00
2 labour hours @ £4.00/hour	8.00
Fixed overhead	20.00

During October 20X7, 5,450 units of the product were made compared with a budgeted production target of 5,500 units. The actual overhead costs incurred were:

	£
Machine-related variable overhead	176,000
Labour-related variable overhead	42,000
Fixed overhead	109,000

The actual number of machine hours was 22,000 and the actual number of labour hours was 10,800.

Requirements

(a) Calculate the overhead cost variances in as much detail as possible from the data provided. **(12 marks)**

(b) Explain the meaning of, and give possible causes for, the variable overhead variances that you have calculated. **(8 marks)**

(c) Explain the benefits of using multiple activity bases for variable overhead absorption. **(5 marks)**

(Total marks = 25)

? Question 6

QBD plc produces souvenirs for international airline operators. The company uses a standard absorption costing system. The standard cost card for one of QBD plc's souvenirs is as follows:

		$
Materials	1.5 kg	6.00
Labour	1.6 hours	8.00
Overheads		
Variable	1.6 hours	4.00
Fixed	1.6 hours	12.00
Total cost		30.00
Selling price		40.00

Production and sales information for April:

	Budget	*Actual*
Production	5,000 units	6,000 units
Sales	5,000 units	4,300 units
Sales revenue	$200,000	$164,800

The resources used and actual costs for April were as follows:

		$
Materials	10,300 kg	38,720
Labour	11,420 hours	71,200
Overhead		
Variable		29,650
Fixed		83,300

The 11,420 labour hours include 2,270 hours of idle time. This was caused by an unexpected machine breakdown.

All of the materials purchased were used during the month.

Requirements

(a) Calculate the budgeted profit/loss for April. **(2 marks)**

(b) Calculate the actual profit/loss for April. **(6 marks)**

(c) Prepare a statement that reconciles the budgeted and actual profits/losses for April 2004 in as much detail as is possible. **(15 marks)**

(d) Calculate the actual profit/loss that would be reported by QBD plc if it used marginal costing. **(2 marks)**

(e) Explain with relevant calculations how the reconciliation statement that you prepared would have been different if QBD plc used standard marginal costing instead of standard absorption costing. **(5 marks)**

(Total = 30 marks)

? Question 7

The following uncompleted accounts appear in the ledger of MDX plc for March 20X0. The company operates a standard costing system, values stock at standard cost, and uses a single plant-wide standard labour rate of £6 per hour for all employees.

Raw materials

	£		£
Balance b/f	240	price variance	460
Creditors	?	Work in progress	6,000
		Balance c/f	180

Wages control

	£		£
Gross wages	?	Wage rate variance	618
		Work in progress	?

Work in progress

	£		£
Raw materials	6,000	Labour efficiency variance	900
Wages control	?	Finishing goods	34,720
Material usage variance	1,440		
Production overhead control	?		

Production overhead control

	£		£
Expenses – creditors	?	Balance b/f	345
Provision for depreciation	800	Work in progress	?
Volume variance	2,400	Expenditure variance	980
Balance c/f	260		

Data extracted from the standard cost card for MDX plc's only product is as follows:

	£/unit
Direct materials: 5 kg @ £2.40/kg	12.00
Direct labour: 4 hours @ £6/hour	24.00
Fixed overhead	20.00

Budgeted fixed overhead costs are £10,000 per month.
Note: all relevant transactions affecting the above accounts have been identified.

Requirements

Calculate:

(i) the actual price paid per kilogram of materials;
(ii) the actual output;
(iii) the production overhead absorbed;
(iv) the actual direct labour hours;
(v) the cost incurred in respect of expense creditors;
(vi) the actual labour rate paid per hour.

(18 marks)

This Page Intentionally Left Blank

Solutions to Revision Questions

2

Solution 1

1.1

Budgeted fixed cost	£100,000
Budgeted production	8,000 units
Absorption rate	$\frac{£100{,}000}{8{,}000 \text{ units}} = £12.50/\text{unit}$
Volume variance	$1{,}400 \times £12.50 = £17{,}500$ (F)

Therefore the answer is (B)

1.2

Budgeted fixed costs = budgeted contribution to breakeven =		£100,000
Budgeted breakeven sales volume =		2,000 units
Budgeted contribution/unit	$= \frac{£100{,}000}{2{,}000} =$	£50
Budgeted selling price	=	£125/unit
So budgeted variable cost	=	£75/unit
So actual variable cost	$= £75 - £12 =$	£63/unit
So actual contribution/unit	$= £125 - £63 =$	£62
So actual contribution	$= 7{,}100 \times £62 =$	£440,200
Less: Actual fixed costs		£105,000
Profit		£335,200

Therefore the answer is (A)

1.3

The absorption rate per standard hour is $\frac{£\,45{,}000}{10{,}000} = £4.50$

Budgeted hours worked	10,000
Actual hours worked	11,135
Difference	1,135

Capacity variance $= 1{,}135 \times £4.50 = £5{,}107.5$ (F)

Therefore the answer is (D)

1.4

Standard hours produced	10,960
Actual hours worked	11,135
Difference	175

Efficiency variance $= 175 \times £4.50 = £787.5$ (A)

Therefore the answer is (D)

1.5

Standard cost	*$*	*$*
9,450 miles × 10	94,500	
6,050 passengers × 0.4	2,420	92,080
Fixed cost		5,000
Total		97,080
Actual cost		99,035
Total variance		1,955 (A)

Therefore the answer is (C)

☑ Solution 2

Work methodically through the exercise, calculating each variance item in turn.
Note that most of the cost variances are calculated by reconciling standard cost with actual cost – not budget cost to actual cost.
Note that administration overheads are not absorbed into product costs and hence there is no associated volume variance.

(a) Standard product specification

	£	£
Sales price		10.00
Input costs:		
Materials 2 kg @ 50p	1.00	
Labour 0.5 hours @ £4	2.00	
Fixed production overhead	2.00	
		5.00
Profit		5.00

Note: The actual hours worked were 5,400 × 0.55 = 2,970.

T plc: budget/actual reconciliation statement – April 20X8

			£	
Budgeted profit (5,000 × £5 − £3,000)			22,000	
Sales volume profit variance (100 × £5)			500	(A)
Standard profit on actual sales			21,500	
Variances:	*£(F)*	*£(A)*		
Direct material				
Price (£6,360 − £5,300)		1,060		
Usage (£5,300 − £5,400)	100			
Direct labour				
Rate (£11,286 − £11,880)	594			
Efficiency (£11,880 − £10,800)		1,080		
Fixed production overhead				
Expenditure (£10,300 − £10,000)		300		
Volume (£10,000 − £10,800)	800			
Sales price (4,900 × £1)	4,900			
Administrative cost expenditure	100			
	6,394	2,540	3,854	(F)
Actual profit			25,354	

Calculation of actual profit

	£	£
Actual sales revenue		53,900
Actual costs		
Material	6,360	
Labour	11,286	
Production overhead	10,300	
	27,946	
Stock increase (500 units × £5)	2,500	
Cost of sales		25,446
		28,454
Fixed administration		3,100
Actual profit		25,354

The variance calculations shown above are in summary form. In an examination this is perfectly adequate, since the examiner does not need you to explain your calculations in expanded, narrative form. As we progress onwards through the text we shall increasingly move to this abbreviated form of working. However, on this occasion a fuller explanation of the variance calculations is given below.

Explanation of cost variances

	£	
Direct materials		
Price		
Actual usage at standard cost	5,300	(10,600 kg × £0.50)
Actual usage at actual cost	6,360	(10,600 kg × £0.60)
Material price variance	1,060	adverse
Usage		
Standard usage for output at standard cost	5,400	(10,800 kg × £0.50)
Actual usage at standard cost	5,300	(10,600 kg × £0.50)
Material usage variance	100	favourable
Direct labour		
Rate		
Actual hours at standard rate	11,880	(5,400 units × 0.55 hrs × £4)
Actual hours at actual rate	11,286	(5,400 units × 0.55 hrs × £3.80)
Labour rate variance	594	favourable
Efficiency		
Standard hours at standard rate	10,800	(5,400 units × 0.50 hrs × £4)
Actual hours at standard rate	11,880	(5,400 units × 0.55 hrs × £4)
Labour efficiency variance	1,080	adverse
Fixed production overhead		
Expenditure		
Budgeted fixed overheads	10,000	
Actual fixed overheads	10,300	
Fixed overhead expenditure variance	300	adverse
Volume		
Budgeted fixed overheads	10,000	(5,400 units × £2)
Standard fixed overheads	10,800	
	800	favourable

(b) (i) The material usage variance may be caused by:
improved training of operating personnel;
the sourcing of a better quality of material than was assumed in the standard cost.
(ii) The labour rate variance may be caused by:
an unanticipated drop in bonus payments;
the retirement of staff who have reached their maximum points on the salary scale and their replacement by low salary staff.
(iii) The sales volume profit variance may be caused by:
the increase in sales price discouraging customers;
the adverse effect of a successful advertising campaign run by a competitor.

(c) The term 'interdependence of variances' describes a relationship in which an action taken by management or operating personnel causes more than one (related) variance to be reported. For example, the sourcing of better quality material, as mentioned in part (b), may result in lower usage (favourable material usage variance) but a higher price (adverse material price variance).

An understanding of interdependence is essential if responsibility for outcomes is to be correctly identified. It is therefore crucial to the success of a control system such as standard costing.

Solution 3

Work methodically through the exercise, calculating each variance item in turn.
Note that most of the cost variances are calculated by reconciling standard cost with actual cost – not budget cost to actual cost.
Note that the question invites you to identify which the most significant variances are – using whatever criteria you consider most appropriate.

(a) Budgeted unit cost is £3.00. Therefore the budgeted profit for October 20X8 is:

(750 × (7.50 − 3.00)) = £3,375

(b) The actual profit for October 20X8 is:

(860 × £7) − £2,548 actual costs = £3,472

(c)

	£	
Budgeted profit	3,375	
Sales volume variance (W1)	495	(F)
Budgeted profit on actual sales	3,870	
Sales price variance (W2)	430	(A)
	3,440	

	Price		*Usage*		
Ingredients	£		£		
Mushrooms	30	(A)	12	(A)	(42)
Cream etc	n/a	–	n/a	–	12
Beef	98	(A)	240	(F)	142
Potatoes	5	(F)	2	(A)	3
Vegetables	7	(A)	11	(A)	(18)
Other	n/a	–	n/a	–	(2)
Fresh fruit	30	(A)	33	(A)	(63)
Actual profit					3,472

Workings

1. Sales volume variance = 110 extra menus sold × £4.50 unit contribution = £495(F).
2. Sales price variance = £(7.00 − 7.50) × 860 menus = £430(A).
3. Mushroom price = £(3.00 − 3.33) × 90 kg = £30(A).
4. Mushroom usage = ((860 × 0.1 kg) − 90 kg) × £3 = £12(A).
5. Beef price = £(15.00 − 16.40) × 70 kg = £98(A)
6. Beef usage = ((860 × 0.1 kg) − 70 kg) × £15 = £240(F).
7. Potatoes price = £(0.25 − 0.22) × 180 kg) = £5(F).
8. Potatoes usage = ((860 × 0.2 kg) − 180 kg) × 0.25 = £2(A).
9. Vegetables price = £(0.90 − 0.925) × 270 kg = £7(A).
10. Vegetables usage = ((860 × 0.3 kg) − 270 kg) × £0.90 = £11(A).
11. Fresh fruit price = £(3.00 − 3.21) × 140 kg = £30(A).
12. Fresh fruit usage = ((860 × 0.15 kg) − 140 kg) × £3 = £33(A)

! These workings are in short summary form. As you progress through your studies you should become comfortable with this form.

(d) Report

To:	Restaurant manager
Date:	25 November 20X8
From:	Management accountant
Ref:	RM99/25

Food variance report – October 20X8

Sales volume variance (£495 favourable). There was an increase of 110 set menus, possibly caused by the reduction in price, but perhaps also caused by an overall increase in the demand for meals within this restaurant because of favourable press comment.

Sales price variance (£430 adverse). Management has reduced prices in order to combat competition and to attract more business.

Signed: Management accountant

✓ Solution 4

The question invites you to work backwards from the variance items to the source figures used to calculate them. The student whose study of variance analysis has consisted of merely memorising formulae will find this exercise difficult. The student who understands the logic of variance analysis will find it much easier.

Note that requirement (b) does not follow on from requirement (a). An imperfect answer to requirement (a) need not prevent an examinee from obtaining full marks for requirement (b).

(a) The first step is to present the given budgeted information in a more usable form.

Budgeted information

	£	£
Sales		20,000
Material: 750 kg @ £6/kg	4,500	
Labour: 1,125 hours @ £4/hour	4,500	
Variable overhead	2,250	
Fixed overhead	4,500	
		15,750
Profit		4,250

Standard cost per units

	£
Materials – 0.5 kg × £6/kg	3.00
Labour – 0.75 hour £4/hour	3.00
Variable overhead – 0.75 hour × £2/hour	1.50
Fixed overhead – £3/unit	3.00
Total	10.50

(i) The budget profit is £4,250 (that is, £20,000 sales less £15,750 costs) giving a standard profit per unit of £2.8333 (that is, £4,250 ÷ 1,500 units). If the sales volume variance is £850 adverse then it follows that unit sales must have been 300 less than budget (that is, £850 ÷ £2,8333). Hence,the actual sales volume was 1,200 units.

(ii) The material usage variance is £150 adverse and this corresponds to 25 kg usage above standard. Standard usage was 775 kg (that is, 1,550 units produced × 0.5 kg per unit) and it follows that actual usage was 800 kg.

(iii) The material price variance is £1 per kg favourable (that is £1,000 material price variance ÷ 1,000 kg purchased). It follows that the actual purchase price must have been £5 per kg (that is, £6 standard price per kg less £1 per kg variance) giving a total material cost of £5,000.

(iv) The labour efficiency variance corresponds to 37.5 hours adverse (that is, £150 variance ÷ £4 per hour standard rate). Standard labour usage was 1,162.5 hours (that is, 1,550 units output × 0.75 hours per unit). Hence, actual labour usage was 1,200 hours.

(v) The rate variance was £0.1666 per hour adverse (that is, £200 rate variance ÷ 1,200 hours) giving an actual rate of £4.1666 per hour. It follows that the actual labour cost was £5,000 (that is, 1,200 hours × £4.1666).

(vi) The standard variable overhead cost was £2,325 (that is, 1,550 units output × £1.50 per unit). The variable overhead variances total £675 adverse, hence the actual variable overhead must be £3,000.

(vii) The actual fixed overhead cost is £2,000 (that is £4,500 budget less £2,500 favourable expenditure variance).

(b) The adverse direct materials usage variance may have been caused by the purchase of materials of an inappropriate specification, or by the use of machinery that is overdue for maintenance.

The adverse direct labour rate variance may have been caused by unanticipated additional payments to some employees for overtime working, or the movement of some trainees to a higher wage scale at the end of their training period.

The adverse sales volume variance may have been caused by a downturn in consumer spending in general, or by the marketing activities of a competitor.

✓ Solution 5

Note that there are two sets of variable overheads each using a different overhead absorption basis. It follows that there will be two separate sets of variable overhead variances. Note that requirement (c) invites discussion of the principles of overhead absorption – a topic introduced in Foundation level studies.

Overhead cost variances

(a)

	£	
Variable overheads		
Machine-hour related		
Standard overhead for 22,000 machine hours	176,000	(22,000 machine hours × £8)
Actual overhead	176,000	
Variable overhead expenditure variance	–	
Standard overhead for standard machine hours	174,400	(5,450 units × 4 machine hours × £8)
Standard overhead for 22,000 machine hours	176,000	(22,000 machine hours × £8)
Variable overhead efficiency variance	1,600	adverse
Labour-hour related		
Standard overhead for 10,800 labour hours	43,200	(10,800 labour hours × £4)
Actual overhead	42,000	
Variable overhead expenditure variance	1,200	favourable
Standard overhead for standard labour hours	43,600	(5,450 units × 2 labour hours × £4)
Standard overhead for 10,800 labour hours	43,200	(10,800 labour hours × £4)
Variable overhead efficiency variance	400	favourable
Fixed overheads		
Budgeted fixed overhead	110,000	(5,500 units × £20 per unit)
Actual fixed overhead	109,000	
Fixed overhead expenditure variance	1,000	favourable
Budgeted fixed overhead	110,000	(5,500 units × £20 per unit)
Standard fixed overhead	109,000	(5,450 units × £20 per unit)
Fixed overhead volume variance	1,000	adverse

(b)

Variance	*Meaning*	*Cause*
Machine-related		
Expenditure	The variable overhead costs incurred are exactly in line with those which would have been budgeted for the machine hours worked.	Nil.
Efficiency	The output from the machines is lower than would have been budgeted based on the machine hours worked, therefore less variable overhead has been absorbed.	Necessary maintenance has been deferred, causing operational difficulties and reduced efficiency.
Labour-related		
Expenditure	The actual variable overhead cost incurred is lower than the standard cost allowance for the hours worked by the employees.	Some subsititution of lower-paid employees has taken place.
Efficiency	The output produced was higher than would have been expected from the number of labour hours worked and therefore more variable overhead has been absorbed.	The employees were anxious to finish a large order on time to maximise the organisation's chances of receiving significant follow-up work. They therefore worked faster.

(c) The use of multiple activity bases for variable overhead absorption can have the following benefits:

more realistic product costs may be produced, resulting in improved pricing and decision-making in general;

management will be more aware of the link between activity and cost behaviour, and will have more incentive to focus on the relationships between these two variables;

cost reduction activities within this area are more likely to be successful;

it may become apparent that costs are not driven solely by output volumes, and therefore the focus of managerial attention may be significantly broadened. This may encourage managers to adopt a 'holistic' view of the organisation.

Solution 6

Requirement (a)

Budgeted profit per unit	$10.00
Budgeted production and sales	5,000 units
Budgeted profit	$50,000

Requirement (b)

	$	$
Sales		164,800
Total costs incurred	223,370	
Closing stock:		
1,700 × $30	51,000	
Cost of sales		172,370
Actual loss		7,570

Requirement (c)

Cost variances	*Adverse* $	*Favourable* $	$
Material price		2,480	
($38,720 − (10,300 × $4))			
Material usage	5,200		
(10,300 − (6,000 × 1.5)) × $4			
Labour rate	14,100		
($71,200 − (11,420 × $5))			
Labour efficiency		2,250	
((11,420 − 2,270) − (6,000 × 1.6)) × $5			
Labour idle time	11,350		
2,270 × $5			
Variable overhead expenditure	6,775		
($29,650 − ((11,420 − 2,270) × $2.5)			
Variable overhead efficiency		1,125	
((11,420 − 2,270) − (6,000 × 1.6)) × $2.5			
Fixed overhead expenditure	23,800		
($83,800 − (5,000 × $12))			
Fixed overhead capacity		8,625	
((11,420 − 2,270) − (5,000 × 1.6)) × $7.5			
Fixed overhead efficiency		3,375	
((11,420 − 2,270) − (6,000 × 1.6)) × $7.5			
Totals	61,225	17,855	43,370 (A)
Actual loss			7,570

Requirement (d)

The actual loss would be greater under marginal costing due to the non absorption of fixed overhead costs into the unsold stock items.

The loss would increase by 1,700 units × \$12 = \$20,400 so that under marginal costing the loss would be \$27,970.

Requirement (e)

There would be no change to the budgeted profit as there was no budgeted change in the level of stocks.

The sales volume variance would be valued on a contribution basis so that it increases to \$15,400 Adverse (700 units × \$22), an increase of \$8,400 adverse.

The fixed overhead capacity and efficiency variances would not exist, thus removing favourable cost variances totalling \$12,000.

There would be no other changes and so, by totalling the above, it can be seen that they equate to \$20,400 adverse, which equals the increase in the size of the loss as per part (d) above.

☑ Solution 7

(i) (£6,640 − £240) ÷ 2,475 kg purchased* = £2.59 per kg
*(£6,400 − £460) ÷ £2.40

(ii) Budgeted volume: £10,000/£20 500 units per month

Volume variance	120 units (F)
Actual output	620 units

(iii) Overhead absorbed = 620 × £20 = £12,400

(iv) Standard hours: 620 × 4	2,480
Add:efficiency variance	150 (A)
Actual direct labour hours	2,630

(v) £12,400 production overhead is transferred to WIP (620 × £20)
To balance: production overhead control account expense creditors = £10,265

(vi) Gross wages = £16,398 (rate £618 + efficiency £900 + standard £14,880)
Actual total labour hours = 2,630 (from (iv))
Actual labour rate per hour = £16,398 ÷ 2,630 = £6.235

This Page Intentionally Left Blank

Standard Costing and Performance Evaluation

3

LEARNING OUTCOMES

After completing this chapter, you will be able to:

- calculate and explain planning and operational variances;
- discuss the behavioural implications of setting standard costs;
- apply standard costing methods within costing systems and demonstrate the reconciliation of budgeted and actual profit margins;
- prepare reports using a range of internal and external benchmarks and interpret the results.

3.1 Introduction

In this chapter we will explore further aspects of the practice of standard costing. In particular we will consider more detailed analysis of particular variances, the separation of variances into operational and planning components and the preparation of performance reports for management based on standard costing.

We will also conduct a general exploration of the role of standard costing in performance evaluation and consider how that role may be changing in the modern economic environment. You should become aware that the relevance of a number of traditional management accounting practices is being questioned in the era of flexible manufacturing and a service based economy.

3.2 Material mix and yield variances

The direct material usage variance measures the change in total direct material cost brought about by using a non-standard amount of material in production. Sometimes it is possible to subdivide the usage variance into a direct material mix variance and a direct material yield variance. This subdivision is most likely to be found in process industries, where a standard input mix is the norm, and recognisable individual components of input are combined during the production process to produce an output in which the individual items are no longer separately identifiable. Paint manufacture provides a typical example: if a blue paint is required, the basic paint base will be introduced to the mixing process, along with the blue dye; at the input stage, both raw process materials are separately identifiable, but at the end of the process, blue paint emerges, with the individual components no longer separately identifiable.

In many process industries, it may be necessary from time to time to vary the input *mix* – perhaps because of shortages of raw material, or in order to take advantage of attractive input prices. Whether the input mix is a standard or a non-standard one, there is a possibility that the *outcome* from the process will differ from that which was expected. In addition to *unexpected* differences in yield, it is perfectly *normal* in some processes for the physical volume of output from the process to be less than the total volume of input, that is, there may be *unavoidable* losses inherent in the operation of an efficiently working process. In the blended whisky industry, for example, such losses arise from evaporation, and the volume of output from the process is *expected* to be less than the volume of the input. The direct material *mix* variance measures the change in cost brought about by an alteration to the *constituents* of the input mix, while the direct material *yield* variance measures the change in cost brought about by any deviation in output from the *standard* process output.

The data below will be used to calculate mix and yield variances in the subsequent examples:

Example

A company has the following standards for a mix to produce 500 kg of product C:

Input	*kg*	*Cost/kg*	*Total cost of mix*	
A	200	£1.00	£200	
B	400	£1.60	£640	
	600		£840	600 kg of input should produce 500 kg of C at a standard cost of £1.68/kg

In a particular period, the actual results of the process were as follows:

Actual input	*kg*	*Actual cost/kg*	*Total actual cost*
A	300	£1.00	£300
B	300	£1.60	£480
	600		£780

Actual output: 400 kg of C

Note that, in the above data, there is no direct material *price* variance, as the actual cost per kilogram of inputs A and B was the standard cost in each case. The *whole* of the direct material variance is thus due to changes in the *usage* thereof. The total variance is the difference between the standard cost of the *output* of 400 kg of C (400 × £1.68 = £672) and the actual cost of £780. This gives an adverse direct material usage variance of £108. This material usage variance may be split into mix and yield components.

(a) Direct material mix variance

For an input of 600 kg:

Material	*Actual input* kg	*Standard mix of input* kg	*Mix variance* kg	*Standard price per kg* £	*Mix variance* £
A	300	200	100 (A)	1.00	100 (A)
B	300	400	100 (F)	1.60	160 (F)
	600	600			60 (F)

The material mix variance demonstrates the cost impact of using an ingredient mix different from that which is standard. That standard mix of 600 kg input is 200 kg of A and 400 kg of B. The actual mix of the 600 kg input is 300 kg of A and 300 kg of B. In this case, ingredient A has been substituted for ingredient B in the mix – and the net cost impact of this is £60 favourable.

Material mix variance: (Actual material input × standard cost per unit) − (actual total material input in standard proportions × standard cost per unit).

The CIMA *Terminology* offers an alternative methodology for working the material mix variance.

This other methodology works the components of the mix variance on the basis of the difference between budget usage for output achieved and the difference between the standard average and standard cost of the materials input. In this case the standard average price of the material used is £1.40 per kg (that is £840/600 kg). This may be illustrated by reworking the mix variance calculated above using the alternative methodology:

Material	*(a)*	*(b)*	*(c)*	*(d)*	*(e)*	*(f)*	*(g)*
	kg	*kg*	*kg*	*£*	*£*	*£*	*£*
A	300	160	140	1.40	1.00	0.40	56 (F)
B	300	320	−20	1.40	1.60	−0.20	4 (F)
						Total	60 (F)

Key:
(a) actual usage
(b) budget input for output achieved A = 200 kg/500 kg × 400 kg, B = 400 kg/500 kg × 400 kg
(c) mix variance (kg), (a) − (b)
(d) standard average price per kg
(e) standard price per kg
(f) (e) − (d)
(g) mix variance (£), (c) × (f).

The logic here is more complex but it may be argued that it gives a more rigorous analysis of the situation. We are using more of the cheap ingredient and less of the expensive ingredient. So, it might be argued, both components of the mixture variance should be favourable.

Material mix variance (alternative methodology): ((Actual input quantity − budget material input quantity for the output produced) × (standard weighted average cost per unit input − standard cost per input unit))

When answering an examination question simply requiring the calculation of a mix variance, the student is advised to always use the simple method illustrated at the start of this section. However, students should be aware that alternatives do exist and that the examiner may invite the student to demonstrate familiarity with these.

(b) Direct material yield variance

Standard cost per kg of output = £840/500 = £1.68

	Kg	
600 kg input should have yielded	500	of C
But did yield	400	of C
Yield variance	100	adverse
x standard cost per kg of output (£1.68)		
Yield variance	£168	adverse

The material yield variance demonstrates the cost impact of generating above or below standard output from a given quantity of input. In this case, the input of 600 kg is associated with a standard output of 500 kg, but the actual output was only 400 kg.

The yield variance is 100 kg adverse (that is, 500 kg standard output – 400 kg actual output).

The cost impact of this is £168 adverse.

Material yield variance: (Standard output for actual input − actual output) × standard cost per unit of output.

The current edition of the *Terminology* permits use of both methods and earlier editions specified use of a third method. All possible methods give the same end result. Students are often confused when they see a mix variance in a text or model answer calculated using a method they are unfamiliar with.

The sum of the direct material mix variance and the direct material yield variance can be seen to be £108 adverse, which, in the absence of a direct material price variance, is equal to the total direct material variance.

The direct material mix and yield variances must be interpreted with care, as there is a very strong interrelationship between them. If we consider the concept of a *standard* mix, it is clear that such a mix will represent the combination of inputs that provides an acceptable quality of output at the least possible cost. If some *other* combination of inputs could produce a *lower* cost output without detriment to quality, then *this* alternative would have been selected as the standard. Any change in the input mix must therefore be expected to have an impact on the *yield* from the process, as well as on the price of the input mix. It is highly unlikely that any meaningful control can be exercised over the output from a process independent of the input to it, and thus the two variances should be considered together.

3.3 Labour mix and yield variances

The same logic applied in the calculation of materials mix and yield variances can equally well be applied to labour costs. When several different classes of labour are engaged then the labour efficiency variance can be split into mix and yield components.

This is best demonstrated through study of a simple example.

Example

The standard labour input associated with the production of one unit is as follows:

4 hours of skilled labour at £15 per hour,
6 hours of unskilled labour at £10 per hour.

The standard labour cost of one unit is £120. The standard total labour input associated with production of one unit is ten hours at an average hourly rate of £12 (that is, £120/10 hours). It can also be seen that the standard labour mix is 40 per cent skilled and 60 per cent unskilled.

During Period 6:

25 units are produced;
95 hours of skilled labour are used;
175 hours of unskilled labour are used;
£3,267.50 wages are paid.

We are required to calculated the labour cost variance and analyse this into labour rate and labour efficiency component variances. We are then required to analyse the labour efficiency variance into labour mix and labour yield components.

Step 1 – calculation of labour cost variance

This is the difference between the standard labour cost of producing 25 units and the actual labour cost incurred.

	£	
Actual labour cost incurred (given)	3,267.50	
Standard labour cost of 25 units (25 × £120)	3,000.00	
Labour cost variance	267.50	adverse

Step 2 – calculation of labour rate and labour efficiency variances

The labour rate variance is the difference between (actual hours worked × standard rate) and the actual wages paid. The labour efficiency variance is (standard hours required for output achieved − actual hours worked) multiplied by the standard hourly rate.

	£
Labour rate variance	
(95 skilled hrs × £15) + (175 unskilled hrs × £10) − £3,267.50	92.50 adverse
Labour efficiency variance	
((100 standard − 95 actual skilled hrs) × £15) +	
((150 standard − 175 actual unskilled hrs) × £10)	175.00 adverse
Sum total (labour cost variance)	267.50 adverse

Step 3 – calculation of labour mix and labour yield variances

Labour mix variance

For 270 hours worked:

Grade	Actual hours	Standard mix of hours	Mix variance hours	Standard rate per hr £	Mix variance £
Skilled	95	(40%) 108	13 (F)	15	195 F
Unskilled	175	(60%) 162	13 (A)	10	130 A
	270	270			65 F

Labour yield variance

270 hours of work should yield (270 hr ÷ 10 hrs/units)	27 units
But did yield	25 units
Yield variance	2 units adverse
x std cost £120 per unit	
Yield varience	£240 adverse

Check: mix variance £65F + yield variance £240A = total efficiency variance £175A.

The variance analysis carried out in step 3 indicates that a cost advantage has been achieved by substituting unskilled for skilled labour in the production process. However, that advantage has been more than offset by a cost disadvantage arising from the diminished efficiency of the whole workforce.

Again, in dealing with the labour mixture variance, the *Terminology* offers an alternative methodology:

Labour mix variance (alternative methodology): ((Actual hours worked − budget hours worked for the output produced) × (standard weighted average cost per hour worked − standard cost per hour worked))

Reworking the earlier example using this alternative methodology gives the following result:

Labour	*(a)* *hours*	*(b)* *hours*	*(c)* *hours*	*(d)* *£*	*(e)* *£*	*(f)* *£*	*(g)* *£*
Skilled	95	100	−5	12.00	15.00	−3.00	15(F)
Unskilled	175	150	25	12.00	10.00	2.00	50(F)
						Total	65(F)

Key:

(a) actual hours

(b) budget hours for output achieved skilled = 25 units × 4 hours, unskilled = 25 units × 6 hours

(c) mix variance (hours), (a) − (b)

(d) std avg rate per hour, £120/10 hour
(e) standard rate
(f) (e) − (d)
(g) mix variance (£), (c) × (f).

The logic in this case is more complicated, but the result is the same as that given in the simple method above. Again, you are always recommended to use the simple method if the requirement is merely to calculate the labour mix variance.

It should be appreciated that the example given is set in a manufacturing environment, but the technique may be most applicable in a service or professional environment. For example, an audit operation typically makes use of several well-defined grades of staff ranging from Partner to Junior. The calculation of a labour mix variance in regard to an audit may give some powerful insights into the effectiveness with which particular jobs were run. One of the key factors that can determine the performance of a professional practice is the manner in which the work of senior/qualified staff is integrated with that of their juniors.

3.4 Sales variances

In Chapter 2, we considered the calculation of the sales volume variance. In its simplest form, this variance is:

(budget − actual sales units) × standard profit per unit

However, it is capable of being expressed in several different ways and is capable of more detailed analysis. The principal alternative ways in which the sales volume variance can be expressed are as follows:

(a)

Sales volume profit variance: ((Budgeted sales units × standard profit per unit) − (actual sales units × standard profit per unit))

This is commonly used to reconcile budget and standard profit as part of a control report when an absorption costing system is in use.

(b)

Sales volume contribution variance: ((budgeted sales units × standard contribution per unit) − (actual sales units × standard contribution per unit))

This is commonly used to reconcile budget and standard contribution as part of a control report when a marginal costing system is in use.

(c)

Sales volume revenue variance: ((budgeted sales units × standard selling price per unit) − (actual sales units × standard selling price per unit))

This is commonly used as a stand-alone element in a sales control report.

Example

The above three alternatives may be illustrated by the following simple example:

ABC Ltd sells the Unit. Details of Unit sales in September were:

Budget – 1,200 Units
Actual – 1,100 Units

Standard profit per Unit – £100
Standard contribution per Unit – £150
Standard selling price per Unit – £200

The three alternative sales volume variances listed above are:

(a) Profit – £10,000
(b) Contribution – £15,000
(c) Revenue – £20,000

The sales volume variance (whichever version of it you are using) can be analysed into mix and quantity components using the same logic encountered in regard to materials usage and labour efficiency variances.

Example

XY Ltd sells two products, X and Y, details for the current period as follows:

	Standard mix (units)	*Standard profit (£ pu)*	*Average profit (£ pu)*
X	2	5	
Y	3	6	
Total	5	28	5.60

Budget sales – 200 units X and 300 units Y
Actual sales – 180 units X and 310 units Y

It is apparent that the sales volume profit variance for the period is £40 adverse (that is (20 units X adverse × £5) plus (10 units Y favourable × £6)

We can split this into a sales quantity profit variance and a sales mix profit variance as follows:

Sales quantity profit variance (500 units Budget – 490 units Actual) × £5.60 per unit	*£56 adv*

Sales mix profit variance

	Standard mix (units)	*Actual mix (units)*	*Variance (units)*	*Variance (£)*
X	196	180	16 adv	80 adv
Y	294	310	16 fav	96 fav
Total	490	490		£16 fav

The standard mix is the total unit sales (490) multiplied by 2/5 to give X and 3/5 to give Y. The mix variances in units are multiplied by the individual standard profits per unit to give the mix variance in £.

As with the other mix variances, there are several alternative means of calculating the sales mix profit variance. That used above is the simplest and they all produce the same result.

The example used relates to the sales volume profit variance, but exactly the same procedure can be used for its contribution and revenue variance alternatives.

3.5 Planning and operational variances

Some variances will arise through factors that are entirely, or almost entirely, within the control of management. These may be referred to as *operational* variances. Other variances can arise from changes in factors external to the business, and may be referred to as *planning* variances.

The *Official Terminology* defines operational and planning variances as follows:

Operational variance: A classification of variances in which non-standard performance is defined as being that which differs from an *ex post* standard. Operational variances can relate to any element of the standard product specification.

Planning variance: A classification of variances caused by *ex ante* budget allowances being changed to an *ex post* basis. Also known as a revision variance.

Management will wish to draw a distinction between these two variances in order to gain a realistic measure of operational efficiency. As planning variances are self-evidently *not* under the control of operational management, it cannot be held responsible for them, and there is thus no benefit to be gained in spending time investigating such variances at an operational level. Planning variances may arise from faulty standard-setting, but the responsibility for this lies with *senior*, rather than *operational*, management.

It should be noted that *all* deviations of cost between actual and budgeted can be subdivided and attributed to either planning or operational causes. The example below illustrates this more general application of the techniques.

Big plc set up a factory to manufacture and sell 'Advance', a new consumer product. The first year's budgeted production and sales were 1,000 units. The budgeted sales price and standard costs for 'Advance' were:

	£	£
Standard sales price (per unit)		200
Standard costs (per unit)		
Raw materials (10 kg at £10)	100	
Labour (6 hours at £8)	48	
		(148)
Standard contribution (per unit)		52

Actual results for the first year were:

	£000	£000
Sales (1,000 units)		316
Production costs (1,000 units)		
Raw materials (10,800 kg)	194.4	
Labour (5800 hours)	69.6	
		(264)
Actual contribution (1,000 units)		52

The managing director made the following observations on the actual results:

In total, the performance agreed with budget; nevertheless, in every aspect other than volume, there were large differences.

Sales were made at what was felt to be the highest feasible price, but we now feel that we could have sold for £330 with no adverse effect on volume. Labour costs rose dramatically with increased demand for the specialist skills required to produce the product, and the general market rate was £12.50 per hour – although we always paid below the general market rate whenever possible.

The raw material cost that was expected at the time the budget was prepared was £10 per kilogram. However, the market price relating to efficient purchases of the material during the year was £17.00 per kilogram.

It is not proposed to request a variance analysis for the first year's results. In any event, the final contribution was equal to that originally budgeted, so operations must have been fully efficient.

Despite the managing director's reluctance to calculate it, the traditional variance analysis is:

	£	£
Sales margin volume variance (Actual sales volume = budgeted sales volume)		–
Sales margin price variance (Actual selling price − standard selling price) × actual sales volume (£316 − £200) × 1,000		116,000 F
Material price (Standard price − actual price) × actual quantity (£10 − £194,400/10,800) × 10,800	86,400 A	
Material usage (Standard quantity − actual quantity) × standard price (10,000 − 10,800) ×£10	8,000 A	
		94,400 A
Wage rate (Standard rate − actual rate) × actual hours (£48 − £69,600/5,800) × 5,800	23,200 A	
Labour efficiency (Standard hours − actual hours) × standard rate ((1,000 × 6) − 5,800) × £8	1,600 F	
		21,600 A
Total variances		–

Reconciliation:

	£
Budgeted contribution (1,000 × £52)	52,000
Add: adverse cost variances	116,000
Less: favourable sales variances	(116,000)
Actual contribution	52,000

As the managing director states, and the above analysis shows, the overall variance for the company was zero: the adverse cost variances exactly offset the favourable sales margin price.

However, this analysis does not clearly indicate the efficiency with which the company operated during the period, as it is impossible to tell whether some of the variances arose from the use of inappropriate standards, or whether they were due to efficient or inefficient implementation of those standards. In order to determine this, a revised *ex post* plan should be constructed, setting out the standards that, with hindsight, *should* have been in operation during the period. These revised *ex post* standards are shown under (B) below.

	(A) *Original plan*	£	*(B)* *Revised ex post plan*	£	*(C)* *Actual result*	£
Sales	(1,000 × £200)	200,000	(1,000 × £330)	330,000	(1,000 × £316)	316,000
Materials	(10,000 × £10)	100,00	(10,000 × £17)	170,000	(10,800 × £18)	194,400
Labour	(6,000 × £8)	48,000	(6,000 × £12.50)	75,000	(5,800 × £12)	696,000

	£	£
Planning variances (A − B)		
Sales price	130,000 F	
Material price (100,000 − 170,000)	70,000 A	
Wage rate	27,000 A	
		33,000 F
Operational variances		
Sales price (B − C)	14,000 A	
Material price (10,800 × £1)	10,800 A	
Material usage (800 × £17)	13,600 A	
Wage rate (5,800 × £0.50)	2,900 F	
Labour efficiency (200 hrs × £12.50)	2,500 F	
		33,000 A
Total variances		–

A comparison of (B) and (C) produces *operational* variances, which show the difference between the results that were actually achieved and those that might legitimately have been achievable during the period in question. This gives a very different view of the period's operations. For example, on the cost side, the wage rate variance has changed from adverse to favourable, and the material price variance, while remaining adverse, is significantly reduced in comparison to that calculated under the traditional analysis; on the sales side, the sales margin price variance, which was particularly large and favourable in the traditional analysis, is transformed into an *adverse* variance in the revised approach, reflecting the fact that the company failed to sell at prices that were actually available in the market. A comparison of the original plan (A) with the revised plan (B) allows the planning variances to be identified. As noted at the beginning of this section, these variances are uncontrollable by *operating*, staff, and may or may not have been controllable by the *original* standard-setters at the start of the budget period. Where a revision of standards is required due to environmental changes that were not foreseeable at the time the budget was prepared, the planning variances are truly uncontrollable. However, standards that failed to anticipate *known* market trends when they were set will reflect faulty standard-setting: it could be argued that these variances *were* controllable (avoidable) at the planning stage.

Example

It would be useful to give a second example of planning and operational variances. For this example, we shall return to the data from the earlier section on material mix and yield variances.

You will recall that the standard mix was one that gave a cost of good output of £1.68 per kg, being the input cost of £840 divided by the standard output of 500 kg. In determining this optimal mix, the interaction between the input, the output and the cost of the input had to be taken into account and minimised. Where there is substitutability between inputs, a number of possible mixes may be feasible, for example, an alternative mix might be the one shown below:

Input	*kg*	*Cost/kg*	*Total cost of mix*
		£	£
A	325	1.00	325
B	275	1.60	440
	600		765

In this case, let us assume that the 600 kg of input has an expected output of 450 kg, so that the cost per kg is

£765/450 = £1.70

Despite resulting in a product of the right quality, this mix would *not* be chosen as the standard, because it has a higher cost per kg than the optimal mix at the expected input prices.

However, suppose that the actual results recorded in a particular period were as follows:

Actual input	*Kg*	*Actual cost/kg*	*Total cost*
		£	£
A	200	1.00	200
B	400	2.00	800
	600		1,000

Actual output: 500 kg of C

The cost per kg of output is now

£1,000 ÷ 500 = £2

In this case, there would be *no* mix or yield variance, as the input to the process was in the standard mix and produced the standard output. The only variance reported would be an adverse *price* variance of £160 (400 × (£1.60 − £2.00)), reflecting the higher cost per kg of material B in the period under consideration. However, it is clear that the increase in the *price* of B renders the current standard mix *suboptimal*. If B has a price of £2, the *alternative* mix of 325 kg of A and 275 kg of B gives a *lower* output price per kg than the current standard mix, as shown below:

Input	*kg*	*Cost/kg*	*Total cost of mix*
		£	£
A	325	1.00	325
B	275	2.00	550
	600		875

With output of 450 kg, the cost per kg of this mix is:

£875/450 = £1.9444

This cost is lower than the cost of £2 per kg that is obtained when the original 'optimal' standard mix is retained in the face of changed prices. A more sophisticated variance analysis system would compare the actions of the operational management with the standards that *would* have been set had the conditions that *actually* prevailed been known at the time the standard was set. In this example, had the price of B been known to be £2 per kg, the alternative mix would have become the standard, and would have been the basis for comparison with the actual result.

The revised standard cost of the actual output is:

500 ÷ £1.9444 = £972.22

The actual cost incurred was £1,000, giving a material cost variance of £27.78 adverse.

The material mixture variance may be calculated as follows:

Input	*Standard mix*	*Actual mix*	*Variance*	*Standard cost*	*Variance*
	kg	*kg*	*kg*	£	£
A	325	200	125 F	1	125 F
B	275	400	125 A	2	250 A
					125 A

The material yield variance is simply the difference between standard (450 kg) and actual (500 kg) yield for the 600 kg input multiplied by the standard cost per kg output.

This gives a result of £97.22 favourable (that is 50 kg × £1,9444).

	£
Material mix variance	125.00 A
Material yield variance	97.22 F
Material usage variance	27.78 A

Suppose that, in the same circumstances, the following results had been recorded:

Actual input	*kg*	*Actual cost/kg*	*Actual cost*
		£	£
A	325	1.00	325
B	275	2.00	550
	600		875

Actual output: 450 kg of C

The actual results are identical to that *would* be expected if the comparison is made with the *revised* standard, and thus there can be no *operational* variance. However, a *planning* variance has occurred. The expected cost of 450 kg of C, based on the original standard mix and input prices, was 450 × £1.68 = £756. The *revised* standard cost of 450 kg of C was £875. The difference of £119 between the two figures results from the change in the price of B, which represents a *planning* variance beyond the control of the operating management.

The formal calculation of the variance is:

$$450 \times (£1.68 - £1.94) = £119 \text{ adverse (remember the £1.94 is rounded)}$$

It is interesting to note that a failure to revise the standard in these circumstances might encourage management to continue to operate with the *original* standard mix, which would, in fact, be against the company's best interests.

On the face of it, the calculation of operational and planning variances is an improvement over the traditional analysis. However, you should not overlook the considerable problem of data collection for the revised analysis: where does this information come from, and how can we say with certainty what should have been known at a particular point in time?

3.6 Capacity ratios

Capacity ratios are measures of performance in the use of capacity. They are different from standard costing variances because they are expressed in terms of percentages. They are included in this chapter because they provide information which is similar to that provided by the fixed overhead variances.

3.6.1 Standard hour

Before you can learn how to calculate and interpret the most common capacity ratios, you must have a thorough understanding of what is meant by a standard hour.

CIMA's *Terminology* defines a standard hour or minute as:

Standard hour or minute: The amount of work achievable, at standard efficiency levels, in an hour or minute. A standard hour is a useful way of measuring output when a number of dissimilar products are manufactured.

Example

A company manufactures tables, chairs and shelf units. The standard times allowed to manufacture one unit of each of these are as follows:

	Standard time per unit
Table	3 hours
Chair	1 hour
Shelf unit	5 hours

Production output during the first two periods of this year was as follows:

	Units produced	
	Period 1	*Period 2*
Table	7	4
Chair	5	2
Shelf unit	3	5

It would be difficult to monitor the trend in total production output based on the number of units produced. We can see that fifteen units were produced in total in period 1 and 11 units in period 2. However it is not particularly meaningful to add together tables, chairs and shelf units because they are such dissimilar items. You can see that the mix of the three products changed over the two periods and the effect of this is not revealed by simply monitoring the number of units produced.

Standard hours present a useful output measure which is not affected by the mix of products. The standard hours of output for the two periods can be calculated as follows:

	Standard hours per unit	*Period 1*		*Period 2*	
		Units produced	*Standard hours*	*Units produced*	*Standard hours*
Table	3	7	21	4	12
Chair	1	5	5	2	2
Shelf unit	5	3	15	5	25
Total standard hours produced			41		39

Expressing the output in terms of standard hours shows that in fact the output level for period 2 was very similar to that for period 1.

It is important for you to realise that the actual hours worked during each of these periods was probably different from the standard hours produced. The standard hours figure is simply an expression of how long the output should have taken to produce, to provide a common basis for measuring output.

3.6.2 Calculating the capacity ratios

CIMA's *Terminology* describes the following three most commonly used capacity levels, together with a worked example of the calculation of the capacity ratios.

Full capacity: The output (expressed in standard hours) that could be achieved if sales orders, supplies, and workforce were available for all installed workplaces.
Practical capacity: Full capacity less an allowance for known unavoidable volume losses.
Budgeted capacity: The standard hours planned for a period, taking into account budgeted sales, supplies, workforce availability and efficiency expected.

On the following given data, the related ratios are set out below:

Full capacity standard hours	100
Practical capacity standard hours	95
Budgeted capacity standard hours (budgeted input hours 90, at 90 per cent efficiency)	81
Actual input hours	85
Standard hours produced	68

$$\text{Idle capacity ratio} = \frac{(\text{Practical capacity} - \text{budget capacity})}{\text{Practical capacity}} \times 100$$

$$= \frac{91 - 81}{95} \times 100 = 15\%$$

This means that the budgeted activity level would not utilise 15 per cent of the practical capacity.

$$\text{Production volume ratio} = \frac{\text{Standard hours produced}}{\text{Budgeted capacity}} \times 100$$

$$= \frac{68}{81} \times 100 = 84\%$$

This means that the actual output achieved amounted to only 84 per cent of the budgeted output.

$$\text{Efficiency ratio} = \frac{\text{Standard hours produced}}{\text{Actual hours}} \times 100 = \frac{68}{85} \times 100 = 80\%$$

This means that an 80 per cent efficiency level was achieved, compared with a budget of 90 per cent efficiency. This ratio may be measured in either direct labour or machine hours, as appropriate.

3.7 Investigation and interpretation of variances

The calculation of variances is not sufficient of itself to ensure better management control. Variances only become useful when *action* is taken as a result of their calculation. The aim of variance analysis is to facilitate management by exception, allowing management to concentrate on those areas where action is necessary, without wasting time on matters which are performing in line with expectations.

Once the variances have been calculated, management then has the task of deciding which variances should be investigated. It would probably not be worthwhile or cost-effective to investigate every single variance. Some criteria must be established to guide the decision as to whether or not to investigate a particular variance. Some general factors which may be taken into account include the following and we will return to consider some of them in more detail later in this section:

(a) *The size of the variance*. Costs tend to fluctuate around a norm and therefore 'normal' variances may be expected on most costs. The problem is to decide how large a variance must be before it is considered 'abnormal' and worthy of investigation.

A rule of thumb may be established that any variance which exceeds, say, 5 per cent of its standard cost may be worthy of investigation. Alternatively control limits may be set statistically and if a cost fluctuates outside these limits it should be investigated.

(b) *The likelihood of the variance being controllable*. Managers may know from experience that certain variances may not be controllable even if a lengthy investigation is undertaken to determine their causes. For example, it may be argued that a material price variance is less easily controlled than a material usage variance because it is heavily influenced by external factors.

(c) *The likely cost of an investigation*. This cost would have to be weighed against the cost which would be incurred if the variance were allowed to continue in future periods.

(d) *The interrelationship of variances*. Adverse variances in one area of the organisation may be interrelated with favourable variances elsewhere. For example, if cheaper material is purchased this may produce a favourable material price variance. However, if the cheaper material is of lower quality and difficult to process, this could result in adverse variances for material usage and labour efficiency.

(e) *The type of standard that was set*. You have already seen that an ideal standard will almost always result in some adverse variances, because of unavoidable waste, etc. Managers must decide on the 'normal' level of adverse variance which they would expect to see.

Another example is where a standard price is set at an average rate for the year. Assuming that inflation exists, favourable price variances might be expected at the beginning of the year, to be offset by adverse price variances towards the end of the year as actual prices begin to rise.

3.7.1 Percentage variance charts

We have seen that the size of a variance may be used as a guide to managers to indicate whether the variance is worthy of investigation. However, it may be difficult for managers to appreciate the significance or the trend of variances when they are presented in absolute terms.

A percentage variance chart can provide a useful graphical presentation of variances that is easier for managers to understand and interpret than a series of figures presented in a tabular format. By presenting the variances over time any trend can be identified, and this can be used to decide whether any control action is required.

Example

Product L has a standard material cost of £7 per unit. Details of output and the recorded material cost variances for the last four periods are as follows:

Period	*Output Units*	*Usage variance £*	*Price variance £*
1	5,800	8,120 (A)	6,090 (F)
2	2,470	2,940 (A)	2,075 (F)
3	4,600	4,185 (A)	3,220 (F)
4	3,100	2,170 (A)	1,520 (F)

The fluctuating output and the corresponding fluctuations in variances make it difficult for managers to see whether there is any trend in the recorded variances.

In order to prepare a percentage variance chart it is necessary to express each variance as a percentage of the total standard cost of material for the output achieved.

	Standard material cost of output @ £7 per unit	*Usage variance*		*Price variance*	
Period	£	£	%	£	%
1	40,600	8,120 (A)	20 (A)	6,090 (F)	15 (F)
2	17,290	2,940 (A)	17 (A)	2,075 (F)	12 (F)
3	32,200	4,185 (A)	13 (A)	3,220 (F)	10 (F)
4	21,700	2,170 (A)	10 (A)	1,520 (F)	7 (F)

The percentage variances can now be plotted on a percentage variance chart (Figure 3.1).

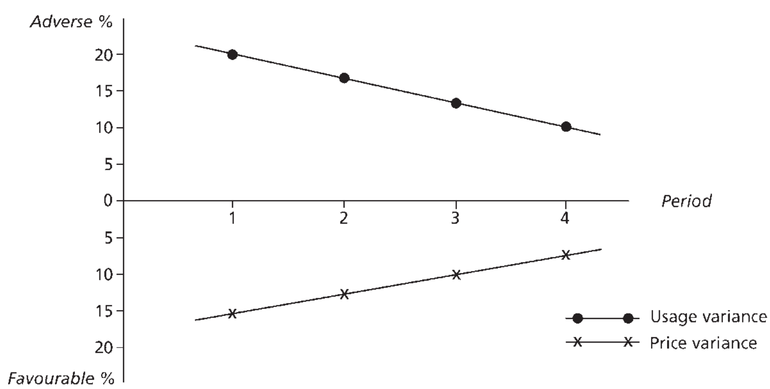


Figure 3.1 Percentage variance chart

The chart shows a clear trend in each variance. This trend was not clearly visible from the absolute figures. It appears that the variances may be interrelated; in period 1 the material purchased was 15 per cent cheaper than standard, which may have caused the 20 per cent adverse usage variance, perhaps because the material was of inferior quality. However, the trend in variances shows that, as the price of material has increased (reducing percentage favourable price variance), the usage has tended to move closer to standard levels (reducing percentage material usage variance).

Since both variances are trending towards a zero percentage it may not be necessary to undertake a detailed investigation at this stage. If you look back at the table of absolute variances you will see that it would have been difficult to reach this conclusion from the information presented there.

3.7.2 The reasons for variances

Before we look in detail at variance investigation models, it will be useful to think about *why* actual performance might differ from standard performance. Four principal sources of variances can be identified, and we shall briefly examine each in turn:

(i) *Inefficient operations*. Currently attainable standards should be achievable by expending a reasonable amount of effort, and incorporate normal levels of machine efficiency, non-productive time, spoilage and waste. Variances from such standards may result from faulty machinery, departures from laid-down procedures or human error. The underlying cause of the inefficiency should be sought and eliminated.

(ii) *Inappropriate standards*. Setting standards can be time-consuming and expensive, particularly when there are large numbers of different products or services which consume large numbers of different inputs, and inaccurate standards may simply be the result of an unwillingness to invest sufficient resources to ensure their accuracy. It can be difficult not only to develop accurate standards in high-technology firms, but also to keep them up to date, as the rapid pace of change can overtake standards after only a short time in operation. If frequent changes occur in the *prices* of input factors, standards may quickly become out of date, and variances become less a measure of the purchasing department's efficiency or inefficiency than a reflection of general market conditions. When variances arise as a result of inappropriate standards, the standards need to be revised or updated – and kept under frequent review.

(iii) *Errors in recording actual results*. Humans being error prone, the amounts recorded for actual costs may be inaccurate. There can be few people who have never made an arithmetic slip, transposed numbers or misclassified a particular type of cost. It is improbable that any benefit would accrue to an investigation when the cause of the variance turns out to be a measurement error of this sort.

(iv) *Random or uncontrollable factors*. When setting a standard, it is usual to select a representative value; this well frequently be the mean, or other measure of central tendency. However, although this *single* value has been taken as a standard, the *reality* of the situation is that a *range* of outcomes is possible, even when the process is under control. This is an important point to bear in mind when considering the concept of a standard, because there is an implicit assumption that it represents a *single-point* acceptable measure. It should be understood to represent a band or *range* of possible acceptable measures. Although the band itself may be predictable, it is not possible to predict the *exact* value of an individual unit within it. As long as the process is under control (i.e. the value falls within the range of acceptable outcomes), an observation that *differs* from the standard would be regarded merely as a *random* or *uncontrollable* variance. By definition, a random deviation calls for no corrective action.

3.7.3 Investigation models

In an ideal world, variances would only be investigated when the benefits of an investigation exceed its cost. The difficulty arises in determining whether this is likely to be the case. Management can adopt one of two approaches to the problem: the application of a simple rule of thumb; or the use of a statistical model (with or without a built-in cost/benefit measurement).

Rules of thumb

By definition, these will be based on arbitrary criteria, but need not be quite as crude as the name suggests. For example, for key cost items, a small percentage deviation might prompt an investigation; for less significant cost items, either a higher percentage cut-off or a cut-off point expressed in absolute cost terms might be applied ('investigate all variances over £2,000 or 30 per cent of standard cost, whichever is the lower').

The obvious advantages of such a method are its inherent simplicity and ease of application. However, the choice of cut-off values is subjective: it relies on judgement and intuition rather than statistical probabilities, and thus fails to capture the statistical significance of variances, or to weigh the costs of an investigation against its potential benefits.

Statistical models

A formal statistical model enables management to determine the probability that a particular variance comes from a process that is in control, and an investigation will only be carried out when the probability of that falls below a particular predetermined level (typically expressed in terms of a number of standard deviations from the mean). The model assumes that two mutually exclusive states exist for a process – it is either 'in control' or 'out of control'. In the former case, variances will be due to random fluctuations around the standard, and merit no further action. In the latter case, variances indicate that investigation is called for, and that action will be able to bring the process back into line. A prerequisite of the model is that the 'in control' state is capable (or assumed to be capable) of being expressed in the form of a probability distribution.

Let us take as an example the standard material content of a product. We shall assume that this figure, say 20 g of a particular chemical, represents the mean value of a large number of observations of the production process operating under conditions of normal efficiency, and that the observations display a normal distribution with a standard deviation of 2 g. On the particular day under review, 20,000 units were produced, with a total usage of 480 kg – an average of 24 g per product. This represents two standard deviations from the mean of 20 g. You should recall that, in a normal distribution, 95.45 per cent of all observations can be expected to fall within $\pm$ two standard deviations of the mean. Thus, in our example, if the process is under control, the probability of the average usage being two standard deviations from the mean is a mere 2.275 per cent ($100 - 95.45\%/2$). In other words, it is highly *unlikely* that an observation of 24 g would come from a distribution with a mean of 20 g and a standard deviation of 2 g, the distribution representing a process under control. Such an observation is much more likely to derive from a totally *different* distribution, and, given the two mutually exclusive states mentioned above, this would imply to management that the process was out of control for the day under review, and investigation would be called for.

Statistical control charts

The formal means of distinguishing between random variations in an 'in control' process and variances indicating an 'out of control' situation is known as statistical quality control.

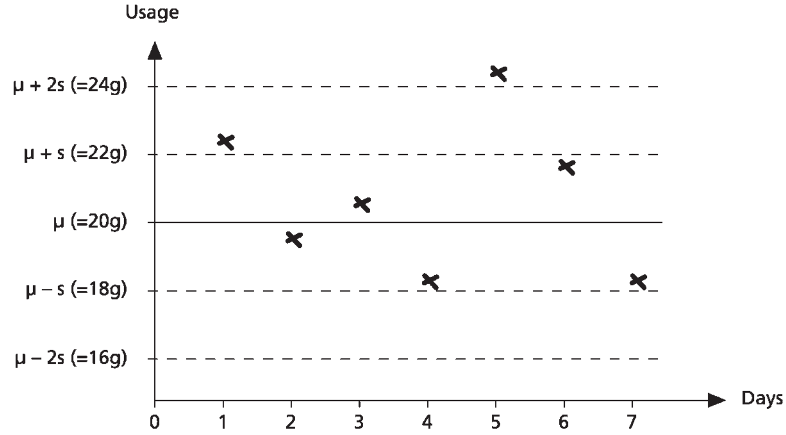


Figure 3.2 Control chart: normal distribution

A convenient means of recording and visually appraising variances is a *control chart*, on which successive cost observations are plotted in the form of a graph. The chart shows certain fixed points, representing the expected distribution of the particular item, and only actual observations which fall *outside* predetermined limits would be regarded as non-random and worth investigating. Visual analysis or statistical procedures can be employed to identify trends that indicate that a process is *heading* out of control, even though current observations are insufficient by themselves to prompt an investigation.

Figure 3.2 is a control chart of a normally distributed item, which takes as its 'in control' parameters – its *control limits* – two standard deviations from the mean (i.e. as there can only be a 4.55 per cent chance (100 to 95.45%) that an observation falling *outside* these parameters could result from a process in control, management considers that there is a high probability that such an observation would come from a process *out of control*). The data employed are those from our previous example, extended to include actual observations from prior and subsequent days to that previously examined. It can be seen that all observations, other than the one of 24 g, fall within the control limits, and would be considered random fluctuations of a process under control.

Not surprisingly, statistical quality control charts tend to be used to plot data measured in *physical quantity* terms, such as number of rejects or (as in our example) material usage. It should be noted, however, that they cannot distinguish between variances due to inappropriate standards or measurement errors, and those due to inefficient operations.

As indicated at the beginning of this section on investigation models, statistical decision models can be extended to incorporate the costs and benefits of an investigation. A discussion of such models lies outside the scope of this book, but interested readers are referred to Drury (see reading list) for an example. To the caveat mentioned above, however, should be added the severe difficulty of determining, or at least quantifying to an acceptable degree of accuracy, both the cost of an investigation and the benefits expected to accrue from it. This is, of course, a problem common to most mathematical decision-making models, and goes some way towards explaining the relatively infrequent use of many of them, including the techniques just mentioned.

3.7.4 Interrelationship of variances

We shall now consider the question of the interrelationship of variances in a little more detail. A simple example will illustrate the dangers of looking at variances in isolation.

Example

Let us assume that a purchasing manager takes a conscious decision to buy a quantity of slightly substandard direct material for a particularly low price. In order to meet the company's quality criteria, heavy spoilage and labour overruns are incurred when the material is put into production. The aim of the manager is to reduce the *total* costs of manufacturing for the company as a whole, by trading off a favourable price variance against expected adverse efficiency variances. If the manager's strategy works, the *overall* variance will be *favourable*, despite the substantial adverse labels attaching to the individual efficiency variances. Conversely, if the strategy *fails*, the overall variance will be *adverse*, despite the large favourable price variance. (An equally valid strategy might be to acquire more *expensive* material, which causes an *adverse* material price variance, in the expectation that product quality will be improved and give rise to reductions in warranty and servicing costs that exceed the increased material cost.) It is important to keep in mind that there are many interdependencies among a company's activities – the 'favourable' or 'adverse' label pinned on an individual variance should not lead management to make unwarranted value judgements and draw unjustified conclusions concerning a period's operations.

Managers should not regard a standard costing system as a straitjacket that constrains or stifles individual initiative, and prevents them from taking an overall view of the company and its objectives. For this reason, it would be wrong to give too much emphasis to any one performance measure. Such a narrow focus encourages managers to make decisions that maximise their own reported performance in terms of the measure, at the expense of profit maximisation for the company as a whole.

A further problem resulting from the interrelationship of variances results from the traditional focus of responsibilities within organisations. Responsibility for material price variances generally rests with the purchasing manager, and responsibility for material efficiency variances with the production manager. The problem revolves around the responsibility for the joint price/efficiency variance, which is invariably buried within the purchasing manager's variance, as the following example demonstrates.

Example

The product cost of X includes two kilograms of direct material Y, at a standard cost of £2 per kilogram. In a particular period, in order to produce a budgeted requirement of 1,000 units of X, 2,300 kg of Y are used, at an actual cost of £2.20 per kilogram.

Conventional variance analysis on the above data would be as follows:

	£
Material price variance (£2.20 − £2.00) × 2,300	460 adverse
Material usage variance (2,300 − 2,000) × £2.00	600 adverse
Total material variance	1,060 adverse

However, the buyer, while accepting responsibility for the price variance on the 2,000 kg in the *standard allowance* for actual production – £0.20 × 2,000 = £400 – might legitimately claim that the additional £60 (300 kg @ £0.20) included in the adverse variance ascribed to *his* activities is more properly attributable to the *production manager*. From the purchasing manager's point of view, if the production manager had operated efficiently, and produced in accordance with the standard quantities, only 2,000 kg would have been required for the actual production of 1,000 units. The extra 300 kg would not have been needed, and – certainly in a JIT system – not even purchased. However, in practice, this distinction between the *pure* price variance − £400 – and the *mutual* price/efficiency variance – £60 – is not often drawn (unless management bonuses depend upon individual variances – an undesirable situation for the reasons outlined above). The efficiency variance, other things being equal, is considered to be of greater significance than the price variance, in view of the more direct influence that the respective manager can exert over it. As a consequence, the management report may be prepared in a manner which seeks to minimise criticism on the part of the production manager of the measurement methods. A joint price/efficiency variance is less likely to cause disagreement – with its concomitant potential for organisational discord – if it is lost within the total *price* variance rather than the *efficiency* variance, particularly as price variances are often regarded more as reflections on forecasting ability than an ability to buy at a particular price.

Normal practice in assigning the joint price/efficiency variance may be rationalised by pointing out that, in reality, it is usual to calculate the material price variance at the point of *receipt* of material, rather than the point of use. Receipt and use will be separated by time in anything other than a JIT system. At the point of receipt, it is not known whether there will be a usage variance or not, and therefore it can be argued that the price variance is properly regarded as the sole responsibility of the buyer. However, this ignores the fact that purchases are ultimately a function of *usage*, and inefficiencies in the production department must inevitably be reflected in adverse price variances for the buyer, irrespective of the point at which the variance is calculated. It could also be argued in this situation that the buyer could generate favourable variances for himself by purchasing substandard material, which then causes inefficiencies in the production department and leads to greater quantities being bought, with concomitant increases in the buyer's favourable variance (this strategy should not be possible, however, in a situation in which a company pursues a policy of minimum standards in the quality of its purchases).

3.8 Behavioural considerations

3.8.1 Organisational goals

This section offers no more than a brief summary of the behavioural aspects of accounting control systems.

It is clear that standard costing and budgetary control systems should be designed in such a way that individuals are encouraged to behave in a manner which is consistent with the overall aims of the organisation. The seminal study of the human problems associated with budgets was published more than 45 years ago (*Argyris*, 1953), but its findings are still pertinent today: budget pressure can lead to tension and a 'them and us' philosophy; this pressure is exacerbated by accountants measuring their success in terms of the number of errors and weaknesses identified in production (and the reporting system making these faults public); and the budget, which in itself is neutral, is often the scapegoat for assertive patterns of leadership. Obviously, the management accountant has an important role to play in ensuring that the accounting control systems take account of behavioural considerations, in order that these problems are minimised.

3.8.2 Target levels for standards and budgets

There is substantial research evidence to suggest that specific quantitative goals can have a strong motivational appeal, but careful consideration must be given to the degree of difficulty represented by the target figures. A major problem faced by the standard/budget setter is that cultural, organisational and personality factors, together with the degree of task uncertainty associated with specific jobs, conspire to affect individual managers' responses to standards in different ways, making an optimal degree of difficulty impossible to specify for all cases. The most that can be said by way of generalisation is the following: if higher levels of performance are to be achieved, the budget set must be *accepted* by management; up to the point where it is no longer accepted, the more demanding the target, the better the response; and demanding targets are seen as more relevant than less difficult goals, although targets that are perceived as too difficult will result in negative attitudes.

Against this background, *Becker and Green* (1962) made the following suggestions regarding revisions to budget levels in the light of actual performance:

(i) Levels of aspiration will rise, and budgets can and should be revised, if performances meet or slightly *exceed* expectations. If no revision takes place, employees will perform at the *budget* level, when they could be performing at *higher* than budget level.
(ii) Performances just slightly *below* budget expectations require feedback rather than budget changes, in order that budgetees will strive for targets in the future.'
(iii) Performances *well below* the budget should probably lead to a downward revision of the budget. If such a revision is *not* made, the employees' level of aspiration will fall, with the concomitant danger that levels of aspiration and output will fall much more than is necessary. The budget should only be revised downwards to the level where it is once more perceived as being *attainable*.

The implication of the research on targets is that the optimum level of motivation is often unlikely to be achieved in practice. At this optimum level, therefore, adverse variances are to be expected *and accepted*; it would be counterproductive to use such variances as a punitive device in an overall reward system, as such a policy would encourage managers to seek looser standards, to the detriment of overall company performance (see section 3.8.5).

Interestingly, there is a conflict between the use of budgets as *motivating devices* and their use in *planning*. Tight budgets that are not expected to be achieved most of the time are unlikely to be of much help for planning purposes, and consideration should be given to the use of separate budgets for each requirement.

3.8.3 Performance measures and evaluation

Performance measures should encourage *goal congruence*. This state is said to exist when the perceived best interests of managers coincide with those of the organisation, and prompt the former to voluntarily take decisions that achieve the objectives of the latter. Needless to say, only if the measure is a *suitable* indicator will it improve organisational performance, and performance measures are far from infallible. If an *unsuitable* measure is adopted, dysfunctional consequences may follow – managers may be motivated to act in a way which is organisationally undesirable, either because they concentrate only on maximising the *measure*, regardless of organisational realities, or because they modify their behaviour in order to *appear* to be obtaining the desired result. We will consider other examples of such dysfunctional behaviour later in this text. Similarly, we will see the dangers of concentrating on a single measures of performance. It has been suggested that these problems can be overcome by adopting *multiple* measures. In order to avoid subjective judgements regarding the relative impact of the different measures on overall organisational performance, weights are attached to each, giving rise to the possibility of a *composite* measure of a manager's efficiency and effectiveness.

The way in which accounting measures are *used* by top management can also provoke undesirable behaviour. Too much emphasis on adverse performance is likely to lead to a feeling of injustice, but too little emphasis can also be demotivating, by implying that the standards or budget have little relevance. In a classic study, *Hopwood* (1976, *Accounting and Human Behaviour*) identified three distinct styles of performance evaluation: budget-constrained (rigid adherence to budget); profit-conscious (more flexible use of the budget, and emphasis on long-term considerations); and non-accounting (budgets little used in performance evaluation). The reward system will usually mirror the style – with a budget-constrained style, achieving targets results in rewards, and failing to achieve targets in punishment; with the profit-conscious style, good reasons for an overspend can result in rewards, and achievement of budget in undesirable ways to punishment; in the non-accounting style, rewards and punishment are not directly related to the attainment of budgeted figures, and thus the budget is of little importance in this context. *Hopwood* listed a number of problems associated with the budget-constrained style, including high job-related tension, manipulation of accounting information, and poor relations with supervisors and colleagues. The profit-conscious style appears to avoid these problems, while concomitantly ensuring an active involvement with the financial aspect of the operations.

More recent research emphasises the importance of the level of task uncertainty, and it has been suggested that higher levels of stress or poorer management performance do not stem from budget style as such, but rather from a *mismatch* of budget style and task context.

3.8.4 Participation in setting standards and budgets

If budget holders are genuinely able to influence standard setting and the make-up of their budgets – as opposed to simply being pressurised into accepting the figures presented to them – three benefits are said to follow for the organisation:

(i) The attitude of managers towards the accounting system itself will improve, reducing the potential for dysfunctional behaviour.
(ii) The standards and budgets are likely to be seen by managers as more relevant, which increases the likelihood of their acceptance as target figures.
(iii) Communication within the organisation will be improved, with a concomitant potential for increased control.

Unfortunately, the empirical research presents conflicting evidence on the usefulness of participation. One possible explanation for the conflicting results in the influence of personality variables on the effectiveness of participation. A high degree of participation has been found to be effective only for individuals with a *low* level of authoritarianism and a consequent *high* need for independence; highly authoritarian individuals with *low* independence needs remain relatively unaffected by the approach, and may well perform better within a framework of externally set standards. The appropriateness of participation should be assessed against this background, and, rather than adopting a blanket approach to it, an attempt should be made by top management to identify those organisational and personal situations where the evidence would point to the effectiveness of participative approaches.

3.8.5 Budget bias

If the performance of managers is to be measured against budgets, and the relevant individuals participate in setting them, it is plainly in the managers' interest, other things being equal, to influence the performance criteria built into the budgets. However, participation in the setting of standards can lead to bias in their formulation.

There is an assumption that this bias is in one direction only, and will invariably lead to the creation of *slack* budgets, containing targets that can be achieved easily. There is certainly considerable empirical evidence to support a common response of understating revenues and overstating costs, but the bias can work in *both* directions: after all, conservative forecasts might disappoint top management at the time they are made, and lead to an undesirable examination of the basis of the projections; whereas an optimistic forecast can please them – albeit increasing the risk of later disapproval if the optimism appears subsequently to be misplaced.

The potential for bias can be regarded as a function of the particular style of performance evaluation adopted by the organisation: a budget-constrained style is likely to give rise to a *high* degree of bias; if standards and budgets are used in a more flexible profit-conscious style, the level of budget bias is likely to be considerably *lower*.

3.9 Standard costing in the modern business environment

3.9.1 Criticisms of standard costing

There has recently been some criticism of the appropriateness of standard costing in the modern business environment. The main criticisms include the following:

- Standard costing was developed when the business environment was more stable and operating conditions were less prone to change. In the present dynamic environment, such stable conditions cannot be assumed. If conditions are not stable, then it is difficult to set a standard cost which can be used to control costs over a period of time.
- Performance to standard used to be judged as satisfactory, but in today's climate constant improvement must be aimed for in order to remain competitive. The focus in a traditional standard costing environment is on minimising costs rather than on improving quality and customer care.
- Standard costing variances tend to be prepared on an aggregate basis. In today's manufacturing environment there is a need for variances specific to production lines and even individual batches.
- Product life cycles tend to be shorter with the result that standard costs become quickly out of date.
- The emphasis on labour variances is no longer appropriate with the increasing use of automated production methods.
- Standard costing variances are usually reported at the end of each month. In order to be flexible and responsive to changes in the external environment, managers need information more frequently.

3.9.2 Addressing the criticisms

An organisation's decision to use standard costing depends on its effectiveness in helping managers to make the correct planning and control decisions. Many of the above criticisms can be addressed by adaptations to traditional standard costing systems.

- Standard costs must be updated regularly if they are to remain useful for control purposes.
- The use of demanding performance standards can help to encourage continuous improvement.
- The standard costing system can be adapted to produce a broader analysis of variances that are less aggregated.
- It is possible to place less emphasis on labour cost variances and focus more on variances for quality costs, variable overhead costs, etc.
- Real time information systems have been developed which allow for corrective action to be taken sooner in response to reported variances.

Standard costing may still be useful even where the final product or service is not standardised. It may be possible to identify a number of standard components and activities for which standards may be set and used effectively for planning and control purposes.

3.9.3 Standards and variances: a cautionary note

An important theme running through this book is the search for continuous improvement, and its importance in the modern, globally-competitive market. Thus, despite the heavy emphasis placed by the syllabus on variance accounting, and the calculation, investigation and interpretation of variances, it is appropriate that, this discussion of standard costing concludes with the (slightly edited) words of Drury (2000):

> It is claimed that the concept of setting standards is not consistent with a . . . philosophy of continuous improvement. When standards are set, a climate is created whereby they represent a target to be achieved and maintained, rather than a philosophy of constant improvement. The . . . philosophy requires that actual performance measures be reported over time, rather than comparisons against a standard, so that the trend in performance can be monitored. Presenting performance measures over time communicates useful feedback information in the amount of rate of change in performance.

However, there is nothing in the process of variance analysis which makes it *inherently* incompatible with continuous improvement; rather, it may be argued that it is the way in which standards have *traditionally* been formulated and maintained which leads to the view quoted above. The standard against which actual performance is measured in variance analysis represents a type of *benchmark*. This benchmark is expressed in financial terms, and has traditionally been *internally* determined, by reference to a company's own costs and procedures.

3.10 Benchmarking

There is now an increasing interest in the use of benchmarking as a means of establishing 'best practice', or standards, by the examination of the practices of *other* organisation relative to a company's own procedures. Benchmarking at its best establishes attainable standards by the examination of both *external* and internal information. If the standards which a firm employs are regularly reviewed in the light of information gained in external as well as internal benchmarking exercises, these standards will embrace continuous improvement by becoming increasingly demanding. The reporting of variances against these updated attainable standards will indicate progress towards them.

External benchmarking is the practice of comparing the critical performance indicators of different organisations. This is frequently carried out by groups of firms that agree to pool information. These firms may not operate in the same geographic areas or may not even be in the same sectors – it is unlikely that direct competitors will agree to voluntarily share information. One can benchmark against an unwilling partner, but the exercise then has to red only on information that is in the public domain or that can be obtained by convert means.

Benchmarked performance indicators may include 'labour cost per unit of output' in a manufacturing concern or 'fee income per dental surgeon' in a dental practice. A benchmarking exercise will usually consider a range of appropriate performance indicators. If a firm finds that it is performing less well than others in respect of any one Indicator then the relevant area of the operation will be a focus for attempted improvements.

Benchmarking can be used as a tool in the establishment of standard manufacturing costs. However, benchmarking is a general performance management tool and is considered further in Chapter 7.

3.11 Developments and current thinking in the application of standard costing

3.11.1 McDonaldization – Another angle on things

Much contemporary discussion concerning the relevance of standard costing in the modern economic environment turns around the manner in which shortened product life cycles and increased customisation of products marginalise the whole concept of the standard cost. Furthermore, the associated 'static optimisation' approach to performance evaluation (through comparison of actual and standard) tends to avoid the whole thrust of modern thinking in areas such as total quality management, continuous improvement and business process re-engineering.

However, one should approach this discussion with a certain caution. In 1993 the American sociologist George Ritzer published his seminal work 'The McDonaldization of Society' (Pine Forge Press), a text which has been reprinted in revised editions on several subsequent occasions. The thrust of this text is that the delivery to market of large-volume, homogenous products (along the lines of McDonald's fast food) offers several advantages which may be grouped under the following headings:

Efficiency. Such products are usually cheap to produce, quick to deliver and efficient in their use of resources. This follows the traditional 'scientific management' approach whereby standardisation of products and production methods leads to cost minimisation.

Calculability. Such products place an emphasis on quantitative considerations such as weight, size, waiting time and price. For example, one measure of the real economic exchange rates of currencies is based on the price of a "Big-Mac" in the different countries concerned.

Predictability. Buyers can confidently purchase a product anywhere they are without having to give too much thought to the matter. A Big-Mac purchased in Chicago is the same as one purchased in Manchester.

Control. The delivery of such products involves the use of a known set of materials and a simple, pre-determined set of tasks. It is therefore easy and meaningful to evaluate performance through comparison of actual inputs with standard inputs.

Ritzer claims that McDonaldization is a social and organisational phenomenon. We need not explore this too deeply, but it is apparent that it is a phenomenon which is entirely consistent with 'Taylorism', scientific management and standard costing (see 'What is a Fair Day's Work?' in Readings at the end of Chapter 2). The conceptual underpinning of McDonaldization is pure 'scientific management'. It might be argued that the thrust of this is deeply traditional and runs counter to the 'new economy' concepts referred to in the first paragraph of this section.

3.11.2 Diagnostic reference groups

One specific area where standard costing currently appears to be flourishing is in healthcare management. For the purposes of remunerating healthcare providers and evaluating the performance of those providers it is often deemed necessary to determine the standard cost of providing healthcare to persons suffering from specific medical conditions.

One response to this is the use of the diagnostic reference group (DRG) otherwise known as the healthcare resource group or case mix group. The medical conditions from which patients admitted to hospital are suffering can be classified into DRGs. Most practical applications of this approach involve the adoption of between 600 and 800 DRGs. Patients within a given DRG all suffer from broadly the same medical condition and will receive broadly the same treatment.

Healthcare funders (insurance companies or the NHS) may undertake to pay a given amount per day to a hospital for the treatment of patients within a particular DRG. That per day rate will be determined with reference to the standard cost of treating a patient within the DRG – having regard to the resources required and the amount that the hospital has to pay for those resources. At the same time, the performance of a hospital may be evaluated by comparing its actual per day costs for given DRGs with the relevant standards. If a hospital incurs a cost of £5,000 per day for treating a patient requiring a liver transplant and the standard cost (or benchmark cost) is £4,000 per day then this comparison offers a comment on the efficiency of the hospital concerned. Similarly, if a hospital takes 23 days to treat a particular DRG and the standard is 19 days, then this also is a comment on its efficiency.

However, the DRG approach is not without its critics. The clinical treatments available for any illness are varied. In the case of heart disease they range from a heart transplant at one extreme to merely counselling on lifestyle and diet at the other extreme. Each patient is different having regard to the detailed nature of the disease, its degree of progression and their own strength and state of general health. The clinician should evaluate each patient individually and decide on the programme of surgery, drugs and lifestyle counselling that is appropriate in each case. However, if a hospital is paid a fixed daily rate for treating a patient in a given DRG, then the clinician will be most reluctant to provide treatment above or below the standard package for that DRG. If treatment is provided above standard then the hospital will not be paid any additional fee, and treatment below standard may result in unpleasant accusations of malpractice being levelled by both patients and funding providers.

The logic of the DRG approach is that each patient who presents with a given set of symptoms is offered a standard package of treatments – which may not always be entirely appropriate. A clinician may be tempted simply to offer the standard package to each patient in a DRG even though he/she may suspect that package to be inadequate in some cases and excessive in others. In effect, the approach may induce a degree of McDonaldization with all patients served the medical equivalent of a Big-Mac. Unless great sensitivity is exercised in its application, the use of DRGs may result in clinical practice being distorted by what is essentially a financial control system.

3.12 Summary

In this chapter we have continued our exploration of the manner in which standard costing can be used as an element in performance evaluation. We have seen that many observers have suggested that standard costing may be in the process of becoming 'last year's model' in terms of its usefulness in the modern economic environment. The modern trend in performance evaluation is towards the use of internal and external benchmarking. Nevertheless, standard costing is a simple approach that is both well understood and widely used.

We will make further reference to various aspects of standard costing and benchmarking as we proceed through this text.

Readings 3

Extract from 'Looking in the mirror' (internal benchmarking)

John P. Puckett III and Philip S. Siegel, *Journal of Business Strategy*, May-June 1997

Most senior executives view external benchmarking as an indispensable management tool. Finding out how their companies stack up against industry leaders provides a yardstick by which to measure performance and, equally important, role models to emulate. For some it has become an obsession to which they devote enormous resources.

But external benchmarking, despite its benefits, is overrated. Many companies are spending countless dollars and man-years seeking something that's right under their noses. By looking in the mirror and appreciating the divergence of performance within their own organisations, they can benchmark to make these internal differences apparent and to help uncover opportunities for capitalising on their unique strengths. The simple truth is a company's own best practices are usually superior to the best company's average practices.

Internal benchmarking will yield solutions that leverage existing knowledge and create more tangible value than external benchmarking. Six factors make this possible:

It's easier to gather the data. External benchmarking relies on competitive data that isn't readily available. When the data is available, it may be neither accurate nor timely. Moreover, it allows a comparison at only one point in time and does not provide a way to continually improve performance. With internal benchmarking, the data is always right at your fingertips.

The comparisons are more relevant. They are more relevant because they relate to your business. You are not comparing yourself to a business that, in truth, is not the same as yours.

It's easier to take action on the results. External benchmarking will identify differences between your company and competitors, but it won't tell you why you are different. Internal benchmarking lets you take that next step and, through a series of interviews and best practice sharing, really understand what behaviors are driving those differences.

It allows you to set sound targets. Performance targets are no longer viewed as arbitrary and unrealistic. A process is in place. Individuals across the organisation are involved. The goals seem achievable because someone in the company is already achieving them. Buy-in increases; whining decreases.

Internal champions exist. Internal benchmarking makes heroes out of the people who already have best practices in place. Pointing to Jane Doe in the phoenix branch, rather than company X or Y, personalises the effort. Everyone knows them and can identify with them. They may even be motivated by them. And, again, since someone in the company is currently doing it, there are no excuses.

It allows continuous improvement. There's always going to be variance in performance across an organisation. Sharing best practices lets management keep raising the bar. One region achieves a record productivity level; a few months later, another region breaks that record. Now, all of the company's regions have an even higher target to shoot for.

Realising the maximum value

The factors most ripe for internal benchmarking are productivity ratios, efficiency response time, cost ratios, and pricing performance. Many of the numerators for such ratios come from a company's finance department, while the denominators often come from information kept by the business units. For example, in many organisations, finance keeps overhead cost data and sales keeps account data, so if you want to benchmark overhead per account, you must combine data sources. You may have to do some digging. Usually, however, there are just one to four high-level metrics that make the most sense for a company to track, with a larger set of measures underlying them.

Internal benchmarking is most valuable when a company has multiple comparable units. These may be business units, branches, plants, sales offices, countries, even products. For example, how does widget plant A's reject rate compare with widget plant B's? Or what is the Asia/Pacific region's unit cost per account vis-à-vis that of Europe?

Conversely, it is difficult to compare the marketing department with the sales department. They don't measure themselves in the same way. But, if a company has six business with six marketing departments, management can benchmark productivity, for example, by looking at what percentage of sales comes from new products.

Market leaders especially stand to benefit from internal benchmarking. If your company is already outperforming the competition, you shouldn't benchmark yourself against the other players. You won't be motivated to improve. You could try to benchmark against the leaders of other industries, but this often lacks credibility and relevance, ultimately adding limited value. But even market leaders have a performance spread internally – the greater the spread, the greater the opportunity for improvement.

Here are examples of how internal benchmarking can work:

Plant economies. A multibillion-dollar commercial printer wanted to improve cost effectiveness across its two dozen plants. So in early 1994 it brought together all of its plant managers to talk about their practices for achieving the lowest possible cost per unit of production across each department – the metric selected to measure plant economies. The disparities among them on every manufacturing cost, from raw materials waste to departmental overhead, were vast. Costs per production unit varied by up to two times, as a percentage of sales, for each cost item.

Surprisingly, volume wasn't the critical factor. Some of the larger plants – despite their apparent size advantage and presumably their significant economies of scale – were outperformed by their smaller counterparts. Instead, the most crucial drivers included set-up time, the number and complexity of accounts, and, frankly, the management's experience.

The group benchmarked and discovered best practices throughout the cost structure. They left the meeting with the goal of reducing plant overhead expense by 15% within two years, a goal they beat within a year. Now they continually measure progress against each other and share Best Practices.

Country business performance. When a multibillion-dollar consumer goods company with operations in almost 100 countries looked at financial returns by country, it found that its operations in some places were well below corporate profit standards. An analysis of each country's cost structure revealed administrative overhead as the primary driver of difference. On an adjusted-scale basis – that is, talking the size of each operation into account – overhead as a percentage of sales ran twice as high in some countries as in others.

The company was surprised to find that smaller countries did not necessarily underperform larger ones; as with the earlier factory example, size turned out not to be factor for success. For instance, the large German operation didn't look that costly to the company, but when adjusted for scale, it performed badly, while the smaller U.K. operation was one of the best performers. One reason countries performed so differently was simply that the company would send a manager to an out-post, and he or she would start something new – there were very few common practices across the company. The country managers used administrative costs divided by direct costs as the key bench-mark to determine whether overhead expenses were too high. The ratio varied by as much as 50% on a scale-adjusted basis.

A joint team of planners and country managers then set standards for that ratio, aiming for 20% overall improvement. The peer pressure helped them beat that number. Now everyone is expected to hit the best performance from the year before in each budget cycle. This has hardwired continuous improvement into their cost structure. However, the company still doesn't prescribe how each country manager should achieve those improvements. Instead, it sets the target and tells managers what their colleagues are doing to reach it.

Just do it

What amazes us about internal benchmarking is how easy it is but how few companies use it. It's much more intuitive process for management than external benchmarking, but lacks its allure. Indeed, while many companies spend a lot of money and manpower on external benchmarking, they often find that their organisations ignore the changes or fight them every step of the way. 'Our company is different,' they say. And, unfortunately, they are right.

Internal benchmarking helps to overcome this resistance. It's a way to uncover hidden pockets of superior performance, catalyse the organisation into spreading its own best practices, make heroes in your own firm rather than legends out of others. And it's already being done in the company!

Spend your time looking in the mirror, not out the window.

Benchmarking

Bob Scarlett – CIMA Insider, October 2003

Benchmarking is the process of improving performance by continuously identifying, understanding (studying and analysing), and adapting outstanding practices and process found inside and outside the organisation and implementing the results

(American Productivity and Quality Centre, 1997)

Benchmarking is an approach to performance management that starts with the premise that whatever the process (supply, production, sales, or services), performance can best be measured and managed by comparing that process with an appropriate outside entity that is already achieving world-class performance. The outside entity used to provide the benchmark need not operate within the same sector as our process. Further the benchmark can be from either another organisation (an 'external' benchmark) or from a different segment within the same organisation (an 'internal' benchmark).

A benchmark provides a standard of excellence against which to measure and compare. Benchmarks are performance measures – How many? (e.g. 'customers served per staff member per hour') How quickly? (e.g. 'delivery time to customer') How high? (e.g. proportion of sales giving rise to repeat business' How low? (e.g. 'proportion of output being defective'). To be meaningful, a benchmark should relate to a 'key performance indicator', that is, something within the business process that has a major influence on results. Establishing benchmarks is a necessary part of benchmarking but of itself does not provide an understanding of best practices nor does knowledge of the benchmarks lead necessarily to improvement. Benchmarking is the learning of lessons about how best performance is achieved. Rather than merely measuring performance, benchmarking focuses on how to improve any given business process by exploiting 'best practices' by discovering the specific practices responsible for high performance, understanding how these practices work, and adapting and applying them to the organisation. A benchmarking exercise may take the form of a process comparison which does not involve the use of metrics.

Some writers identify three distinct approaches to benchmarking:

(1) *metric benchmarking* – the practice of comparing appropriate metrics to identify possible areas for improvement;
(2) *process benchmarking* – the practice of comparing processes with a partner as part of an improvement process;
(3) *diagnostic benchmarking* – the practice of reviewing the processes of a business to identify those which indicate a problem and offer a potential for improvement.

The Xerox corporation is often cited as the pioneer in benchmarking practice. When it wanted to improve performance in its warehousing and distribution operation it did not go down the then conventional road of process redesign. Rather, it identified the business which was acknowledged as being the very best at warehousing and distribution – the L.L. Bean catalogue merchant. L.L. Bean agreed to undertake a co-operative benchmarking project. Over a period the two exchanged data on various aspects of their inventory handling and processing of orders. As a result of this, Xerox identified those areas in its own operation which were performing at below Bean's standards and acted to implement improvements. One critical point to note is that Xerox did not adopt another office equipment business as its model – it adopted a business operating in a different sector altogether.

There are many other high profile cases that have been reported in management literature. When ICL wanted to improve its distribution system, it benchmarked with Marks and Spencer. When Motorola was trying to speed the delivery process of its cellular phones, it benchmarked with Domino's Pizza and Federal Express. American Express is often regarded as having best practice in terms of payment collection and has provided a benchmark for many other businesses most of which are not in the financial services sector.

Many benchmarking exercises have been sponsored by trade organisations, academic groups and government departments. For example, the Department of the Environment has published the *Business Guide to Energy Costs in Buildings*, prepared with the support of CIMA. This Guide reports energy usage across a wide variety of buildings including offices, factories, shops, stores and banks throughout the UK. Energy usage is reported using the simple metric 'energy consumption per square metre of floorspace' for each type of building with two figures given – one for typical consumption and one for best practice consumption. Each user has to multiply these metrics by an appropriate location factor (allowing for climate differences – 1.1 for Scotland and 0.8 for Southern England) in order to make a comparison with own consumption meaningful.

Energy consumption in a building is very much influenced by its design, equipment and management. Wall insulation, double glazing, energy efficient light bulbs and simple practices such as switching off computers outside office hours can all achieve substantial cost savings. Problems and possibilities in this regard may not be apparent to a business until a benchmarking exercise is undertaken. The DoE reports cases where energy saving programmes undertaken by businesses have saved up to 60% of energy costs in certain buildings.

A 1999 article in the journal *Total Quality Management*,[1] the formation of a regional benchmarking network based on the Newcastle Business School is described. Businesses from the North East subscribed to the network and formed eight special interest groups (each with a facilitator) in order to undertake a variety of process benchmarking exercises.

Benchmarking in all its varied forms is becoming increasingly widespread in industry, services and the public sector. In particular, it is perceived to offer a more sophisticated tool in performance management than more traditional approaches such as standard costing. The general thrust behind this idea is that standard costing belongs in the era when goods were produced in long continuous production runs and a high proportion of costs were ‘product specific’. In the new economy, goods tend to be highly customised, contain a significant service element and are produced in short discontinuous production runs on a JIT basis. A large proportion of product costs are determined at the design stage or are ‘customer specific’, that is, they relate to the manner in which the goods are provided to the customer. Efficiency is therefore very much a function of product engineering, the flexibility of the production operation and customer relationship management. It is argued that the traditional budgetary control report based on standard costing simply does not address these issues.

A comprehensive system of benchmarking can provide a much fuller impression of how well or badly an operation is performing. And, it is more likely to give an indication of those areas in the operation that are amenable to improvement. That said, benchmarking has its critics. For example:

> Benchmarking relies on competitive data that isn’t readily available. When the data is available, it may be neither accurate nor timely. Moreover, it allows a comparison at only one point in time and does not provide a way to continually improve performance.
>
> John Pucket, Boston Consulting Group (quoted from 1997)

That is fair comment, but the discussion above indicates some of the ways in which such criticism might be answered. For one thing, benchmarking need not rely on competitive data. As with most business techniques, benchmarking has to be carried out well if it is to yield results.

The ‘pursuit of best practice’ concept is widely regarded as the way of the future and has become increasingly popular among practitioners of various management disciplines since the 1990s. The ever-growing literature on benchmarking indicates its widespread adoption. It is forecast that this momentum will grow in the future as benchmarking becomes the normal way organisations conduct business.

Note

1. ‘Collaborating to compete: benchmarking through regional partnerships.’ By David Yarrow and Vas Prabhu – Total Quality Management, 7/99.

This Page Intentionally Left Blank

Revision Questions 3

Question 1

The following data relates to both questions 1.1 and 1.2.

P Ltd operates a standard costing system. The following information has been extracted from the standard cost card for one of its products:

Budgeted production		1,250	units
Direct material cost	7 kg @ £4.10 per kg	£28.70	per unit
Actual results for the period were as follows:			
Production		1,000	units
Direct material (purchased and used)	7,700 kg	£33,880	

It has subsequently been noted that the market price of the material was £4.50 per kg during the period.

1.1 The value of the planning variance is

(A) £1,225 adverse.
(B) £2,800 adverse.
(C) £3,500 adverse.
(D) £4,375 adverse.
(E) £5,950 adverse.

(2 marks)

1.2 The value of the material usage variance is

(A) £2,870 adverse.
(B) £3,080 adverse.
(C) £3,150 adverse.
(D) £3,587.50 adverse.
(E) £3,937.50 adverse.

(2 marks)

The following data is to be used to answer questions 1.3 and 1.4 below.

SW plc manufactures a product known as the TRD100 by mixing two materials. The standard material cost per unit of the TRD100 is as follows:

		£
Material X	12 litres @ £2.50	30
Material Y	18 litres @ £3.00	54

In October 2002, the actual mix used was 984 litres of X and 1,230 litres of Y. The actual output was 72 units of TRD100.

1.3 The total material mix variance reported was nearest to

(A) £102 (F)
(B) £49 (F)
(C) £49 (A)
(D) £151 (A)

(3 marks)

1.4 The total material yield variance reported was nearest to

(A) £102 (F)
(B) £49 (F)
(C) £49 (A)
(D) £151 (A)

(2 marks)

The following data is to be used to answer questions 1.5, 1.6 and 1.7 below

Q plc sells a single product. The standard cost and selling price details are as follows:

	£
Selling price per unit	200
Unit variable costs	124
Unit fixed costs	35

During October 2002, a total of 4,500 units of the product were sold, compared to a sales and production budget of 4,400 units. The actual cost and selling price details were as follows:

	£
Selling price unit	215
Unit variable costs	119
Unit fixed costs	40

1.5 The budgeted margin of safety is closest to

(A) 100 sales units.
(B) £154,000 sales value.
(C) £334,000 sales value.
(D) £475,000 sales value.

(2 marks)

1.6 The sales volume contribution variance for October was

(A) £4,100(F)
(B) £5,600(F)
(C) £7,600(F)
(D) £9,600(F)

(2 marks)

1.7 The sales price variance for October was

(A) £20,000(F)
(B) £21,500(F)

(C) £66,000(F)
(D) £67,500(F)

(2 marks)
(Total = 20 marks)

1.8 The standard ingredients of 1 kg AB are 0.7 kg A (cost £5 per kg) and 0.3 kg B (cost £8 per kg). In the current period, 100 kg AB has been produced using 68 kg A and 32 kg B. The material mixture variance is:

(A) nil
(B) £10 adverse
(C) £6 favourable
(D) £12 favourable
(E) £6 adverse

1.9 Based on original standards, the standard requirement for the work achieved in the current period is 100 labour hours at a rate of £12 per hour. However, labour efficiency has increased by 20 per cent (that is, 20 per cent more output can be achieved from the same hours) and the standard has been revised to allow for this. The labour efficiency planning variance is:

(A) £100 favourable
(B) £150 adverse
(C) £60 favourable
(D) nil
(E) £200 favourable

The following data are to be used to answer questions 1.10 and 1.11 below

The following extract from a standard cost card shows the materials to be used in producing 100 litres of an agricultural fertiliser.

Material H	30 litres	@ $4.00 per litre
Material J	50 litres	@ $3.50 per litre
Material K	40 litres	@ $6.50 per litre
	120	

During April 5,400 litres of the agricultural fertiliser were produced using the following materials:

Material H	1,860 litres
Material J	2,450 litres
Material K	2,740 litres
	7,050

1.10 The total material mix variance to be reported for April is nearest to

(A) $2,636 (A)
(B) $1,219 (A)
(C) $1,219 (F)
(D) $2,636 (F)

1.11 The total material yield variance to be reported for April is nearest to

(A) $2,636 (A)
(B) $1,219 (A)
(C) $1,219 (F)
(D) $2,636 (F)

? Question 2

Super Clean products Ltd manufactures 'Whizzoh'. Whizzoh comprises three basic ingredients, the standard mix and price of which are as follows:

To produce 1 kg of Whizzoh:

HCB (hydrocarbon base)	0.9	kg at 5p per kg
SHC (sodium hypochlorite)	0.1	kg at 21p per kg
WM7 (a secret formula)	0.05	kg at 29p per kg
	1.05	kg

SHC and WM7 are the active ingredients and are interchangeable. Super Clean Products Ltd's production facilities are highly automated and there is no direct labour. Fixed overheads are budgeted at £10,000 per month and production is budgeted to run at 20,000 kg of Whizzoh per month. Fixed overheads are absorbed through HCB usage. During the course of January, 21,500 kg of Whizzoh are produced with the following figures for material consumption:

HCB	19,100	kg at 5.1p per kg
SHC	2,800	kg at 20p per kg
WM7	980	kg at 33p per kg
	22,880	kg

Fixed overheads during the period were £10,000.

Requirement

Reconcile standard and actual costs in January using a full variance analysis.

(25 marks)

? Question 3

PH plc operates a modern factory that converts chemicals into fertiliser. Because the demand for its product is seasonal, the company expects that there will be an average level of idle time equivalent to 20% of hours paid. This is incorporated into the company's standard costs, and the standard labour rate of £6.00 per hour paid is then adjusted accordingly. Any difference between the expected and actual amount of idle time is reported as the 'idle time variance' and is valued at the adjusted wage rate.

Data for each of the four months January to April 2002 is as follows:

	January	*February*	*March*	*April*
Actual hours paid	10,000	14,000	17,000	30,000
Actual productive hours	7,200	10,304	12,784	23,040
Standard hours produced	6,984	9,789	11,889	20,966
Idle time variance	£6,000 (A)	£6,720 (A)	£6,120 (A)	?
Efficiency variance	£1,620 (A)	£3,863 (A)	£6,713 (A)	?

Requirements

(a) Calculated the idle time variance and the efficiency variance for April.

(4 marks)

(b) (i) Using the data provided and your answer to (a) above as appropriate, prepare a percentage variance chart that shows the trend of these variances. (Use graph paper and show both variances on the same chart.)

(ii) Comment on the usefulness of presenting the information in this format.

(10 marks)

(c) Comment briefly on the possible inter-relationships between the idle time variance and the efficiency variance.

(4 marks)

(d) Explain briefly the factors that should be considered before deciding to investigate a variance.

(7 marks)
(Total = 25 marks)

Question 4

Variance analysis involves the separation of individual cost variances into component parts. The benefit that may be derived from variance analysis depends on the interpretation and investigation of the component variances. A company has recently been carrying out a study on its use of variance analysis.

Requirements

Explain, with the aid of simple numeric examples, for each of the following variance analysis exercises:

their logic, purpose and limitation; and
how the management accountant should go about investigating the component variances disclosed.

(a) The separation of the fixed overhead volume variance into capacity utilisation and efficiency components.
(b) The separation of the materials usage variance into materials mixture and materials yield components.
(c) The separation of the labour rate variance into planning and operational components.

This Page Intentionally Left Blank

Solutions to Revision Questions 3

Solution 1

1.1

Planning variance		£
Ex-ante Standard	7 kg × £4.10 × 1,000	28,700
Ex-post Standard	7 kg × £4.50 × 1,000	31,500
Variance		2,800 (A)

Therefore the answer is (B)

1.2

Material usage variance		*kg*
Ex-post standard	7 kg × 1,000	7,000
Actual		7,700
Variance		700 × £4.50/kg = £3,150 (A)

Therefore the answer is (C)

1.3

	Actual mix litres	*Standard mix litres*	*Difference litres*	*Price £*	*Variamce £*
X	984	885.6	98.4 (A)	2.50	246.0 (A)
Y	1,230	1,328.4	98.4 (F)	3.00	295.2 (F)
Totals	2,214	2,214.0	nil		49.2 (F)

Therefore the answer is (B)

1.4

Expected output $= \frac{2{,}214}{30}$ = 73.8 units
Actual output = 72.0 Units
Shortfall = 1.8 units
1.8 units × £84/unit = 151.2 (A)

Therefore the answer is (D)

1.5

Budgeted fixed costs = 4,400 units × £35/unit = £154,000
Budgeted contribution/unit = £200 − £124 = £76
Budgeted breakeven point (units) = $\frac{£154,000}{£76}$ = 2,026 units
Budgeted sales units = 4,400.00 units
Budgeted margin of safety (units) = 4,400 − 2,026 = 2,374
Budget margin of safety (sales value) = 2,374 × £200 = £474,800

Therefore the answer is (D)

1.6

100 units × (£200 − £124) = £7,600 (F)

Therefore the answer is (C)

1.7

4,500 units × (£200 − £215) = £67,500 (F)

Therefore the answer is (D)

1.8 Answer: (E)

£6 adverse – standard mix is 70 kg A plus 30 kg B, from which it follows that the mixture variance is 2 kg A @ £5 (favourable) plus 2 kg B @ £8 (adverse).

1.9 Answer: (E)

£200 favourable. Since output that required 100 hours under orginal standards now requires 83.333 hours (100 hours ÷ 1.2) it follows that the planning efficiency variance is 16.666 hours favourable with a cost of £200 (16.666 × £12).

1.10

	Actual mix litres	*Standard mix litres*	*Differnce litres*	*Standard price $/litre*	*Variance $*
H	1,860	1,762.5	97.5	4.00	390.00 (A)
J	2,450	2,937.5	(487.5)	3.50	1,706.25 (F)
K	2,740	2,350.0	390.0	6.50	2,535.00 (A)
Total	7,050	7,050	nil		1,218.75 (A)

Therefore the answer is (B)

1.11

Standard cost per litre of output:

		$
H	30 litres @ $4.00	120.00
J	50 litres @ $3.50	175.00
K	40 litres @ $6.50	260.00
Total		555.00 per 100 litres

Actual input of 7,050 litres should yield 100/120 litres of output =	5,8750 litres
Actual output	5,400 litres
Shortfall	475 litres

475 litres @ $555.00 per 100 litres = $2,636.25 (A)

Therefore the answer is (A)

✓ Solution 2

In answering this it is critical to appreciate that you are being invited to reconcile standard and actual costs – not budget and actual costs. Failing to grasp this is one of the most common problems that student accountants have when undertaking variance analysis exercises.

In specifying 'a full variance analysis' the question invites calculation of material mix/yield variance and fixed overhead capacity usage/efficiency variances.

Notes that since budget fixed overheads equals actual fixed overheads, there will be no fixed overhead expenditure variance.

Standard material cost of 1 kg of Whizzoh is:

	Input	*Unit cost*	*Total cost*
	kg	*p/kg*	*£*
HCB	0.90	5	0.0450
SHC	0.10	21	0.0210
WM7	0.05	29	0.0145
	1.05		0.0805

Standard overhead cost of 1 kg Whizzoh is:

0.9 kg of HCB @ £0.55555 = £0.50

The £0.55555 absorption rate is budgeted overheads (£10,000) divided by budgeted HCB usage (18,000 kg).

Variance calculations	£	£
Standard cost of output		
Materials: (21,500 kg × £0.0805)	1,730.75	
Overheads: (21,500 kg × 0.9hrs × £0.5555)	10,749.89	
Total		12,480.64
Actual cost of output		
Materials	1,857.50	
Overheads	10,000.00	
Total		11,857.50
Cost variance		623.14 favourable
	£	£
Material price variance		
A: 19,100 kg × (5p − 5.1p)	(19.10) A	
B: 2,800 kg × (21p − 20p)	28.00 F	
C: 980 kg × (29p − 33p)	(39.20) A	
Total		(30.30) A
Material mixture variance		
A: (19,611 kg standard − 19,100 kg actual) × 5p	25.57 F	
B: (2,179 kg standard − 2,800 kg actual × 21p	(130.40) A	
C: (1,089 kg standard − 980 kg actual × 29p	31.76 F	
Total		(73.07) A

	£	
Material yield variance		
((22,880 kg ÷ 1.05) − 21,500 kg) × £0.0805	(23.38)	A
Fixed overhead capacity		
(19,100 kg actual − 18,000 kg budget) × £0.55555	611.11	F
Fixed overhead efficiency		
(19,350 kg standard − 19,100 kg actual) × £0.55555	138.89	F
Cost variance total	623.00	F

Note: In calculating the mixture variance for A, the standard amount of A in the mix is 22,880 kg (actual input) ÷ 1.05 × 0.09

Solution 3

(a) Standard rate per hour worked $= \dfrac{£6.00}{0.8} = £7.50$

Idle time variance:

Expected idle time = 20% × 30,000 hours = 6,000 hours
Actual idle time = 30,000 − 23,040 = 6,960 hours
960 hours

960 hours × £7.50 per hour = £7,200 Adverse

Efficiency variance:

Standard hours produced = 20,966
Actual hours worked = 23,040
2,074 hours

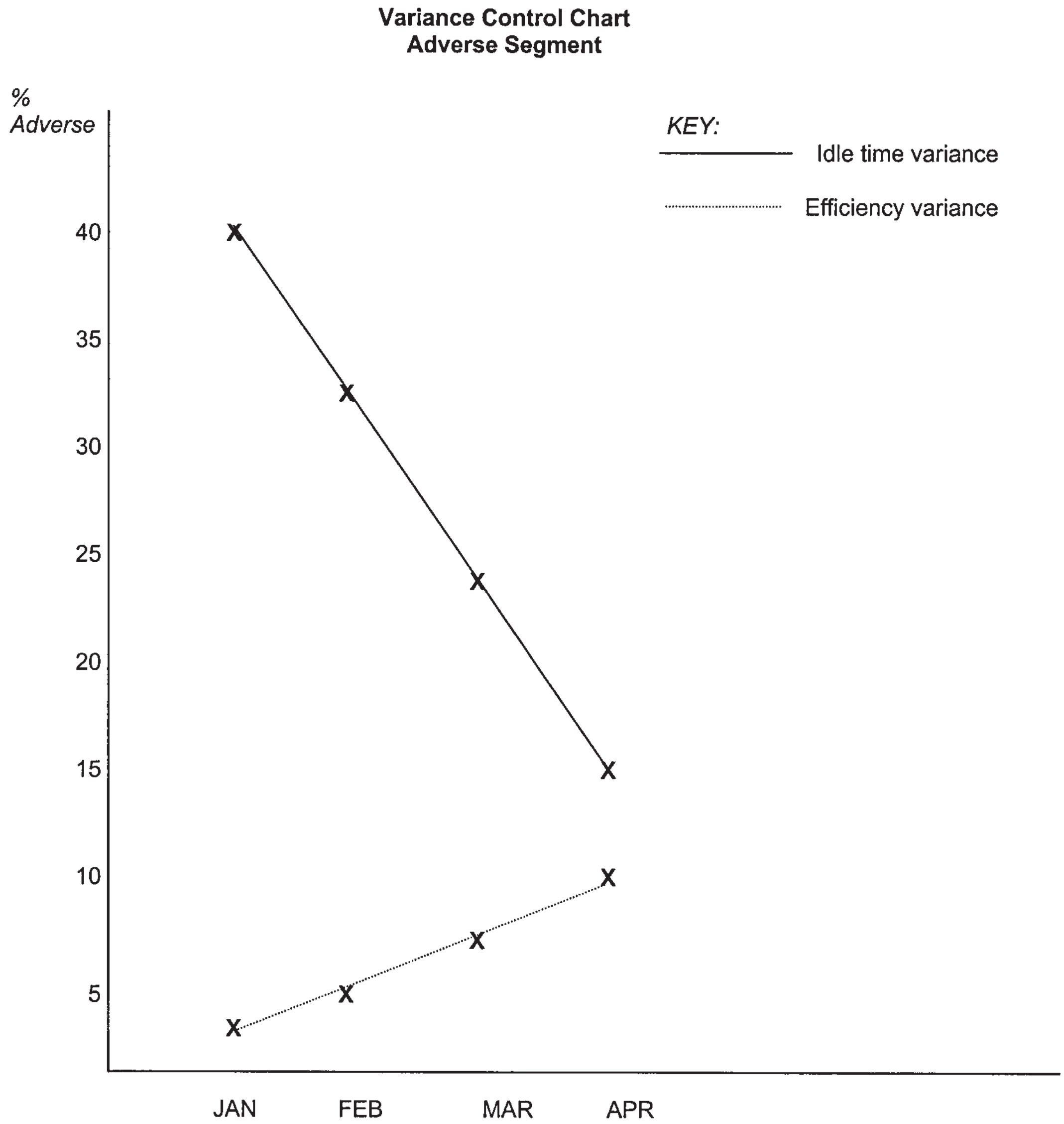
2,074 hours × £7.50 per hour = £15,555 Adverse

(b) (i) Calculations for graph (expressing variances as % of standard)

Idle time	*Standard cost of expected Idle time*	*Idle time variance*	
	£	£	%
January	15,000	6,000 (A)	40 (A)
February	21,000	6,720 (A)	32 (A)
March	25,500	6,120 (A)	24 (A)
April	45,000	7,200 (A)	16 (A)

Efficiency	*Standard cost of Standard hours Produced*	*Efficiency variance*	
	£	£	%
January	52,380	1,620 (A)	3 (A)
February	73,418	3,863 (A)	5 (A)
March	89,168	6,713 (A)	8 (A)
April	157,245	15,555 (A)	10 (A)

See graph overleaf.



(ii) Many managers find the graphical presentation of variances easier to understand than a series of figures presented in a tabular format. By presenting the variances over time the trend can be identified, and this used to decide if any control action is required.

In this question, the variances have been expressed as percentages of the standard cost, rather than expressing them in monetary amounts. The use of percentages removes the changes in the monetary size of the variances caused by changing activity levels and this improves the trend information that is provided.

(c) The idle time variance and the efficiency variance are sub-variances of the overall efficiency variance.
As can be seen from the control chart, the idle time variance has reduced over the period, while the efficiency variance has increased. This could be because the employees

are deliberately taking longer to complete their tasks to avoid being idle because of a lack of work.

(d) There are a number of factors to be considered before investigating a variance. These include:

the size of the variance;
the likelihood of identifying the cause of the variance;
the likelihood that the cause of the variance is controllable;
the likely cost of correcting the cause;
the cost of the investigation.

The overall factor that will determine whether or not to investigate a variance is whether or not there will be a positive benefit from the investigation.

✓ Solution 4

The question invites you to develop examples to illustrate the calculation of certain variances. A student whose study of variance analysis consisted of memorising formulae would have difficulty.

Note that the question specifies simple examples. In developing an example to illustrate material mixture and yield variances, you should use only two materials.

Note that the question invites an exploration of the labour rate variance. You should not include a labour efficiency variance in your example.

(a) The materials usage variance shows the standard costs of the variation in quantity of materials used from the standard for a given level of output. The mixture component arises from using different relative proportions of the constituent raw materials from the budget. The yield component reflects any difference between the actual output achieved and that expected based upon the standard operation. For example:

	Standard	*Actual*
Input for 100 kg of product AB	60 kg of A at £1.00/kg	64 kg of A at £1.10/kg
	40 kg of B at £1.30/kg	38 kg of B at £1.25/kg

The materials usage variance is £1.40 adverse, that is, 2 kg B × £1.30 − 4 kg A × £1.00.

The materials mixture component is £0.84 favourable, that is 2.8 kg B × £1.30 − 2.8 kg A × £1.00.

Alternatively, the materials mix variance can be worked on an average ingredient price of £1.12 (i.e., £112/10 kg). In this case the mix variance is (2.8 kg A × £0.12) + (2.8 kg B × £0.18) = £0.84 favourable.

The materials yield component is £2.24 adverse, that is, 2 kg of AB at standard cost of (0.6 × 1 + 0.4 × 1.30).

(b) The purpose is the same as for part (a). The limitation is that this model assumes that there is no change in the quality of the product AB produced from different proportions of A and B. This is not likely to be true in practice where 'side' chemical reactions may become more prevalent, which may render the product unsuitable for its intended purpose. Investigation of the variances would consider:

Mixture variance: ingredients used, material control and wastage;
Yield variance: efficiency of equipment and the quality of materials used.

(c) The labour rate variance is the difference between the actual cost incurred for the actual hours worked and the costs for working the actual amount of hours using the budgeted labour rate. The operational component arises from any changes in the rate of pay, which were a consequence of the way labour was operated, for example allowing a discretionary extra payment for poor working conditions. The planning component shows the change in labour rate due to inadequacies to inaccuracies in the preparation of the original budget. For example, the anticipated annual pay increase may have been different from that obtained by the workforce:

Actual hours worked	100
Actual wages paid	£500
Original standard wage rate	£4.00 per hour
Revised standard wage rate for the period	£5.20 per hour

The labour rate variance is £100 adverse, that is, $(500 - (4 \times 100))$.
The operational component is £20 favourable, that is, $(500 - (5.20 \times 100))$.
The planning component is £120 adverse, that is, (100×1.20).

Again, the purpose is the same as for part (a). The limitation of this subdivision is that it is rare for there to be a controllable (operational) reason for the labour rate variance. In general, labour rates are fixed by the marketplace, that is, they are uncontrollable (planning) variances.

Thus, this subdivision is an unnecessary complication that will rarely provide an insight that is an improvement on that provided by the labour rate variance. However, any investigation would focus on the establishment of wages rates and labour recruitment, whereas investigation of the operational variance would look at the actual payment of wages and the control of payroll.

This Page Intentionally Left Blank

4 Basic Aspects of Management Accounting

Learning Outcomes

The contents of this chapter provides the theory that underpins material in subsequent chapters. As such it contributes to the Learning Outcomes of those chapters. However, none of the Learning Outcomes for Performance Evaluation draw wholly on material from this chapter.

4.1 Introduction

You should have encountered the basic principles of cost and revenue behaviour in your Foundation (or equivalent) studies. The major part of this chapter amounts to a revision of those basic principles.

You are reminded, once again, that the CIMA examination scheme is cumulative and Performance Evaluation examination questions may draw heavily on material taken from Foundation studies. This may be a critical issue for students who were exempted from or only narrowly passed Foundation examinations, or who passed Foundation examinations some time ago.

Much of the content of this chapter is 'assumed prior knowledge' for Performance Evaluation studies and for material covered in subsequent chapters of this text. If you are entirely familiar with the basic aspects of management accounting then you may prefer just to skim-read this chapter. However, you are advised not to ignore it completely – particularly the sections on relevant costs and limiting factor analysis.

4.2 Cost behaviour

Many factors affect the level of costs incurred; for instance inflation will cause costs to increase over a period of time. In management accounting, when we talk about cost behaviour we are referring to the way in which costs are affected by fluctuations in the level of activity.

The level of activity can be measured in many different ways. For example, we can record the number of units produced, miles travelled, hours worked, percentage of capacity utilised and so on.

An understanding of cost behaviour patterns is essential for many management tasks, particularly in the areas of planning, decision-making and control. It would be impossible for managers to forecast and control costs without at least a basic knowledge of the way in which costs behave in relation to the level of activity.

In this section, we will look at the most common cost behaviour patterns and we will consider some examples of each.

4.2.1 Fixed cost

The CIMA *Terminology* defines a fixed cost as 'a cost which is incurred for an accounting period, and which, within certain output or turnover limits, tends to be unaffected by fluctuations in the levels of activity (output or turnover)'.

Another term which can be used to refer to a fixed cost is a period cost. This highlights the fact that a fixed cost is incurred according to the time elapsed, rather than according to the level of activity.

A fixed cost can be depicted graphically as shown in Figure 4.1.

Examples of fixed costs are rent, rates, insurance and executive salaries.

The graph shows that the cost is constant (in this case at £5,000 for all levels of activity. However it is important to note that this is only true for the relevant range of activity. Consider, for example, the behaviour of the rent cost. Within the relevant range it is possible to expand activity without needing extra premises and therefore the rent cost remains constant. However if activity is expanded to the critical point where further premises are needed, then the rent cost will increase to a new, higher level.

This cost behaviour pattern can be described as a stepped fixed cost (Figure 4.2).

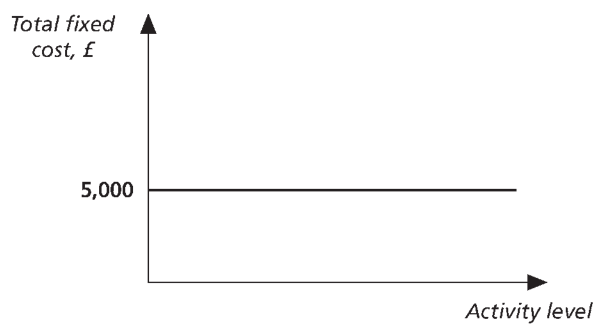


Figure 4.1 Fixed cost

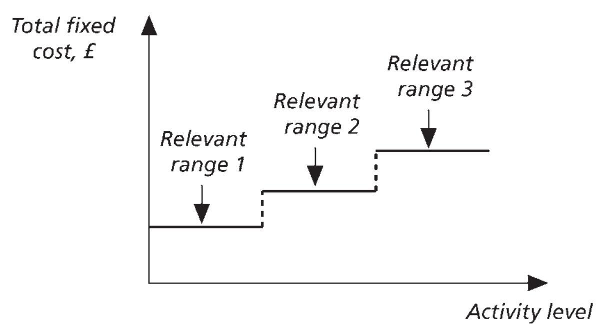


Figure 4.2 Stepped fixed cost

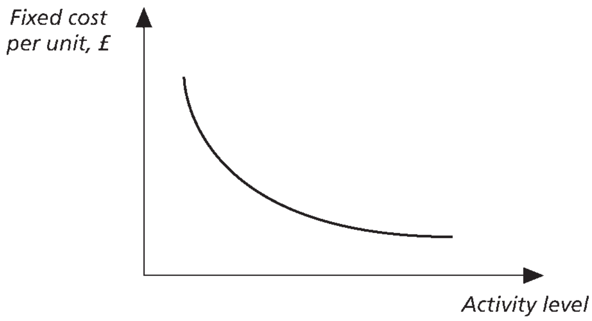


Figure 4.3 Fixed cost per unit

The cost is constant within the relevant range for each activity level but when a critical level of activity is reached, the total cost incurred increases to the next step.

The possibility of changes occurring in cost behaviour patterns means that it is unreliable to predict costs for activity levels which are outside the relevant range. For example, out records might show the cost incurred at various activity levels between 100 units and 5,000 units. We should therefore try to avoid using this information as the basis for forecasting the level of cost which would be incurred at an activity of, say, 6,000 units, which is outside the relevant range.

This warning does not only apply to fixed costs: it is never wise to attempt to predict costs for activity levels outside the range for which cost behaviour patterns have been established.

When you are drawing or interpreting graphs of cost behaviour patterns, it is important that you pay great attention to the label on the vertical axis. In Figures 4.1 and 4.2 the graphs depicted the total cost incurred. If the vertical axis had been used to represent the fixed cost per unit, then it would look as shown Figure 4.3.

The fixed cost per unit reduces as the activity level is increased. This is because the same amount of fixed cost is being spread over an increasing number of units.

4.2.2 Variable cost

The CIMA *Terminology* defines a variable cost as 'a cost which varies with a measure of activity'.

Examples of variable costs are direct material, direct labour and variable overheads.

Exercise 4.1

Figure 4.4 depicts the total variable cost at each activity level. Can you draw a sketch graph of the variable cost per unit?

Figure 4.4 depicts a linear variable cost. It is a straight line through the origin which means that the cost is nil at zero activity level. When activity increases, the total variable cost increases in direct proportion, i.e. if activity goes up by 10 per cent, then the total variable

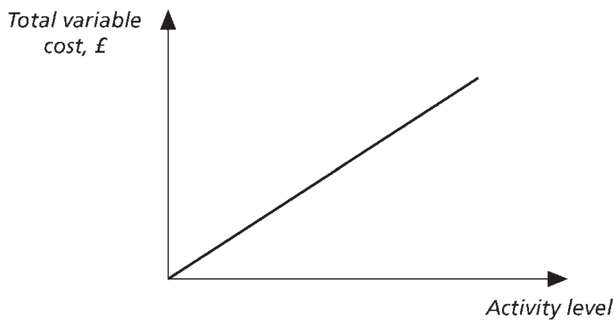


Figure 4.4 Linear variable cost

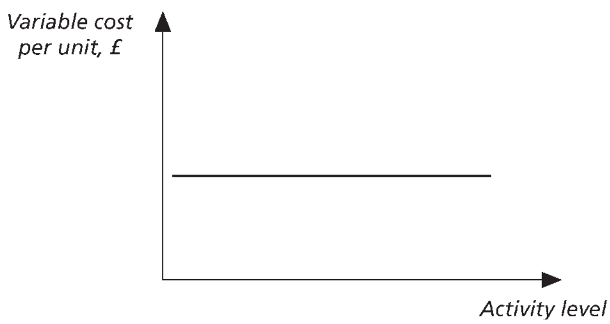


Figure 4.5 Variable cost per unit

cost also increases by 10 per cent, as long as the activity level is still within the relevant range.

The gradient of the line will depend on the amount of variable cost per unit.

If you attempted Exercise 1.4, then your graph of variable cost per unit should look like Figure 4.5.

The straight line parallel to the horizontal axis depicts a constant variable cost per unit, within the relevant range.

In most examination situations, and very often in practice, variable costs are assumed to be linear. Although many variable costs do approximate to a linear function, this assumption may not always be realistic. A variable cost may be non-linear as depicted in either of the diagrams in Figure 4.6.

These costs are sometimes called curvilinear variable costs.

The graph of cost A becomes steeper as the activity level increases. This indicates that each successive unit of activity is adding more to the total variable cost than the previous unit. An example of a variable cost which follows this pattern could be the cost of direct labour where employees are paid an accelerating bonus for achieving higher levels of output. The graph of cost B becomes less steep as the activity level increases. Each successive unit of activity adds less to total variable cost than the previous unit. An example of a variable cost which follows this pattern could be the cost of direct material where quantity discounts are available.

Exercise 4.2

Can you think of other variable costs which might follow the behaviour patterns depicted in Figure 4.6?

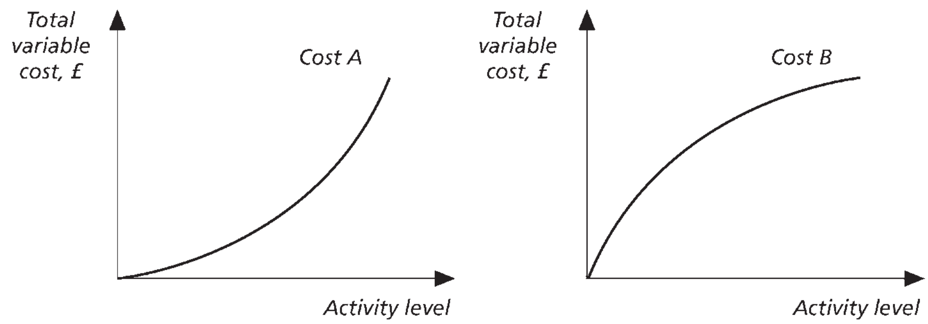


Figure 4.6 Non-linear variable costs

The important point is that managers should be aware of any assumptions that have been made in estimating cost behaviour patterns. They can then use the information which is based on these assumptions with a full awareness of its possible limitations.

4.2.3 Semi-variable cost

A semi-variable costs is also referred to as a semi-fixed or mixed cost. The CIMA *Terminology* defines it as 'a cost containing both fixed and variable components and which is thus partly affected by a change in the level of activity'.

A graph of a semi-variable cost might look like Figure 4.7.

Examples of semi-variable costs are gas and electricity. Both of these expenditures consist of a fixed amount payable for the period, with a further variable amount which is related to the consumption of gas or electricity.

Alternatively a semi-variable cost behaviour pattern might look like Figure 4.8.

This cost remains constant up to a certain level of activity and then increases as the variable cost element is incurred. An example of such a cost might be the rental cost of a photocopier where a fixed rental is paid and no extra charge is made for copies up to a certain number. Once this number of copies is exceeded, a constant charge is levied for each copy taken.

Exercise 4.3

Can you think of other examples of semi-variable costs with behaviour patterns like those indicated in Figures 4.7 and 4.8?

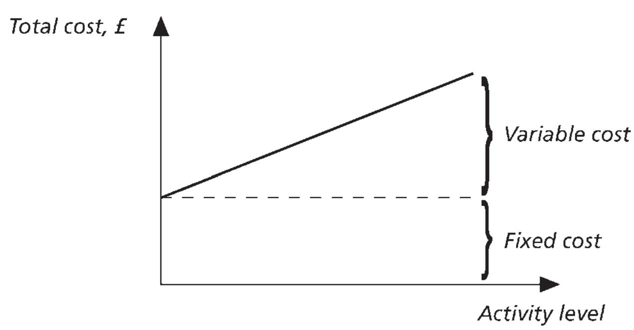


Figure 4.7 Semi-variable cost

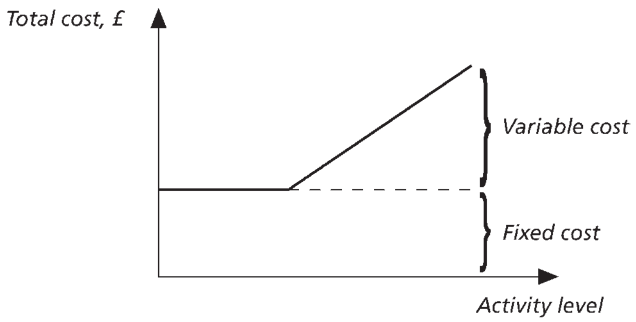


Figure 4.8 Semi-variable cost

4.2.4 Analysing semi-variable costs

The semi-variable cost behaviour pattern depicted in Figure 4.7 is most common in practice and in examination situations.

When managers have identified a semi-variable cost they will need to know how much of it is fixed and how much is variable. Only when they have determined this will they be able to estimate the cost to be incurred at relevant activity levels. Past records of costs and their associated activity levels are usually used to carry out the analysis. The three most common methods used to separate the fixed and variable elements are as follows:

(a) The high–low method.
(b) The scattergraph method.
(c) The least squares method of regression analysis.

You will be learning about the least squares method in your studies of *Business Mathematics*. In this text we will look at methods (a) and (b) in more depth.

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. The highest and lowest points are selected to try to use the greatest possible range of data. This improves the accuracy of the result.

Example: the high–low method

A company has recorded the following data for a semi-variable cost:

Month	*Activity level* units	*Cost incurred* £
January	1,800	36,600
February	2,450	41,150
March	2,100	38,700
April	2,000	38,000
May	1,750	36,250
June	1,950	37,650

The highest activity level occurred in February and the lowest in May. Since the amount of fixed cost incurred in each month is constant, the extra cost resulting from the activity increase must be the variable cost.

	Activity level units	£
February	2,450	41,150
May	1,750	36,250
Increase	700	4,900

The extra variable cost for 700 units is £4,900. We can now calculate the variable cost per unit:

$$\text{Variable cost} = \frac{4{,}900}{700} = £7 \text{ per unit}$$

Substituting back in the data for February, we can determine the amount of fixed cost:

February	£
Total cost	41,150
Variable cost (2,450 units × £7)	17,150
Therefore, fixed cost per month	24,000

Now that the fixed and variable cost elements have been identified, it is possible to estimate the total cost for any activity level within the range 1,750 units to 2,450 units.

The scattergraph method

This method takes account of all available historical data and it is very simple to use. However it is very prone to inaccuracies that arise due to subjectivity and the likelihood of human error.

1. First a scattergraph is drawn which plots all available pairs of data on a graph.
2. Then a line of best fit is drawn by eye. This is the line which, in the judgement of the user, appears to be the best representation of the gradient of the sets of points on the graph. This is demonstrated in Figure 4.9.

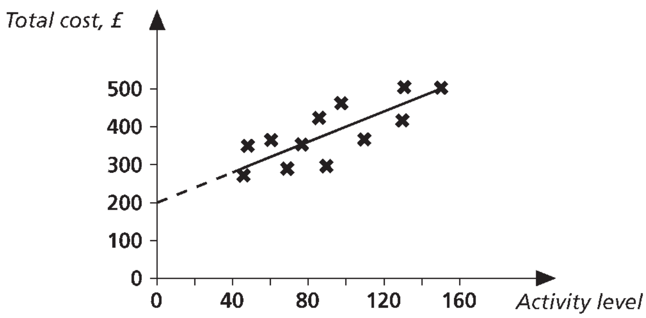


Figure 4.9 Scattergraph

! The inaccuracies involved in drawing the line of best fit should be obvious to you. If you had been presented with this set of data, your own line of best fit might have been slightly different from ours.

3. The point where the extrapolation of this line cuts the vertical axis (the intercept) is then read off as the total fixed cost element. The variable cost per unit is given by the gradient of the line.
   From Figure 4.9, the fixed cost contained within this set of data is adjudged to be £200.
   The variable cost is calculated as follows:

   Cost for zero units = £200
   Cost for 150 units = £500

   $$\text{Gradient (i.e. variable cost)} = \frac{500 - 200}{150 - 0} = £2 \text{ per unit}$$

4.2.5 Using historical data

The main problem which arises in the determination of cost behaviour is that the estimates are usually based on data collected in the past. Events in the past may not be representative of the future and managers should be aware of this if they are using the information for planning and decision-making purposes.

4.3 Costs and activity based techniques (ABTs)

Since the mid-1980s, ABTs have been at the forefront of developments in management accounting. The use of ABTs will be explored in some depth later in this text.

The general background to ABTs is discussed in 'Activity Based Techniques', one of the Readings items attached to Chapter 8 of this text. This article should be accessible to you at this point and you may care to read forward to it if the topic interests you.

The key point to note for now is that costs can be collected and reported in various different ways. One way is to report them according the activities that they contribute to. For example, the overhead costs associated with the stores operation of a manufacturing business for period X can be reported as follows:

(1) Chart of accounts view

	£
Indirect wages	50,000
Rent of premises	25,000
Maintenance of equipment	5,000
Total	80,000

And/or:

(2) Activity-based view

	£	*Activities*	*£ per Activity*
Placing orders	40,000	2,000 orders	20
Receipt of deliveries	30,000	3,000 receipts	10
Issues of supplies	10,000	10,000 issues	1
Total	80,000		

The traditional management accounting treatment of these costs would be to treat them as fixed overheads and absorb them into product costs using some arbitrary overhead absorption base such as direct labour hours. This logic follows the chart of accounts view shown above.

In fact, few costs are truly fixed if you take a long enough time horizon, consider a wide enough span of activity levels and study the costs carefully to determine what activities they vary with. If costs are reported according to the activities they relate to, then one obtains the Activity Based view shown above. This provides a sensitive view of costs that can be used for a variety of management purposes. We will explore those purposes as we progress through this text and consider ABTs such as activity-based costing (ABC), activity-based budgeting (ABB) and activity-based management (ABM).

4.4 Breakeven or cost–volume–profit analysis

Cost–volume–profit (CVP) analysis is defined in CIMA's *Official Terminology* as 'the study of the effects on future profit of changes in fixed cost, variable cost, sales price, quantity and mix'.

A more common term used for this type of analysis is *breakeven analysis*. However, this is somewhat misleading, since it implies that the focus of the analysis is the *breakeven point*, i.e. the level of activity that produces neither profit nor loss. the scope of CVP analysis is much wider than this, as indicated in the definition. However, you should be aware that the terms 'breakeven analysis' and 'CVP analysis' tend to be used interchangeably.

4.4.1 Calculating the breakeven point

Contribution is so called because it literally does contribute towards fixed costs and profit. As sales revenues grow from zero, the contribution also grows until it just covers the fixed costs. This is the breakeven point where neither profits nor losses are made.

It follows that to break even the amount of contribution must exactly match the amount of fixed costs. If we know how much contribution is earned from each unit sold, then we can calculate the number of units required to break even as follows:

$$\text{Breakeven point in units} = \frac{\text{Fixed costs}}{\text{Contribution per unit}}$$

For example, suppose that an organisation manufactures a single product, incurring variable costs of £30 per unit and fixed costs of £20,000 per month. If the product sells for £50 per unit, then the breakeven point can be calculated as follows:

$$\text{Breakeven point in units} = \frac{£20{,}000}{£50 - £30} = 1{,}000 \text{ units per month}$$

4.5 The margin of safety

The margin of safety is the difference between the expected level of sales and the breakeven point. The larger the margin of safety, the more likely it is that a profit will be made, that is, if sales start to fall there is more leeway before the organisation begins to incur losses. (Obviously, this statement is made on the assumption that projected sales volumes are above the breakeven point.)

In the above example, if forecast sales are 1,700 units per month, the margin of safety can be easily calculated.

$$\begin{aligned}\text{Margin of safety} &= \text{projected sales} - \text{breakeven point}\\ &= 1{,}700 \text{ units} - 1{,}000 \text{ units}\\ &= 700 \text{ units per month, or } 41\% \text{ of sales } (700/1{,}700 \times 100\%)\end{aligned}$$

The margin of safety should be expressed as a percentage of projected sales to put it in perspective. To quote a margin of safety of 700 units without relating it to the projected sales figure is not giving the full picture.

The margin of safety might also be expressed as a percentage of the breakeven value, that is, 70 percent of the breakeven value in this case.

The margin of safety can also be used as one route to profit calculation. We have seen that the contribution goes towards fixed costs and profit. Once breakeven point is reached the fixed costs have been covered. After the breakeven point there are no more fixed costs to be covered and all of the contribution goes towards making profits grow.

In our example the monthly profit from sales of 1,700 units would be £14,000.

$$\begin{aligned}\text{Margin of safety} &= 700 \text{ units per month}\\ \text{Monthly profit} &= 700 \times \text{contribution per unit}\\ &= 700 \times £20\\ &= £14{,}000\end{aligned}$$

4.6 The contribution to sales (C/S) ratio

The contribution to sales ratio is usually expressed as a percentage. It can be calculated for the product in our example as follows:

$$\begin{aligned}\text{Contribution to sales ratio (C/S ratio)} &= £20/£50 \times 100\%\\ &= 40\%\end{aligned}$$

A higher contribution to sales ratio means that contribution grows more quickly as sales levels increase. Once the breakeven point has been passed, profits will accumulate more quickly than for a product with a lower contribution to sales ratio.

You might sometimes see this ratio referred to as the profit–volume (P/V) ratio.

If we can assume that a unit's variable cost and selling price remain constant then the C/S ratio will also remain constant. It can be used to calculate the breakeven point as follows (using the data from the earlier example):

$$\text{Breakeven point in sales value} = \frac{\text{Fixed costs}}{\text{C/S ratio}} = \frac{£20{,}000}{0.40} = £50{,}000$$

This can be converted to 1,000 units as before by dividing by the selling price of £50 per unit.

Exercise

A company manufactures and sells a single product that has the following cost and selling price structure:

	£/unit	*£/unit*
Selling price		120
Direct material	22	
Direct labour	36	
Variable overhead	14	
Fixed overhead	12	
		84
Profit per unit		36

The fixed overhead absorption rate is based on the normal capacity of 2,000 units per month. Assume that the same amount is spent each month on fixed overheads.

Budgeted sales for next month are 2,200 units.

You are required to calculate:

(i) the breakeven point, in sales units per month;
(ii) the margin of safety for next month;
(iii) the budgeted profit for next month;
(iv) the sales required to achieve a profit of £96,000 in a month.

Solution

(i) The key to calculating the breakeven point is to determine the contribution per unit.

$$\text{Contribution per unit} = £120 - (£22 + £36 + £14) = £48$$

$$\text{Breakeven point} = \frac{\text{Fixed overhead}}{\text{Contribution per unit}}$$

$$= \frac{£12 \times 2{,}000}{£48} = 500 \text{ units}$$

(ii) Margin of safety = budgeted sales − breakeven point
= 2,200 − 500
= 1,700 units (or, 1,700/2,200 × 100% = 77% of budgeted sales)

(iii) Once breakeven point has been reached, all of the contribution goes towards profits because all of the fixed costs have been covered.

Budgeted profit = 1,700 units margin of safety × £48 contribution per unit
= £81,600

(iv) To achieve the desired level of profit, sufficient units must be sold to earn a contribution that covers the fixed costs and leaves the desired profit for the month.

$$\text{Number of sales units required} = \frac{\text{Fixed overhead} + \text{desired profit}}{\text{Contribution per unit}}$$

$$= \frac{(£12 \times 2{,}000) + £96{,}000}{£48} = 2{,}500 \text{ units}$$

4.7 Drawing a basic breakeven chart

A basic breakeven chart records costs and revenues on the vertical axis and the level of activity on the horizontal axis. Lines are drawn on the chart to represent costs and sales revenue. The breakeven point can be read off where the sales revenue line cuts the total cost line.

We shall use our basic example to demonstrate how to draw a breakeven chart. The data is:

Selling price	£50 per unit
Variable cost	£30 per unit
Fixed costs	£20,000 per month
Forecast sales	1,700 units per month

You must be able to prepare breakeven charts to scale using data provided. To give yourself some practice it would be a good idea to follow the step-by-step guide that follows to produce your own chart on a piece of graph paper.

Step 1. Select appropriate scales for the axes and draw and label them. Your graph should fill as much of the page as possible. This will make it clearer and easier to read. You can make sure that you do this by putting the extremes of the axes right at the end of the available space.

The furthest point on the vertical axis will be the monthly sales revenue, that is,

1,700 units × £50 = £85,000

The furthest point on the horizontal axis will be monthly sales volume of 1,700 units.

Make sure that you do not need to read data for volumes higher than 1,700 units before you set these extremes for your scales.

Step 2. Draw the fixed cost line and label it. This will be a straight line parallel to the horizontal axis at the £20,000 level.

The £20,000 fixed costs are incurred in the short term even with zero activity.

Step 3. Draw the total cost line and label it. The best way to do this is to calculate the total costs for the maximum sales level, which is 1,700 units in our example. Mark this point on the graph and join it to the cost incurred at zero activity, that is, £20,000

	£
Variable costs of 1,700 units	
(1,700 × £30)	51,000
Fixed costs	20,000
Total cost for 1,700 units	71,000

Step 4. Draw the revenue line and label it. Once again, the best way is to plot the extreme points. The revenue at maximum activity in our example is 1,700 × £50 = £85,000. This point can be joined to the origin, since at zero activity there will be no sales revenue.

Step 5. Mark any required information on the chart and read off solutions as required. Check that your chart is accurate by reading off the measures that we have already calculated in this chapter: the breakeven point, the margin of safety, the profit for sales of 1,700 units.

Step 6. Check the accuracy of your readings using arithmetic. We already have the solutions calculated arithmetically for our example. However, it is always good examination practice to check the accuracy of your answers and make adjustments for any errors in your chart (if you have time!).

The completed graph is shown in Figure 4.10.

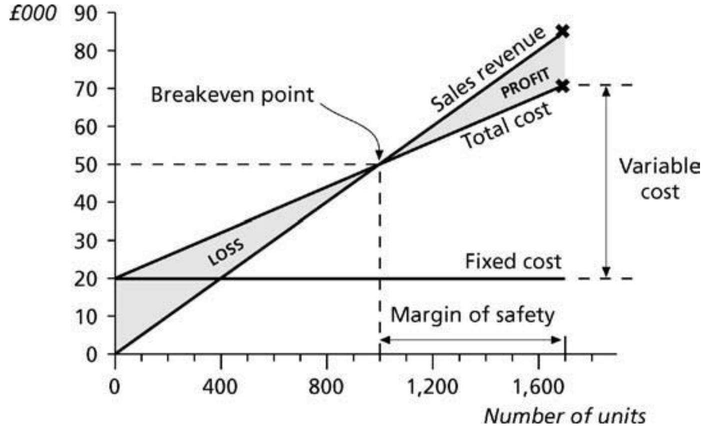


Figure 4.10 Basic breakeven chart

Your own graph should be considerably larger than this: a full A4 graph-ruled sheet is recommended to facilitate ease of interpretation.

4.8 The contribution breakeven chart

One of the problems with the conventional or basic breakeven chart is that it is not possible to read contribution directly from the chart. A contribution breakeven chart is based on the same principles but it shows the variable cost line instead of the fixed cost line (Figure 4.11). The same lines for total cost and sales revenue are shown so the breakeven point and profit can be read off in the same way as with a conventional chart. However, it is also possible to read the contribution for any level of activity.

Using the same basic example as for the conventional chart, the total variable cost for an output of 1,700 units is 1,700 × £30 = £51,000. This point can be joined to the origin since the variable cost is nil at zero activity.

The contribution can be read as the difference between the sales revenue line and the variable cost line.

This form of presentation might be used when it is desirable to highlight the importance of contribution and to focus attention on the variable costs.

4.9 The PV chart

Another form of breakeven chart is the PV chart. This chart plots a single line depicting the profit or loss at each level of activity. The breakeven point is where this line cuts the horizontal axis. A PV graph for our example will look like Figure 4.12.

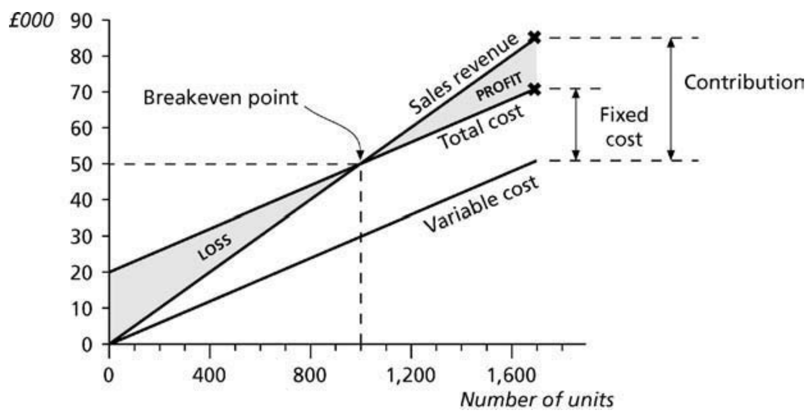


Figure 4.11 Contribution breakeven chart

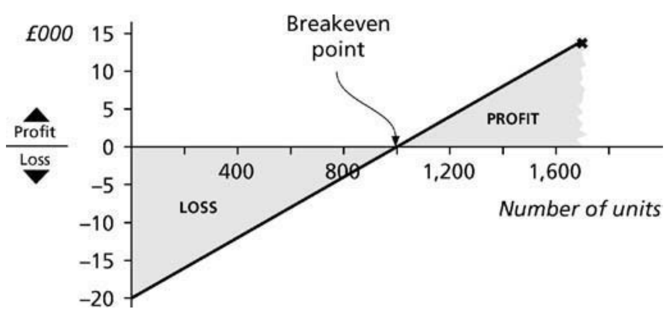


Figure 4.12 Profit–volume chart

The vertical axis shows profits and losses and the horizontal axis is drawn at zero profit or loss.

At zero activity the loss is equal to £20,000, i.e. the amount of fixed costs. The second point used to draw the line could be the calculated breakeven point or the calculated profit for sales of 1,700 units.

The PV graph is also called a profit graph or a contribution–volume graph.

Exercise

Make sure that you are clear about the extremes of the chart axes. Practise drawing this chart to scale on a piece of graph paper.

4.9.1 The advantage of the PV chart

The main advantage of the PV chart is that it is capable of depicting clearly the effect on profit and breakeven point of any changes in the variables. An example will show how this can be done.

Example

A company manufactures a single product that incurs fixed costs of £30,000 per annum. Annual sales are budgeted to be 70,000 units at a sales price of £30 per unit. Variable costs are £28.50 per unit.

(a) Draw a PV graph, and use it to determine the breakeven point.

The company is now considering improving the quality of the product and increasing the selling price to £35 per unit. Sales volume will be unaffected, but fixed costs will increase to £45,000 per annum and variable costs to £33 per unit.

(b) Draw, on the same graph as for part (a), a second PV graph and comment on the results.

Solution

The PV chart is shown in Figure 4.13.

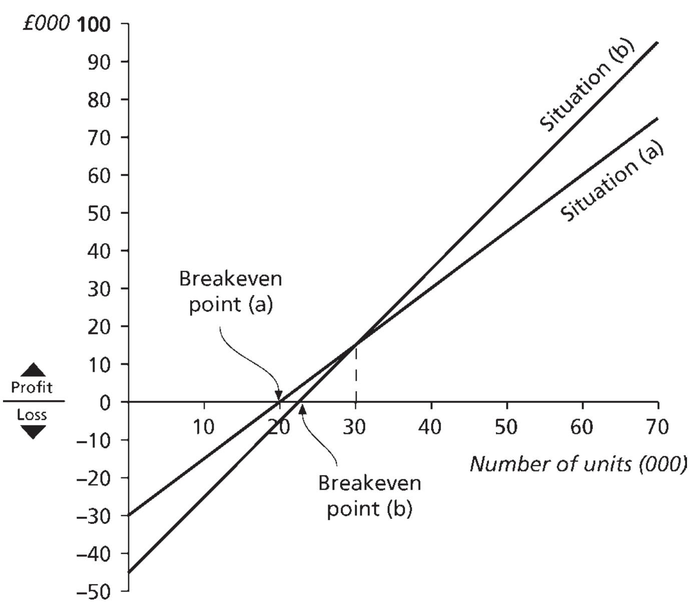


Figure 4.13 Showing changes with a PV chart

The two lines have been drawn as follows:

Situation (a). The profit for sales of 70,000 units is £75,000.

	£000
Contribution 70,000 × £(30 − 28.50)	105
Fixed costs	30
Profit	75

This point is joined to the loss at zero activity, £30,000, i.e. the fixed costs.

Situation (b). The profit for sales of 70,000 units is £95,000.

	£000
Contribution 70,000 × £(35 − 33)	140
Fixed costs	45
Profit	95

This point is joined to the loss at zero activity, £45,000 that is, the fixed costs.

Comment on the results

The graph depicts clearly the larger profits available from option (b). It also shows that the breakeven point increases from 20,000 units to 22,500 units but that this is not a large increase when viewed in the context of the projected sales volume. It is also possible to see that for sales volumes above 30,000 units the profit achieved will be higher with option (b). For sales volumes below 30,000 units option (a) will yield higher profits (or lower losses).

The PV graph is the clearest way of presenting information like this. If we attempted to draw two conventional breakeven charts on one set of axes the result would be a jumble that would be very difficult to interpret.

4.10 The limitations of breakeven (or CVP) analysis

The limitations of the practical applicability of breakeven analysis and breakeven charts stem mostly form the assumptions that underline the analysis:

(a) Costs are assumed to behave in a linear fashion. Unit variable costs are assumed to remain constant and fixed costs are assumed to be unaffected by changes in activity levels. The charts can in fact be adjusted to cope with non-linear variable costs or steps in fixed costs, but too many changes in behaviour patterns can make the charts very cluttered and difficult to use.

(b) Sales revenues are assumed to be constant for each unit sold. This may be unrealistic because of the necessity to reduce the selling price to achieve higher sales volumes. Once again, the analysis can be adapted for some changes in selling price but too many changes can make the charts unwieldy.

(c) There is assumed to be no change in stocks. Reported profits can vary if absorption costing is used and there are changes in stock levels.

(d) It is assumed that activity is the only factor affecting costs, and factors such as inflation are ignored. This is one of the reasons why the analysis is limited to being essentially a short-term decision aid.

(e) Apart from the unrealistic situation described above of a constant product mix, the charts can only be applied to a single product or service. Not many organisations have a single product or service, and if there is more than one then the apportionment of fixed costs between them becomes arbitrary.

(f) The analysis seems to suggest that as long as the activity level is above the breakeven point, then a profit will be achieved. In reality certain changes in the cost and revenue patterns may result in a second breakeven point after which losses are made. This situation will be depicted in the next section of this chapter.

4.11 The economist's breakeven chart

An economist would probably depict a breakeven chart as shown in Figure 4.14.

The total cost line is not a straight line that climbs at a constant rate as in the accountant's breakeven chart. Instead, its slope increases moving from left to right because marginal costs are likely to increase with output – given short term capacity constraints.

The revenue line is not a straight line as in the accountant's chart. The line becomes less steep to depict the need to reduce unit selling prices in order to achieve higher sales volumes.

However, you will see that within the middle range the economist's chart does look very similar to the accountant's breakeven chart. This area is marked as the relevant range in Figure 4.14.

For this reason it is unreliable to assume that the CVP relationships depicted in breakeven analysis are relevant across a wide range of activity. In particular, Figure 4.14 shows that the constant cost and price assumptions are likely to be unreliable at very high or very low levels of activity. Managers should therefore ensure that they work within the relevant range for the available data, that is, within the range over which the depicted cost and revenue relationships are more reliable.

4.12 Using costs for decision-making

Most management decisions involve a change in the level, method or mix of activities in order to maximise profits. The only costs that should be considered in decision-making are those that will be altered as a result of the decision. Those costs that will be affected by the

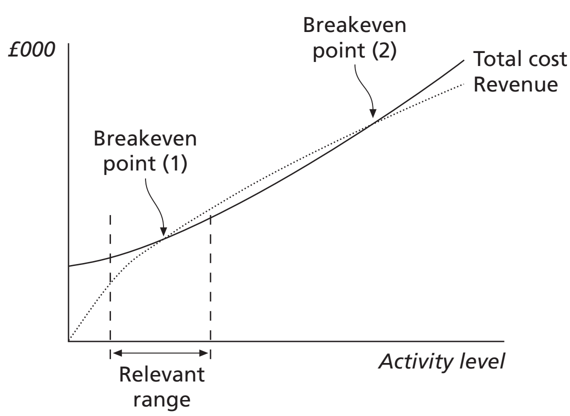


Figure 4.14 The economist's breakeven chart

decision may be referred to as *relevant costs*, while others are non-relevant and should be ignored in the analysis.

It is often the case that variable costs are relevant whereas fixed costs are not, unless the decision affects the cost structure of the organisation. Thus, information for decision-making should always be based on marginal costing principles, since marginal costing focuses on the variable costs and is not concerned with arbitrary apportionment of fixed costs that will be incurred anyway.

4.12.1 Short-term decision-making

An important point that you should appreciate for all of the decision-making techniques that you learn about in this chapter is that they are usually most relevant to short-term, one-off decisions. Furthermore, as you will see with the example of the minimum-price quotation, the analysis provides only a starting point for management decisions. The financial figures are only part of the information needed for a fully informed decision. It is also important to consider the non-financial factors which might be relevant to the decision.

You must get into the habit of considering non-financial and qualitative factors in any decision. Many exam questions will specifically ask you to do so.

4.13 Evaluating proposals

As an introduction to using cost information to evaluate proposals, use your understanding of breakeven analysis and cost behaviour patterns to evaluate the proposals in the following exercise.

Exercise

A summary of a manufacturing company's budgeted profit statement for its next financial year, when it expects to be operating at 75 per cent of capacity, is given below.

	£	£
Sales 9,000 units at £32		288,000
Less		
Direct materials	54,000	
Direct wages	72,000	
Production overhead – fixed	42,000	
– variable	18,000	
		186,000
Gross profit		102,000
Less: admin., selling and dist'n costs		
Fixed	36,000	
Varying with sales volume	27,000	
		63,000
Net profit		39,000

It has been estimated that:

(i) if the selling price per unit were reduced to £28, the increased demand would utilise 90 per cent of the company's capacity without any additional advertising expenditure;

(ii) to attract sufficient demand to utilise full capacity would require a 15 per cent reduction in the current selling price and a £5,000 special advertising campaign.

You are required to:

(a) calculate the breakeven point in units, based on the original budget;
(b) calculate the profits and breakeven points that would result from each of the two alternatives and compare them with the original budget.

Solution

(a) First calculate the current contribution per unit.

	£000	£000
Sales revenue		288
Direct materials	54	
Direct wages	72	
Variable production overhead	18	
Variable administration, etc.	27	
		171
Contribution		117
Contribution per unit (÷9,000 units)		£13

Now you can use the formula to calculate the breakeven point.

$$\text{Breakeven point} = \frac{\text{Fixed costs}}{\text{Contribution per unit}} = \frac{£42{,}000 + £36{,}000}{£13} = 6{,}000 \text{ units}$$

(b) Alternative (i)

Budgeted contribution per unit	£13
Reduction in selling price (£32 − £28)	£4
Revised contribution per unit	£9
Revised breakeven point $= \frac{£78{,}000}{£9}$	8,667 units
Revised sales volume = 9,000 ×90/75	10,800 units
Revised contribution = 10,800 × £9	£97,200
Less fixed costs	£78,000
Revised profit	£19,200

Alternative (ii)

Budgeted contribution per unit	£13.00
Reduction in selling price (15% × £32)	£4.80
Revised contribution per unit	£8.20
Revised breakeven point $= \frac{£78{,}000 + £5{,}000}{£8.20}$	10,122 units
Revised sales volume = 9,000 units × 100/75	12,000 units
Revised contribution = 12,000 × £8.20	£98,400
Less fixed costs	£83,000
Revised profit	£15,400

Neither of the two alternative proposals is worthwhile. They both result in lower forecast profits. In addition, they will both increase the breakeven point and will therefore increase the risk associated with the company's operations. This exercise has shown you how an understanding of cost behaviour patterns and the manipulation of contribution can enable the rapid evaluation of the financial effects of a proposal. We can now expand it to demonstrate another aspect of the application of marginal costing techniques to short-term decision-making.

Exercise

The manufacturing company decided to proceed with the original budget and has asked you to determine how many units must be sold to achieve a profit of £45,500.

Solution

Once again, the key is the required contribution. This time the contribution must be sufficient to cover both the fixed costs and the required profit. If we then divide this amount by the contribution earned from each unit, we can determine the required sales volume.

$$\text{Required sales} = \frac{\text{Fixed costs} + \text{required profit}}{\text{Contribution per unit}}$$

$$= \frac{(£42{,}000 + £36{,}000) + £45{,}500}{£13} = 9{,}500 \text{ units}$$

Now we shall move from this very basic analysis to consider specific types of cost that may assist management decision-making.

4.14 Relevant costs

Relevant costs are those which will be affected by the decision being taken. All relevant costs should be considered in management decision-making. If a cost will remain unaltered regardless of the decision being taken, then it is called a non-relevant cost.

4.14.1 Non-relevant costs

Costs that are not usually relevant in management decisions include the following:

(a) Sunk or past costs, that is money already spent that cannot now be recoverd. An example of a sunk cost is expenditure that has been incurred in developing a new product. The money cannot be recovered even if a decision is taken to abandon further development of the new product. The cost is therefore not relevant to future decisions concerning the product.
(b) Absorbed fixed overheads that will not increase or decrease as a result of the decision being taken. The amount of overhead to be absorbed by a particular cost unit might alter because of the decision; however, this is a result of the company's cost accounting procedures for overheads. If the actual amount of overhead incurred by the company will not alter, then the overhead is not a relevant cost.
(c) Expenditure that will be incurred in the future, but as a result of decisions taken in the past that cannot now be changed. These are known as committed costs. They can sometimes cause confusion because they are future costs. However, a committed cost will be incurred regardless of the decision being taken and therefore it is not relevant.

An example of this type of cost could be expenditure on special packaging for a new product, where the packaging has been ordered and delivered but not yet paid for. The company is obliged to pay for the packaging even if they decide not to proceed with the product; therefore it is not a relevant cost.

(d) Historical cost depreciation that has been calculated in the conventional manner. Such depreciation calculations do not result in any future cash flows. They are merely the book entries that are designed to spread the original cost of an asset over its useful life.

(e) Notional costs such as notional rent and notional interest. These are only relevant if they represent an identified lost opportunity to use the premises or the finance for some alternative purpose.

In these circumstances, the notional costs would be opportunity costs. This explanation will become clearer when you learn more about opportunity costs later in this chapter.

Exercise

Test your understanding of relevant and non-relevant costs by seeing if you can identify which of the following costs are relevant:

(a) The salary to be paid to a market researcher who will oversee the development of a new product. This is a new post to be created specially for the new product but the £12,000 salary will be a fixed cost. Is this cost relevant to the decision to proceed with the development of the product?

(b) The £2,500 additional monthly running costs of a new machine to be purchased to manufacture an established product. Since the new machine will save on labour time, the fixed overhead to be absorbed by the product will reduce by £100 per month. Are these costs relevant to the decision to purchase the new machine?

(c) Office cleaning expenses of £125 for next month. The office is cleaned by contractors and the contract can be cancelled by giving one month's notice. Is this cost relevant to a decision to close the office?

(d) Expenses of £75 paid to the marketing manager. This was to reimburse the manager for the cost of travelling to meet a client with whom the company is currently negotiating a major contract. Is this cost relevant to the decision to continue negotiations?

Solution

(a) The salary is a relevant cost of £12,000. Do not be fooled by the fact that it is a fixed cost. The cost may be fixed in total but it is definitely a cost that is relevant to the decision to proceed with the future development of the new product. This is an example of a directly attributable fixed cost.

A directly attributable fixed cost may also be called product-specific fixed cost.

(b) The £2,500 additional running costs are relevant to the decision to purchase the new machine. The saving in overhead absorption is not relevant since we are not told that the *total* overhead expenditure will be altered. The saving in labour cost would be relevant but we shall assume that this has been accounted for in determining the additional monthly running costs.

(c) This is not a relevant cost for next month since it will be incurred even if the contract is cancelled today. If a decision is being made to close the office, this cost cannot be included as a saving to be made next month. However, it will be saved in the months after that so it will become a relevant cost saving from month 2 onwards.

(d) This is not a relevant cost of the decision to continue with the contract. The £75 is sunk and cannot be recovered even if the company does not proceed with the negotiations.

Conclusion

It is essential to look to the future when deciding which costs are relevant to a decision. Costs that have already been incurred or that will not be altered in the future as a result of the decision being taken are not relevant costs.

4.15 Opportunity costs

An opportunity cost is a special type of relevant cost. It is defined in the CIMA *Terminology* as 'the value of the benefit sacrificed when one course of action is chosen, in preference to an alternative. The opportunity cost is represented by the forgone potential benefit from the best rejected course of action.'

With opportunity costs we are concerned with identifying the value of any benefit forgone as the result of choosing one course of action in preference to another.

4.15.1 Examples of opportunity costs

The best way to demonstrate opportunity costs is to consider some examples.

(a) A company has some obsolete material in stock that it is considering using for a special contract. If the material is not used on the contract it can either be sold back to the supplier for £2 per tonne or it can be used on another contract in place of a different material that would usually cost £2.20 per tonne.

The opportunity cost of using the material on the special contract is £2.20 per tonne. This is the value of the next best alternative use for the material, or the benefit forgone by not using it for the other contract.

(b) Chris is deciding whether or not to take a skiing holiday this year. The travel agent is quoting an all-inclusive holiday cost of £675 for a week. Chris will lose the chance to earn £200 for a part-time job during the week that the holiday would be taken.

The relevant cost of taking the holiday in £875. This is made up of the out-of-pocket cost of £675, plus the £200 opportunity cost that is the part-time wages forgone.

4.15.2 Notional costs and opportunity costs

Notional costs and opportunity costs are in fact very similar. This is particularly noticeable in the case of notional rent. The notional rent could be the rental that the company is forgoing by occupying the premises itself, that is, it could be an opportunity cost. However, it is only a true opportunity cost if the company can actually identify a forgone opportunity to rent the premises. If nobody is willing to pay the rent, then it is not an opportunity cost.

If an examination question on relevant costs includes information about notional costs, read the question carefully and state your assumptions concerning the relevance of the notional cost.

4.16 Avoidable, differential and incremental costs

There are two other types of relevant cost that you will need to know about: avoidable costs and differential/incremental costs.

4.16.1 Avoidable costs

CIMA defines avoidable costs as 'the specific costs of an activity or sector of a business which would be avoided if that activity or sector did not exist'.

For example, if a company is considering shutting down a department, then the avoidable costs are those that would be saved as a result of the shutdown. Such costs might include the labour costs of those employed in the department and the rental cost of the space occupied by the department. The latter is an example of an attributable or specific fixed cost. Costs such as apportioned head office costs that would not be saved as a result of the shutdown are unavoidable costs. They are not relevant to the decision.

4.16.2 Differential/incremental costs

CIMA defines a differential/incremental cost as 'the difference in total cost between alternatives; calculated to assist decision-making'.

For example, if the relevant cost of contract X is £5,700 and the relevant cost of contract Y is £6,200 we would say that the differential or incremental cost is £500, that is, the extra cost of contract Y is £500.

4.16.3 Using incremental costs

Incremental costs can be useful if the cost accountant wishes to highlight the consequences of taking sequential steps in a decision. For example, the accountant might be providing cost information for a decision about whether to increase the number of employees in a department. Instead of quoting several different total-cost figures, it might be more useful to say 'the incremental cost per five employees will be £5,800 per month'.

Remember that only relevant costs should be used in the calculations.

4.16.4 Incremental revenues

Just as incremental costs are the differences in cost between alternatives, so incremental revenues are the differences in revenues between the alternatives. Matching the incremental costs against the incremental revenue will produce a figure for the incremental gain or loss between the alternatives.

Exercise

To consolidate the material so far on relevant costs and opportunity costs, work through the following exercise to identify the relevant costs of the decision. Try to work out the relevant cost of each item before you look at the solution.

ABC Ltd is deciding whether or not to proceed with a special order. Use the details below to determine the relevant cost of the order.

(a) Materials P and Q will be used for the contract. 100 tonnes of material P will be needed and sufficient material is in stock because the material is in common use in the company. The original cost of the material in stock is £1 per tonne but it would cost £1.20 per tonne to replace if it is used for this contract. The material Q required is in stock as a result of previous over-purchasing. This material originally cost £500 but it has no other use. The material is toxic and if it is not used on this contract, then ABC must pay £280 to have it disposed of.
(b) The contract requires 200 hours of labour at £5 per hour. Employees possessing the necessary skills are currently employed by the company but they are idle at present due to a lull in the company's normal business.
(c) Overhead will be absorbed by the contract at a rate of £10 per labour hour, which consists of £7 for fixed overhead and £3 for variable.
(d) The contract will require the use of a storage unit for three months. ABC is committed to rent the unit for one year at a rental of £50 per month. The unit is not in use at present. A neighbouring business has recently approached ABC offering to rent the unit from them for £70 per month.
(e) Total fixed overheads are not expected to increase as a result of the contract.

✓ Solution

(a) The relevant cost of a material that is used regularly is its replacement cost. This will ensure that the business profits are unaffected by the use of the material for this contract. The relevant cost of material P is therefore £1.20 per tonne.

Material Q has a 'negative' cost if used for the contract. This is the saving that will be made through not having to pay the disposal cost of £280.
(b) The relevant cost of labour is zero. The labour cost is being paid anyway and no extra cost will be incurred as a result of this contract.
(c) The fixed overhead is not relevant because we are told that fixed overheads are not expected to increase. The relevant variable overhead cost is: £3 per hour × 200 hours = £600.

Even if you are not specifically told that fixed overheads will remain unaltered, it is usual to assume that they will not increase, stating the assumption clearly.
(d) The rental cost £50 per month is not relevant because it will not be affected by the contract. The relevant cost of using the storage unit is the forgone rental income of £70 per month.

Summary of relevant costs

		£
(i)	Material P	120
	Material Q	(280)
(ii)	Labour	–
(iii)	Variable overhead	600
(iv)	Rent forgone	210
	Total relevant cost	650

4.17 Limiting factor decision-making

A limiting factor is any factor that is in scarce supply and that stops the organisation from expanding its activities further, that is, it limits the organisation's activities.

The limiting factor for many trading organisations is sales volume because they cannot sell as much as they would like. However, other factors may also be limited, especially in the short term. For example, machine capacity or the supply of skilled labour may be limited for one or two periods until some action can be taken to alleviate the shortage.

4.17.1 Decisions involving a single limiting factor

If an organisation is faced with a single limiting factor, for example, machine capacity, then it must ensure that a production plan is established that maximises the profit from the use of the available capacity. Assuming that fixed costs remain constant, this is same as saying that the contribution must be maximised from the use of the available capacity. The machine capacity must be allocated to those products that earn the most contribution per machine hour.

This decision rule can be stated as 'maximising the contribution per unit of limiting factor'.

Example

LMN Ltd manufactures three products, L, M and N. The company that supplies the two raw materials that are used in all three products has informed LMN that their employees are refusing to work overtime. This means that supply of the materials is limited to the following quantities for the next period:

Material A	1,030 kg
Material B	1,220 kg

No other source of supply can be found for the next period.
Information relating to the three products manufactured by LMN Ltd is as follows:

	L	*M*	*N*
Quantity of material used per unit manufactured			
Material A (Kg)	2	1	4
Material B (kg)	5	3	7
Maximum sales demand (units)	120	160	110
Contribution per unit sold	£15	£12	£17.50

Owing to the perishable nature of the products, no finished goods stocks are held.

Requirements

(a) Recommend a production mix that will maximise the profits of LMN Ltd for the forthcoming period.
(b) LMN Ltd has a valued customer to whom they wish to guarantee the supply of 50 units of each product next period. Would this alter your recommended production plan?

Solution

(a) The first step is to check whether the supply of each material is adequate or whether either or both of them represent a limiting factor.

	L	*M*	*N*	*Total*
Maximum sales demand (units)	120	160	110	
Material A required per unit (kg)	2	1	4	
Total material A required (kg)	240	160	440	840
Material B required per unit (kg)	5	3	7	
Total material B required (kg)	600	480	770	1,850

There will be sufficient material A to satisfy the maximum demand for the products but material B will be a limiting factor.

The next step is to rank the products in order of their contribution per unit of limiting factor. The available material B can then be allocated according to this ranking.

	L	*M*	*N*
Contribution per unit sold	£15	£12	£17.50
Material B consumed (kg)	5	3	7
Contribution per kg of material B	£3	£4	£2.50
Ranking	2	1	3

The available material B will be allocated to the products according to this ranking, to give the optimum production plan for the next period.

Product	*Recommended production (units)*	*Material B utilised (Kg)*	
M	160 (maximum)	480	
L	120 (maximum)	600	
N	20	140	(balance)
		1,220	

The available material B is allocated to satisfy the maximum market demand for products M and L. The balance of available material is allocated to the last product in the ranking, product N.

(b) The recommended production plan in part (a) does not include sufficient product N to satisfy the requirement of 50 units for the valued customer. Some of the material allocated to product L (second in the ranking) must be allocated to product N. The recommended production plan will now be as follows:

Product	*Recommended production (units)*	*Material B utilised (kg)*	
N	50	350	
M	160	480	
L	78	390	(balance)
		1,220	

This recommendation makes the best use of the available material B within the restriction of the market requirements for each product.

Exercise

Gill Ltd manufactures three products, E, F and G. The products are all finished on the same machine. This is the only mechanised part of the process. During the next period the production manager is planning an essential major maintenance overhaul of the machine. This will restrict the available machine hours to 1,400 hours for the next period. Data for the three products is:

	Product E *£ per unit*	*Product F* *£ per unit*	*Product G* *£ per unit*
Selling price	30	17	21.00
Variable cost	13	6	9.00
Fixed production cost	10	8	6.00
Other fixed cost	2	1	3.50
Profit	5	2	2.50
Maximum demand (units/period)	250	140	130

No stocks are held.

Fixed production costs are absorbed using a machine hour rate of £2 per machine hour.

You are required to determine the production plan that will maximise profit for the forthcoming period.

Solution

The first step is to calculate how many machine hours are required for each product. We can then determine whether machine hours are really a limiting factor.

	Product E	*Product F*	*Product G*	*Total*
Fixed production costs per unit @ £2 per hour	£10	£8	£6	
Machine hours per unit	5	4	3	
Maximum demand (units)	250	140	130	
Maximum hours required	1,250	560	390	2,200

4.18 Summary

In this chapter we have explored the basic ideas behind and cost and revenue behaviour that are used by management accountants in the design and operation of product costing, budgetary planning and financial control systems. These ideas are fundamental to much of what follows in this text, so you should have a clear understanding of them.

Readings

4

This chapter has dealt with quantitative approaches to short term decision making. It is important to appreciate that the techniques we have considered act as guides to the decision maker and rarely offer definitive answers to the questions that are posed in the decision making process. For one thing, they are usually based on simplified models of cost and revenue structures. How those models are constructed and what figures are inserted in them may be a highly subjective exercise. Business decision making takes place in a behavioural and organisational context. The readings which follow consider various aspects of this context.

Extract from: Rely on science, not your gut (decision-making techniques for executives)

Sal Marino, *Industry Week*, January 24, 2000

Gentlemen, I take it we are all in complete agreement on the decision here. Then I propose we postpone further discussion of this matter until our next meeting to give ourselves time to develop disagreement and perhaps gain some understanding of what the decision is all about.

Alfred P. Solan Jr., credited with creating the multidivisional manufacturing corporation.

Every day, executives in business are rated on their ability to make good decisions. It is one of their most important business skills.

About 10 year ago I discovered a book that helped me improve my decision-making batting average substantially. The book was Decision Traps (1989, Doubleday/Currency), written by J. Edward Russo, professor of marketing and behavioral science in the Graduate School of Management at Cornell University, and Paul J. H. Shoemaker, professor of decision sciences and policy in the Graduate School of Business at the University of Chicago.

In the book Russo and Shoemaker list 10 reasons why most of us err when making decisions. They are:

1. Plunging in – Gathering information and reaching conclusions without taking time to think about the crux of the issue we're facing.
2. Frame blindness – Setting out to solve the wrong problem because we have created a mental framework for our decision, with little thought.
3. Lack of control – Failing to consciously define the problem in a variety of ways rather than just one.
4. Overconfidence in judgement – Failing to collect key factual information because we are too sure of our assumptions and opinions.

5. Shortsighted shortcuts – Relying on 'rules of thumb' inappropriately. Trusting only readily available information. Relying on convenient facts.
6. Shooting from the hip – Believing we can keep straight all the information we've discovered, 'winging it' rather than following systematic procedures before making the final choice.
7. Group failure – Assuming that with many smart people involved, good choices will follow. Failing to manage the group decision-making process.
8. Fooling ourselves about feedback – Failing to interpret the evidence of past outcomes for what it says, either because we are protecting our egos or because we are tricked by hindsight.
9. Not keeping track – Assuming that experience will make its lessons available automatically, thus failing to keep systematic records to track our results. Failing to analyse the results in ways that reveal their key lessons.
10. Failing to audit our decision process – Failing to create an organised approach to understanding our decision-making. This exposes us to all the already-mentioned mistakes.

Feeling right about a decision may be good for your psyche, but being right about it is better for your reputation. Intuition and gut feeling are costly substitutes for logical, systematic, and informed thinking.

Russo and Shoemaker offer this astounding example: The New England Journal of Medicine reported that when boys were examined for a possible tonsillectomy, doctors showed no consistency in their diagnoses. A panel of physicians examined 389 boys and judged that 45% of them needed a tonsillectomy. A second panel examined only the boys judged to be healthy by the first panel. They concluded that 46% of them needed a tonsillectomy. Finally, a third panel examined only the 116 boys who had been judged healthy by the first two groups. It found that 44% needed a tonsillectomy.

Few of us realise how flawed our intuitive judgements often are. And how poor our decision-making can be.

Extract from: Decisions, Decisions

Bob Gunn, *Strategic Finance*, January 2000

Published by the Institute of Management Accountants, Montuale, NJ. For more information about reprints from Strategic Finance Contact PARS International

Everyone knows that making good decisions depends on analyzing every facet, dissecting every variable, and taking all facts into account. In other words, managers operate on the assumption that decision making is a rational, quantitative process. This belief provides work for many finance and accounting professionals, for they're the ones who do most of the analytic work when line managers start making decisions.

But decisions have an elusive aspect. At the moment leaders make decisions, they are committing themselves to a course of action with an uncertain outcome. They're taking a step into the unknown.

Because the unknown seems risky, managers are tempted to play the game not to lose rather than to win. This mind-set favors conservatism and uses assumptions that give more weight to negatives – 'what might go wrong' – than to positives – 'what needs to go right'. Expectations are keyed to past results, so people are skeptical that far better outcomes can be generated by bold, fresh, or innovative actions.

But bold decisions are the precursors of great outcomes. Precisely because the future is unknowable, you can't really tell if positive or negative outcomes are more likely. In an important sense, you get what you expect. So, in the absence of certainty, why not expect the best?

Suppose, then, that leaders consciously embraced the unknown when they made decisions. How would this look?

For one thing, they would want to be very clear about the questions to ask. All too often, leaders start off halfcocked in the sense that that they're so eager to get to the 'what' and 'how' answers that they fail to first address the fundamental 'why' and 'where' questions.

Recently a client was faced with a long list of investment proposals, and the finance staff was extremely busy analyzing them using various tools that would yield a forced ranking. Someone brought all this activity to a halt by raising two basic questions: (1) 'Why does investment need to be made in this business?' and (2) 'where should these resource commitments lead us?'

Once these questions had been asked, it took the leaders less than an hour to clarify the desired outcomes and to specify the critical factors. End of story. Then it took the finance team less than a day to apply this common-sense direction and whittle the investment list to a few critical programs.

Originally, everyone had assumed that there were too few resources to fund all the necessary projects. Now, they were surprised to find a surplus of money and people. Because the context had been clearly established, the finance team found it much easier to explain to the leaders how it had arrived at its decision and to demonstrate that the results made sense.

Asking the 'why' and 'where' questions always pays off. They point to the big picture and force people to look past the details and encompass the future as part of the 'now'. Such questions call on leaders to use their innate wisdom and common sense because the thinking path to answer them is insight driven, not analytically derived. And it's something that any finance or accounting business partner is well equipped to do, for what he or she brings to work is a desire to see things add up and keep the whole picture in focus.

Another aspect of embracing the unknown is exploring all variables defined by the decision. This is nothing more than understanding the critical aspects of the decisions as you make up your mind. It's thinking from the stance of 'looking to learn' rather than 'applying' what you already know?

How many times have you seen people fit their 'answer' to the situation at hand when everyone else can plainly see that the circumstances require something fresh? Too many. When you hear someone say 'We've tried that before' or 'That reminds me of such and such a circumstance,' you know that he or she is living the past. While the answers may have been exactly right for that time and place, good decisions have to address things as they exist now.

Henry Ford couldn't see that his stubborn attachment to the color black and the Model T was going to bankrupt his company. His devotion to one model and one color stemmed from the principle of 'not wandering from our own path, only learning to do one thing well.' Unwittingly, this 'answer from the past' put everything he had accomplished at risk because the markets had changed. Fortunately, he had the courage to embrace the unknown. He shut down for more than a year to re-tool the company – a bold decision by any standard.

Continuing to push past the frontiers of knowledge into uncharted areas lies at the heart of continuous improvement. Kaizen, as the Japanese call it, takes the long-term view that making efforts to improve can yield revolutionary results.

Toyota wrote a book, 20 Million Suggestions in 20 Years, that captures this idea. They consider implementing any suggestion that can save at least 1/100th of a minute – half a step or the time it takes to reach your hand for something. They attribute more than half of their cost advantage to the application of this principle by everyone in the company.

(Authors' note: This refers to Total Quality Management, discussed in Chapter 8)

This determination to make things better step by step is another way of saying, 'Innovate by taking one decision or action at a time into the unknown.'

Exploring the unknown sometimes leads to insights that are truly revolutionary. But whether the results are big or small, it's the inherent learning that comes from working from a stance of 'not knowing' that produces fresh and creative answers time after time.

Finally, working in the unknown is mistakenly believed to be stressful. Nothing could be further from the truth! Everyone has had the experience of trying to force an answer by willpower alone and has experienced the associated bleak feelings – stress, anxiety, pressure, muddle, or even frustration. But consider how you feel when you pose a question and then wait for the obvious to come to mind. Curiosity, expectation, surprise, or gratification are characteristic of these moments. Haven't you put off making a decision and been surprised a few days later when a common-sense answer came to mind when you weren't even expecting it?

This works in business, too. One of our clients had been stymied trying to decide which to do first – get on with an improvement program or spend more time clarifying the vision and purpose. They couldn't resolve the dilemma, so they put the question aside.

By the next meeting, a few days later, about half the group had arrived at the same thought: to do both by either integrating the vision work into the first project or by integrating the project work into the vision development.

The act of putting the issue on the back burner can be liberating. It isn't that you're forgetting about it. Quite the contrary. The topic remains in your subconscious, and you are confident the answer will come to you from beyond acquired knowledge – from what we call wisdom or common sense.

While there's a place for analytic rigor in making decisions, we have learned that you can't expect to arrive at fresh, creative, or innovative decisions either by analyzing the past or by comparing future scenarios.

(Author's note: 'Analytic rigour' is what the contents of this Chapter are all about. However, one should understand the limitations of the ideas and techniques contained therein.)

Getting to the heart of the matter, seeing the obvious, and illuminating choices clearly comes from reflecting on the right questions, exploring the important variables in search of something fresh, or by putting the topic on hold and waiting for something to come to mind that is obviously right.

Finance and accounting professionals who want to impact business results know that they can help their leaders and line managers most by helping them to focus on the right question, by being unafraid to explore uncharted waters, and by resisting the temptation to act before clarity is achieved.

Analytic tools and frameworks are useful in bounding the decision, indicating a direction, and describing desired outcomes, but, when it comes to exploring the unknown, they are no substitute for the human mind's creativity and inventiveness.

Revision Questions

4

Question 1

GHI manufactures three products – X, Y and Z. GHI's factory is highly automated and labour can be quickly recruited to support any level of production. However, machine capacity is limited to 18,000 hours. GHI's goods dispatch department is equipped in a manner which makes it impossible to send out more than 1,000 units of any one product to customers in a single period.

Details concerning production in the coming period are as follows:

	X	*Y*	*Z*
Market demand, units	900	1,000	1,200
Variable cost per unit, £	21	28	9
Selling price per unit, £	38	52	29
Machine hours per unit	8.5	10.0	5.0

Fixed costs are £ 35,000 per period.

Requirements

(a) Calculate the mix of X, Y and Z production that will achieve the maximum possible profit in the current period. Prepare a statement showing how that maximum profit is made up. **(9 marks)**

(b) Advise GHI's management on whether or not it should hire new equipment (rental per period £ 1,100) for the dispatch department in order to allow its handling capacity to be increased from 1,000 units of any one product to 1,200 units. **(9 marks)**

(c) Explain the full range of things that can be limiting factors in a business situation. Explain why these things might be only 'short-term' problems. **(7 marks)**

(Total marks = 25)

Question 2

2.1 GA is the Project Manager of X Ltd where he earns an annual salary of \$60,000. He has just identified an unexpected opportunity to undertake an extra project that he could supervise within his existing workload. The project would take one month to complete.

The project would also need a Marketing Manager, but the Marketing Manager of X Ltd, who earns an annual salary of \$36,000, is extremely busy and she does not have any spare time. However, it would be possible to hire a temporary manager for $3,700 to cover her regular duties for the duration of the project. Alternatively, a marketing consultant could be hired for the project for $4,500.

The total relevant cost of the Project Manager and a Marketing Manager for the extra project would be:

(A) $3,700
(B) $4,500
(C) $8,000
(D) $9,500

2.2 A company provides three services that use the same machine, M1. The budgeted details per service are as follows:

	Service X *£ per unit*	*Service Y* *£ per unit*	*Service Z* *£ per unit*
Selling price	12	14	24
Variable costs	6	4	13
Fixed cost	2	5	8
Profit	4	5	3
Number of M1 machine hours	2	3	6

The fixed costs are general fixed costs that have been absorbed by the services by their direct labour content.

If M1 hours are scarce, the most and least profitable services are:

	Most profitable	*Least profitable*
(A)	Y	Z
(B)	Z	X
(C)	Y	X
(D)	X	Z

? **Question 3** Objective test questions

3.1 OT Ltd plans to produce and sell 4,000 units of product C each month, at a selling price of £18 per unit. The unit cost of product C is as follows:

	£ per unit
Variable cost	8
Fixed cost	4
	12

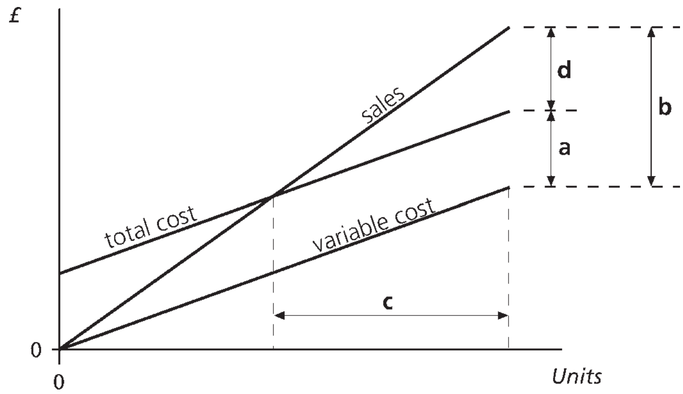
Calculate (to the nearest whole number) the monthly margin of safety, as a percentage of planned sales.

3.2 Is the following statement *true* or *false*?
The P/V ratio is the ratio of profit generated to the volume of sales.

3.3 Product J generates a contribution to sales ratio of 30 per cent. Fixed costs directly attributable to product J amount to £75,000 per month. Calculate the sales revenue required to achieve a monthly profit of £15,000.

3.4 Match the following terms with the labels **a** to **d** on the graph:

Margin of safety
Fixed cost
Contribution
Profit



3.5 Which of the following statements about a PV chart are *true*?

(a) The profit line passes through the origin.
(b) Other things being equal, the angle of the profit line becomes steeper when the selling price increases.
(c) Contribution cannot be read directly from the chart.
(d) The point where the profit line crosses the vertical axis is the breakeven point.
(e) Fixed costs are shown as a line parallel to the horizontal axis.

3.6 (a) Printing costs of £30 are incurred in putting together a proposal for a new client. Is this cost relevant to the decision to continue negotiating to obtain the client's business?
(b) In order to carry out a contract, additional premises will have to be rented at a cost of £2,000 per month. It is company policy to allocate rental costs to general fixed overheads. Is this rental cost relevant to the decision to accept the contract?
(c) Some material held in stock can be used on a particular job. The material has no other use but it could be sold for scrap for £1 per kilogram. Is the scrap value of the material a relevant cost of this job?

3.7 PH Ltd has spare capacity in its factory. A supermarket chain has offered to buy a number of units of product XZ each month, and this would utilise the spare capacity. The supermarket is offering a price of £8 per unit and the cost structure of XZ is as follows:

	£ per unit
Direct material	3
Direct labour	2
Variable overhead	1
Fixed overhead	3
	9

Fixed costs would not be affected.
On a purely financial basis, should the supermarket's offer be accepted or rejected?

3.8 *Delete as appropriate.*

(a) If a material stock item is regularly used in a business, the relevant cost of using the item for a particular job is its original purchase price/replacement price.
(b) If a material stock item is not regularly used in a business, and would not be replaced if it were used for a particular job, the relevant cost of using the item is the higher/lower of its resale value and its value from an alternative use.

3.9 Put the following tasks in the correct sequence for deciding on the optimum production plan when a limiting factor exists.

Rank the products according to the contribution per unit of limiting factor used.
Calculate each product's contribution per unit of limiting factor used.
Identify the limiting factor.
Allocate the limited resource according to the ranking.

3.10 The following details relate to three services provided by JHN plc.

	Service J	*Service H*	*Service N*
	£	£	£
Fee charged to customers	84	122	145
Unit service costs			
Direct materials	12	23	22
Direct labour	15	20	25
Variable overhead	12	16	20
Fixed overhead	20	42	40

All three services use the same type of direct labour which is paid £30 per hour.

The fixed overheads are general fixed overheads that have been absorbed on the basis of machine hours.

If direct labour is a scarce resource, the most and least profitable uses of it are:

	Most profitable	*Least profitable*
A	H	J
B	H	N
C	N	J
D	N	H

(2 marks)

? **Question 4** Profit statements and decision-making

BSE Veterinary Services is a specialist laboratory carrying out tests on cattle to ascertain whether the cattle have any infection. At present, the laboratory carries out 12,000 tests each period but, because of current difficulties with the beef herd, demand is expected to increase to 18,000 tests a period, which would require an additional shift to be worked.

The current cost of carrying out a full test is:

	£ per test
Materials	115
Technicians' wages	30
Variable overhead	12
Fixed overhead	50

Working the additional shift would:

(i) require a shift premium of 50 per cent to be paid to the technicians on the additional shift;
(ii) enable a quantity discount of 20 per cent to be obtained for all materials if an order was placed to cover 18,000 tests;
(iii) increase fixed costs by £700,000 per period.

The current fee per test is £300.

Requirements

(a) Prepare a profit statement for the current 12,000 capacity.
(b) Prepare a profit statement if the additional shift was worked and 18,000 tests were carried out.
(c) Comment on three other factors that should be considered before any decision is taken.

Question 5 PV graphs

(a) MC Ltd manufacturers one product only, and for the last accounting period has produced the simplified profit and loss statement below:

	£	£
Sales		300,000
Costs		
Direct materials	60,000	
Direct wages	40,000	
Prime cost	100,000	
Variable production overhead	10,000	
Fixed production overhead	40,000	
Fixed administration overhead	60,000	
Variable selling overhead	40,000	
Fixed selling overhead	20,000	
		270,000
Net profit		30,000

You are required to construct a PV graph from which you should state the breakeven point and the margin of safety.

(b) Based on the above, draw separate PV graph to indicate the effect on profit of each of the following:

(i) an increase in fixed cost;
(ii) a decrease in variable cost;
(iii) an increase in sales price;
(iv) a decrease in sales volume.

Question 6 Decision-making, limiting factor

ABC Limited makes three products, all of which use the same machine, which is available for 50,000 hours per period.

The standard costs of the product, per unit, are:

	Product A	*Product B*	*Product C*
	£	£	£
Direct materials	70	40	80
Direct labour			
Machinists (£8/hour)	48	32	56
Assemblers (£6/hour)	36	40	42
Total variable cost	154	112	178
Selling price per unit	200	158	224
Maximum demand (units)	3,000	2,500	5,000

Fixed costs are £300,000 per period.

Requirements

(a) Calculate the deficiency in machine hours for the next period.
(b) Determine the production plan that will maximise ABC Ltd's profit for the next period.
(c) Calculate the profit that will result from your recommended production plan.

Solutions to Revision Questions

4

Solution 1

(a) The products are ranked according to the contribution they offer in regard to the primary limiting factor (machine hours). This is so because maximum production allowed by both market demand and handing capacity cannot be achieved because of the machine hour constraint. Resources are then allocated according to this ranking and the secondary limiting factor (handling capability). The results are:

	X	*Y*	*Z*	*Total*
Selling price p.u. (£)	38	52	29	
Variable cost p.u. (£)	21	28	9	
Contribution p.u. (£)	17	24	20	
Mac. hrs. p.u.	8.5	10	5	
Cont. per mac. hr. (£)	2	2.4	4	
Rank	3	2	1	
Units	353	1,000	1,000	
Contribution (£)	6,001	24,000	20,000	50,001
Fixed costs (£)				−35,000
Profit (£)				15,001

(b) Increasing the handling capability from 1,000 units of any one product to 1,200 units of any one product has the following results:

Units	235	1,000	1,200	
Contribution (£)	3,995	24,000	24,000	51,995
Fixed costs (£)				−36,100
Profit (£)				15,895

Since the new arrangement increases profit, it should be adopted.

(c) Machine hours, skilled labour hours, material availability and transport capacity are all factors that are capable of being limiting factors. They are usually only short term factors because in a dynamic economy some means can usually be found to evade them. A new source of materials may be opened up, new skilled labour may be trained and products may be redesigned to have a lower machine hour requirement.

For example, one of the key limiting factors in the second world war UK armaments industry was availability of aluminium. So, aircraft were designed that could be built with wood rather than aluminium. These did not have the same performance, service life or reliability as metal built aircraft – but they were available in numbers that an metal building programme would not have allowed.

However, it is often found that as soon as one limiting factor is eliminated or avoided, then another one tends to appear. For example, there is no point in producing more aircraft if there are no spare pilots to fly them.

Solution 2

2.1 Answer: (A)

2.2

Service type	*X*	*Y*	*Z*
	£	£	£
Selling price	12	14	24
Variable costs	6	4	13
Contribution/unit	6	10	11
	Hours	*Hours*	*Hours*
Type M1 machine hours/unit	2	3	6
	£	£	£
Contribution/unit	3.00	3.30	1.83

Therefore the answer is (A)

Solution 3

3.1 Monthly fixed costs = 4,000 units × £4 = £16,000.

$$\text{Breakeven point} = \frac{\text{Fixed costs}}{\text{Contribution per unit}} = \frac{£16,000}{£18 - £8} = 1,600 \text{ units}$$

$$\text{Margin of safety \%} = \frac{\text{Planned sales} - \text{breakeven sales}}{\text{Planned sales}} \times 100\%$$

$$= \frac{4,000 - 1,600}{4,000} \times 100\% = 60\%$$

3.2 *False*. The P/V ratio is another term for the C/S ratio. It measures the ratio of the contribution to sales.

3.3 $$\text{Required sales value} = \frac{\text{Required contribution}}{\text{C/S ratio}} = \frac{£75,000 + £15,000}{0.30} = £300,000$$

3.4 (a) Fixed cost
(b) Contribution
(c) Margin of safety
(d) Profit.

3.5 (a) *False*. The profit line passes through the breakeven point on the horizontal axis, and cuts the vertical axis at the point where the loss is equal to the fixed costs.
(b) *True*. Profits increase at a faster rate if the selling price is higher.
(c) *True*. A contribution breakeven chart is needed for this.
(d) *False*. The breakeven point is where the profit line cuts the horizontal axis.
(e) *False*. No fixed cost line is shown on a PV chart.

3.6 (a) *Not relevant*. This is a sunk cost that will not be affected by a decision to continue negotiations.
(b) *Relevant*. Although the rental cost will be treated as a general fixed overhead, it is an incremental cost that will be incurred if the contract is accepted.
(c) *Relevant*. The opportunity cost of using the material on the contract is the scrap value forgone of £1 per kilogram.

3.7 *Accepted*. On a purely financial basis, the price of £8 per unit exceeds the incremental variable cost of £6 per unit.

3.8 (a) If a material stock item is regularly used in a business, the relevant cost of using the item for a particular job is its *replacement* price. (The original purchase price is a sunk or past cost).
(b) If a material stock item is not regularly used in a business, and would not be replaced if it were used for a particular job, the relevant cost of using the item is the *higher* of its resale value and its value from an alternative use. (This is the opportunity of using the stock item on this job.)

3.9
1. Identify the limiting factor.
2. Calculate each product's contribution per unit of limiting factor used.
3. Rank the products according to the contribution per unit of limiting factor used.
4. Allocate the limited resource according to the ranking.

3.10

	J	*H*	*N*
Contribution/unit	£45	£63	£78
Direct labour/unit	£15	£20	£25
Contribution/£1 of direct labour	£3.00	£3.15	£3.12

Therefore the answer is (A)

Solution 4

In part (b) do not be tempted to use unit rates to calculate the new level of fixed costs. The current level of fixed costs is £600,000 *per period*. This will increase by £700,000.
Also in part (b), notice that the shift premium applies only to the technicians working on the additional shift. It does not apply to all technicians' wages.
In part (c) you may have thought of other, equally valid, factors to be considered. In an examination, if you are asked for three factors do not waste valuable time by suggesting more than three.

(a) Profit statement for current 12,000 capacity

		£000
Sales	12,000 tests @ £300/test	3,600
Direct materials	12,000 tests @ £115/test	(1,380)
Direct labour	12,000 tests @ £30/test	(360)
Variable overhead	12,000 tests @ £12/test	(144)
Contribution		1,716
Fixed costs	12,000 tests @ £50/test	(600)
Profit		1,116

(b) Profit statement for 18,000 capacity, with additional shift

		£000	£000
Sales	18,000 tests @ £300/test		5,400
Direct materials	18,000 tests @ £92/test		(1,656)
Direct labour	12,000 tests @ £30/test	(360)	
	6,000 tests @ £45/test	(270)	
			(630)
Variable overhead	18,000 tests @ £12/test		(216)
Contribution			2,898
Fixed costs			(1,300)
Profit			1,598

(c) Three other factors that should be considered are:

Will the increase in demand continue in the long run, or is it short-lived? If it is thought that it will continue in the long run, management should consider expanding its permanent workforce so that shift premiums can be avoided.

Will the quality of the test decrease if more tests are carried out in the same time period? Also purchasing materials at a 20 per cent discount may indicate a decrease in the quality of the materials.

The elasticity of demand for the test. If demand is relatively inelastic, it may be more economic to increase the price of the test.

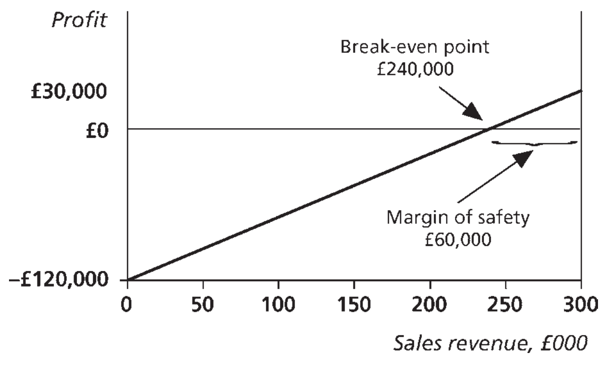
Solution 5

Try to obtain a piece of graph paper and practise drawing your graphs to scale. Remember to use the whole of the paper – do not produce a tiny graph in the corner of the sheet.

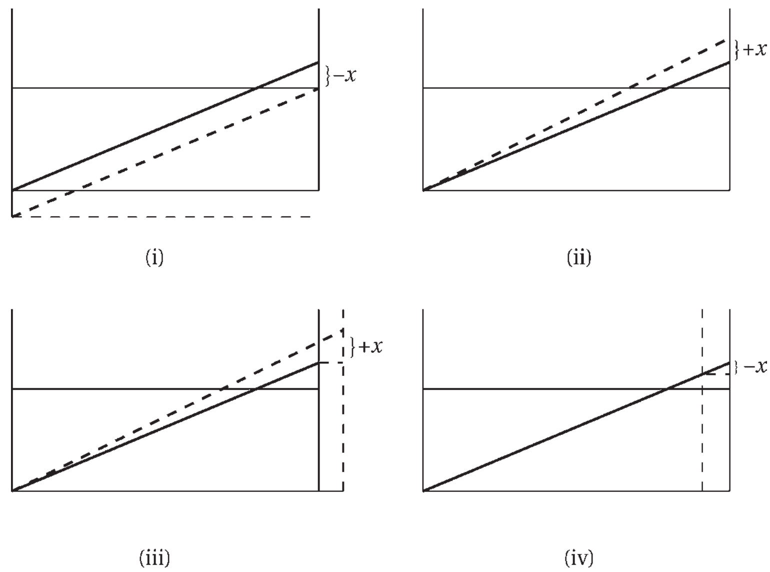
Remember that the graph in part (a) will cut the vertical axis at the point equal to the fixed costs, that is, the loss when no sales are made.

Practise good exam technique: check your breakeven point arithmetically to verify that your graph is accurate.

(a)



(b) These graphs show increase or decrease in profit by $+x$ or $-x$.



(i) An increase in fixed cost
(ii) A decrease in variable cost
(iii) An increase in sales price
(iv) A decrease in sales volume.

✔ Solution 6

In part (b) remember to rank the products according to their contribution per machine hour. Then allocate the available machine hours according to this ranking.
Do not attempt to apportion the fixed costs to the individual products. When you are calculating the profit in part (c), simply deduct the total fixed costs from your calculated contribution.

(a) Deficiency in machine hours for next period

	Product A	*Product B*	*Product C*	*Total*
Machine hours required per unit	48/8 = 6	32/8 = 4	56/8 = 7	
Maximum demand (units)	3,000	2,500	5,000	
Total machine hours to meet maximum demand	18,000	10,000	35,000	63,000
Machine hours available				50,000
Deficiency of machine hours				13,000

(b)

	Product A	*Product B*	*Product C*
	£	£	£
Selling price per unit	200	158	224
Variable cost per unit	(154)	(112)	(178)
Contribution per unit	46	46	46
Machine hours required per unit	6	4	7
Contribution per machine hour	£7.67	£11.50	£6.57
Order of production	2	1	3

Therefore, make:

	M/C hours
2,500 units of product B, using machine hours of (4 × 2,500)	10,000
3,000 units of product A, using machine hours of (6 × 3,000)	18,000
	28,000
Machine hours left to make product C	22,000
	50,000

Therefore, the company should make 3,142 i.e (22,000/7) units of product C.

(c) Profit for the next period

	Total	*Product A*	*Product B*	*Product C*
	£	£	£	£
Contribution from recommended production:				
£46 × 3,000		138,000		
£46 × 2,500			115,000	
£46 × 3,142				144,532
	397,532	138,000	115,000	144,532
Fixed costs	(300,000)			
Profit for the period	97,532			

The Theory and Practice of Budgeting

5

LEARNING OUTCOMES

When you have completed study of this Chapter you will be able to:

- explain why organisations prepare forecasts and plans;
- calculate projected product/service volumes employing appropriate forecasting techniques;
- calculate projected revenues and costs based on product/service volumes, pricing, pricing strategies and cost structures;
- describe and explain the possible purposes of budgets including planning, communication, co-ordination, motivation, authorisation, control and evaluation;
- evaluate and apply alternative approaches to budgeting;
- calculate the consequences of 'what if' scenarios and evaluate their impact on master profit and loss account and balance sheet.

5.1 Introduction

In this chapter we will consider the manner in which an understanding of cost and revenue structures can be applied in the construction of forecasts, plans and budgets. The preparation of budgets and their use in the control of operations are core management accounting functions. Budgets are widely used in the manufacturing, services, public and voluntary sectors.

The basic concepts and practices involved in budgeting are explored in this chapter.

5.2 The purposes of budgeting

Budgets have two main roles:

(a) they act as authorities to spend, that is, they give authority to budget managers to incur expenditure in their part of the organisation.

(b) they act as comparators for current performance, by providing a yardstick against which current activities can be monitored, and they may be used as targets to motivate managers.

These two roles are combined in a system of budgetary planning and control.

5.2.1 Budgetary planning and control

Planning the activities of an organisation ensures that the organisation sets out in the right direction. Individuals within the organisation will have definite targets that they will aim to achieve. Without a formalised plan the organisation will lack direction and managers will not be aware of their own targets and responsibilities. Neither will they appreciate how their activities relate to those of other managers within the organisation.

A formalised plan will help to ensure a co-ordinated approach and the planning process itself will force managers to continually think ahead, planning and reviewing their activities in advance.

However, the budgetary process should not stop with the plan. The organisation has started out in the right direction but to ensure that it continues on course it is management's responsibility to exercise control.

Control is best achieved by comparison of the actual results with the original plan. Appropriate action can then be taken to correct any deviations from the plan.

The two activities of planning and control must go hand in hand. Carrying out the budgetary planning exercise without using the plan for control purposes is performing only part of the task.

5.2.2 What is a budget?

A budget could be defined as 'a quantified plan of action relating to a given period of time'.

For a budget to be useful it must be quantified. For example, it would not be particularly useful for the purposes of planning and control if a budget was set as follows: 'We plan to spend as little as possible in running the printing department this year'; or 'We plan to produce as many units as we can possibly sell this quarter'.

These are merely vague indicators of intended direction; they are not quantified plans. They will not provide much assistance in management's task of planning and controlling the organisation.

These 'budget' could perhaps be modified as follows: 'Budgeted revenue expenditure for the printing department this year is £60,000'; and 'Budgeted production for the quarter is 4,700 units'.

The quantification of the budgets has provided:

(a) a definite target for planning purposes; and
(b) a yardstick for control purposes.

The thrust of this approach is that the budget provides an internal benchmark against which performance can be evaluated. If the department or business achieves its budget turnover and/or profit for the period that it is deemed to be performing well. Conversely, if it fails to achieve budget then it is deemed to be performing badly. This approach to performance evaluation has been subject to a variety of criticisms and we will explore these criticisms as we proceed through the text.

A budget can also have a variety of other uses relating to the legitimisation of decisions taken within an organisation. The process of preparing and obtaining approval for a spending budget may provide the channel through which authorisation is granted to commit resources.

In theory, a budget should be a motivating but 'neutral' tool. The practice of budgeting should not distort the processes it is meant to serve. However, at this point it should be noted that the process of establishing a budget and its subsequent use in control and performance evaluation can have a variety of behavioural effects within the organisation. These effects are not always obvious or intended. Sometimes, they can harm the organisation. Behavioural aspects of budgeting are considered fully in Chapter 6.

5.2.3 The budget period

You may have noticed that in each of these 'budgets' the time period was different. The first budget was prepared for a year and the second budget was for a quarter. The time period for which a budget is prepared and used is called the budget period. It can be any length to suit management purposes but it is usually one year.

The length of time chosen for the budget period will depend on many factors, including the nature of the organisation and the type of expenditure being considered. Each budget period can be subdivided into control periods, also of varying lengths, depending on the level of control which management wishes to exercise. The usual length of a control period is one month.

5.2.4 Strategic planning, budgetary planning and operational planning

It will be useful at this stage to distinguish in broad terms between three different types of planning:

- strategic planning;
- budgetary planning;
- operational planning.

These three forms of planning are interrelated. The main distinction between them relates to their time span which may be short term, medium term or long term.

Strategic planning

Strategic planning is concerned with preparing long-term action plans to attain the organisation's objectives.

Budgetary Planning

Budgetary planning is concerned with preparing the short- to medium-term plans of the organisation. It will be carried out within the framework of the strategic plan. An organisation's annual budget could be seen as an interim term step towards achieving the long-term or strategic plan.

Operational Planning

Operational planning refers to the short-term or day-to-day planning process. It is concerned with planning the utilisation of resources and will be carried out within the framework set by the budgetary plan. Each stage in the operational planning process can be seen as an interim step towards achieving the budget for the period.

Remember that the full benefit of any planning exercise is not realised unless the plan is also used for control purposes. Each of these types of planning should be accompanied by the appropriate control exercise covering the same time span.

5.3 The preparation of budgets

The process of preparing and using budgets will differ from organisation to organisation. However, there are a number of key requirements in the design of a budgetary planning and control process.

5.3.1 Co-ordination: the budget committee

The need for co-ordination in the planning process is paramount. The interrelationship between the functional budgets (e.g., sales, production, purchasing) means that one budget cannot be completed without reference to several others.

For example, the purchasing budget cannot be prepared without reference to the production budget, and it may be necessary to prepare the sales budget before the production budget can be prepared. The best way to achieve this co-ordination is to set up a budget committee. The budget committee should comprise representatives from all parts of the organisation. There should be a representative from sales, a representative from marketing, a representative from personnel, and so on.

The budget committee should meet regularly to review the progress of the budgetary planning process and to resolve any problems that have arisen. These meetings will effectively bring together the whole organisation in one room, to ensure that a co-ordinated approach is adopted to budget preparation.

5.3.2 Participative budgeting

CIMA defines participative budgeting as:

Participative budgeting: A budgeting system in which all budget holders are given the opportunity to participate in setting their own budgets.

This may also be referred to as 'bottom-up budgeting'. It contrasts with imposed or top-down budgets where the ultimate budget holder does not have the opportunity to participate in the budgeting process. The advantages of participative are as follows:

Improved quality of forecasts to use as the basis for the budget: Managers who are doing a job on a day-to-day basis are likely to have a better idea of what is achievable, what is likely to happen in the forthcoming period, local trading conditions, etc.
Improved motivation: Budget holders are more likely to want to work to achieve a budget that they have been involved in setting themselves, rather than one that has been imposed on them from above.

The main disadvantage of participative budgeting is that it tends to result in a more extended and complex budgetary process. However, the advantages are generally accepted to outweigh this disadvantage.

5.3.3 Information: the budget manual

Effective budgetary planning relies on the provision of adequate information to the individuals involved in the planning process.

Many of these information needs are contained in the budget manual.

A budget manual is a collection of documents that contains key information for those involved in the planning process. Typical contents could include the following.

(a) An introductory explanation of the budgetary planning and control process, including a statement of the budgetary objective and desired results.

Participants should be made aware of the advantages to them and to the organisation of an efficient planning and control process. This introduction should give participants an understanding of the workings of the planning process, and of the sort of information that they can except to receive as part of the control process.

(b) A form of organisation chart to show who is responsible for the preparation of each functional budget and the way in which the budgets are interrelated.

(c) A timetable for the preparation of each budget. This will prevent the formation of a 'bottleneck' with the late preparation of one budget holding up the preparation of all others.

(d) Copies of all forms to be completed by those responsible for preparing budgets, with explanations concerning their completion.

(e) A list of the organisation's account codes, with full explanations of how to use them.

(f) Information concerning key assumptions to be made by managers in their budgets, for example the rate of inflation, key exchange rates, etc.

(g) The name and location of the person to be contacted concerning any problems encountered in preparing budgetary plans. This will usually be the co-ordinator of the budget committee (the budget officer) and will probably be a senior accountant.

5.3.4 Early identification of the principal budget factor

The principal budget factor is the factor that limits the activities of the organisation. The early identification of this factor is important in the budgetary planning process because it 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, based on the available sales forecasts. All other budgets should then be linked to this.

Alternatively, machine capacity may be limited for the forthcoming period and therefore machine capacity is the principal budget factor. In this case the production budget must be prepared first and all other budgets must be linked to this.

Failure to identify the principal budget factor at an early stage could lead to delays later on when managers realise that the targets they have been working with are not feasible.

5.3.5 The interrelationship of budgets

The critical importance of the principal budget factor stems from the fact that all budgets are interrelated. For example, if sales is the principal budget factor this is the first budget to be prepared. This will then provide the basis for the preparation of several other budgets, including the selling expenses budget and the production budget.

However, the production budget cannot be prepared directly from the sales budget without a consideration of stockholding policy. For example, management may plan to increase finished goods stock in anticipation of a sales drive. Production quantities would then have to be higher than the budgeted sales level. Similarly, if a decision is taken to reduce the level of material stocks held, it would not be necessary to purchase all of the materials required for production.

5.3.6 Using spreadsheets in budget preparation

It is clear from just this simple example that changes in one budget can have a knock-on effect on several other budgets. For this reason spreadsheets are particularly useful in budget preparation. Budgetary planning is an iterative process. Once the first set of budgets has been prepared they will be considered by senior managers. They may require amendments to be made or they may wish to see the effect of changes in key decision variables.

A well-designed spreadsheet model can take account of all of the budget interrelationships. This means that it will not be an onerous task to alter decision variables and produce revised budgets for management's consideration.

5.3.7 The master budget

The master budget is a summary of all the functional budgets. It usually comprises the budgeted profit and loss account, budgeted balance sheet and budgeted cash flow statement. It is this master budget that is submitted to senior managers for approval because they should not be burdened with an excessive amount of detail. The master budget is designed to give the summarised information that they need to determine whether the budget is an acceptable plan for the forthcoming period.

5.4 Preparation of operational budgets

In this section, you will be working through an example of the preparation of operational budgets. Try to apply your knowledge from your earlier studies of cost accounting to prepare the budgets before looking at our solution.

Exercise: preparing operating budgets

A company manufactures two products, Aye and Bee. Standard cost data for the products for next year are as follows:

	Product Aye per unit	*Product Bee per unit*
Direct materials		
X at £2 per kg	24 kg	30 kg
Y at £5 per kg	10 kg	8 kg
Z at £6 per kg	5 kg	10 kg
Direct wages		
Unskilled at £3 per hour	10 hours	5 hours
Skilled at £5 per hour	6 hours	5 hours

Budgeted stocks for next year are as follows:

	Product Aye units	*Product Bee units*	
1 January	400	800	
31 December	500	1,100	
	Material X Kg	*Material Y kg*	*Material Z kg*
1 January	30,000	25,000	12,000
31 December	35,000	27,000	12,500

Budgeted sales for next year: Product Aye 2,400 units. Product Bee 3,200 units.
Prepare the following budgets for next year:

(a) production budget, in units;
(b) material purchases budget, in kg and by value;
(c) direct labour budget, in hours and by value.

Solution

(a) Production budget for next year

	Product Aye units	*Product Bee units*
Sales units required	2,400	3,200
Closing stock at end of year	500	1,100
	2,900	4,300
Less opening stock	400	800
Production units required	2,500	3,500

(b) Material purchases budget for next year

	Material X kg	*Material Y kg*	*Material Z kg*	*Total £*
Requirements for production				
Product Aye	60,000	25,000	12,500	
Product Bee	105,000	28,000	35,000	
	165,000	53,000	47,500	
Closing stock at end of year	35,000	27,000	12,500	
	200,000	80,000	60,000	
Less opening stock	30,000	25,000	12,000	
Material purchases required	170,000	55,000	48,000	
	£	£	£	
Standard price per kg	2	5	6	
Material purchases value	340,000	275,000	288,000	903,000

(c) Direct labour budget for next year

	Unskilled labour hours	*Skilled labour hours*	*Total £*
Requirements for production			
Product Aye	25,000	15,000	
Product Bee	17,500	17,500	
Total hours required	42,500	32,500	
	£	£	
Standard rate per hour	3	5	
Direct labour cost	127,500	162,500	290,000

5.4.1 Using stock control formulae in budget preparation

In this example the required closing stocks for material and for finished goods were detailed in the question data. You should recall from your earlier studies that there exist a number of stock control formulae that could be used to determine the required stock levels, taking into account such factors as supplier lead time.

The procedure used to prepare the budgets would be the same, but they would be based on more detailed calculations of the required stock levels.

5.4.2 Budget interrelationships

This example has demonstrated how the data from one operational budget becomes an input in the preparation of another budget. The last budget in the sequence, the direct labour budget, would now be used as an input to other budgets. The material purchases budget will also provide input data for other budgets. For example, the material purchases budget would probably be used in preparing the creditors budget, taking account of the company's intended policy on the payment of suppliers. The creditors budget would indicate the payments to be made to creditors, which would then become an input for the cash budget, and so on.

The cash budget is the subject of the next section of this chapter.

5.5 The cash budget

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.

Management decisions will have been taken concerning such factors as stockholding policy, credit policy, selling price policy and so on. All of these plans will be designed to meet the objectives of the organisation. However, if there are insufficient cash resources to finance the plans, they may need to be modified or perhaps action might be taken to alleviate the cash restraint.

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.

There are four possible cash positions that could arise:

Cash position	*Possible management action*
Short-term deficit	Arrange a bank overdraft, reduce debtors and stocks, increase creditors.
Long-term deficit	Raise long-term finance, such as loan capital or share capital.
Short-term surplus	Invest short term, increase debtors and stocks to boost sales, pay creditors early to obtain cash discount.
Long-term surplus	Expand or diversify operations, replace or update fixed assets.

A detailed understanding of cash management is outside the scope of the IMPM syllabus. However you should notice that the type of action taken by management will depend not only on whether a deficit or a surplus is expected, but also on how long the situation is expected to last.

For example management would not wish to use surplus cash to purchase fixed assets, if the surplus was only short term and the cash would soon be required again for day-to-day operations.

Cash budgets therefore forewarn managers of the following:

(a) Whether there will be cash surpluses or cash deficits.
(b) How long the surpluses or deficits are expected to last.

5.5.1 Preparing cash budgets

You will have studied the basic principles of cash budget preparation at Foundation level. However, in case you have forgotten the basics we shall review them now and work through a basic example.

The examiner has stressed that your studies should emphasise the interpretive aspects of budget preparation. Therefore, we shall also look in outline at how to interpret the cash budget that you have prepared.

(a) The format for cash budgets

There is no definitive format that should be used for a cash budget. However, whichever format you decide to use it should include the following:

(i) *A clear distinction between the cash receipts and cash payments for each control period.* Your budget should not consist of a jumble of cash flows. It should be logically arranged with a subtotal for receipts and a subtotal for payments.

(ii) *A figure for the net cash flow for each period.* It could be argued that this is not an essential feature of a cash budget. However, you will find it easier to prepare and use a cash budget in an examination if you include the net cash flow. Also managers find in practice that a figure for the net cash flow helps to draw attention to the cash flow implications of their actions during the period.

(iii) *The closing cash balance for each control period.* The closing balance for each period will be the opening balance for the following period.

(b) Depreciation is not included in cash budgets

Remember that depreciation is not a cash flow. It may be included in your data for overheads and must therefore be excluded before the overheads are inserted into the cash budget.

(c) Allowance must be made for bad and doubtful debts

Bad debts will never be received in cash and doubtful debts may not be received. When you are forecasting the cash receipts from debtors you must remember to adjust for these items.

Exercise: cash budget

Watson Ltd is preparing its budgets for the next quarter. The following information has been drawn from the budgets prepared in the planning exercise so far.

Sales value	June (estimate)	£12,500
	July (budget)	£13,600
	August	£17,000
	September	£16,800
Direct wages	£1,300 per month	
Direct material purchases	June (estimate)	£3,450
	July (budget)	£3,780
	August	£2,890
	September	£3,150

Watson sells 10 per cent of its goods for cash. The remainder of customers receive one month's credit.
Payments to creditors are made in the month following purchase.
Wages are paid as they are incurred.
Watson takes one month's credit on all overheads.
Production overheads are £3,200 per month.
Selling, distribution and administration overheads amount to £1,890 per month.
Included in the amounts for overhead given above are depreciation charges of £300 and £190 respectively.

Watson expects to purchase a delivery vehicle in August for a cash payment of £9,870. The cash balance at the end of June is forecast to be £1,235.

Prepare a cash budget for each of the months July to September.

Solution

Watson Ltd cash budget for July to September

	July £	*August* £	*September* £
Sales receipts			
10% in cash	1,360	1,700	1,680
90% in one month	11,250	12,240	15,300
Total receipts	12,610	13,940	16,980
Payments			
Material purchases (one-month credit)	3,450	3,780	2,890
Direct wages	1,300	1,300	1,300
Production overheads	2,900	2,900	2,900
Selling, distribution and administration overhead	1,700	1,700	1,700
Delivery vehicle	–	9,870	–
Total payments	9,350	19,550	8,790
Net cash inflow/(outflow)	3,260	(5,610)	8,190
Opening cash balance	1,235	4,495	(1,115)
Closing cash balance at the end of the month	4,495	(1,115)	7,075

5.5.2 Interpretation of the cash budget

This cash budget forewarns the management of Watson Ltd that their plans will lead to a cash deficit of £1,115 at the end of August. They can also see that it will be a short-term deficit and can take appropriate action.

They may decide to delay the purchase of the delivery vehicle or perhaps negotiate a period of credit before the payment will be due. Alternatively, overdraft facilities may be arranged for the appropriate period.

If it is decided that overdraft facilities are to be arranged, it is important that due account is taken of the timing of the receipts and payments within each month.

For example, all of the payments in August may be made at the beginning of the month but receipts may not be expected until nearer the end of the month. The cash deficit could then be considerably greater than it appears from looking only at the month-end balance.

If the worst possible situation arose, the overdrawn balance during August could become as large as £4,495 − £19,550 = £15,055. If management had used the month-end balances as a guide to the overdraft requirement during the period then they would not have arranged a large enough overdraft facility with the bank. It is important therefore that they look in detail at the information revealed by the cash budget, and not simply at the closing cash balances.

5.5.3 Cash budget: second example

In the last example you saw how a cash budget can be used to forewarn managers of the cash effect of their planning decisions. A cash budget can also be used as a cash planning tool, as you will see when you work through the following example where it is used to decide on the payments to be made to suppliers.

Exercise

A redundant manager who received compensation of £80,000 decides to commence business on 4 January year 8, manufacturing a product for which he knows there is a ready market. He intends to employ some of his former workers who were also made redundant but they will not all commence on 4 January. Suitable premises have been found to rent. Material stocks costing £10,000 and second-hand machinery costing £60,000 have already been bought out of the £80,000. The machinery has an estimated life of five years from January year 8 and no residual value.

Other data is as follows:

1. Product will begin on 4 January and 25 per cent of the following month's sales will be manufactured in January. Each month thereafter the production will consist of 75 per cent of the current month's sales and 25 per cent of the following month's sales.
2. Estimated sales are:

	Units	£
January	–	–
February	3,200	80,000
March	3,600	90,000
April	4,000	100,000
May	4,000	100,000

3. Variable production cost per unit:

	£
Direct materials	7
Direct wages	6
Variable overhead	2
	15

4. Raw material requirements for January's production will be met from the stock already purchased. During January, 50 per cent of the materials required for February's production will be purchased. Thereafter it is intended to buy, each month, 50 per cent of the materials required for the following month's production requirements. The other 50 per cent will be purchased in the month of production.
5. Payment for raw material purchases will usually be made 30 days after purchase, but it will be possible to delay payment if necessary for another month. The manager does not intend to use this course of action too frequently because of the danger of adversely affecting the business's credit rating. Ten per cent of the business's purchases will be eligible for a 5 per cent discount if payment is made immediately on delivery.
6. Direct workers have agreed to have their wages paid into their bank accounts on the seventh working day of each month in respect of the previous month's earnings.
7. Variable production overhead: 60 per cent is to be paid in the month following the month it was incurred and 40 per cent is to be paid one month later.
8. Fixed overheads are £4,000 per month. One-quarter of this is paid in the month incurred, one-half in the following month, and the remainder represents depreciation on the second-hand machinery.
9. Amounts receivable: a 5 per cent cash discount is allowed for payment in the current month and 20 per cent of each month's sales qualify for this discount. Fifty per cent of each month's sales are received in the following month, 20 per cent in the third month and 8 per cent in the fourth month. The balance of 2 per cent represents anticipated bad debts.

10. The manager's intended cash policy is to maintain a minimum month-end cash balance of £5,000. If cash balances are likely to be lower than this then supplier payment will be delayed as described above.

Prepare a cash budget for each of the first three months of year 8, taking account of the requirement to maintain a minimum month-end cash balance of £5,000. All calculations should be made to the nearest pound.

Solution

Initial workings

	January	*February*	*March*	*April*
1. *Monthly production (units)*				
25% of following month's sales	800	900	1,000	1,000
75% of current month's sales	–	2,400	2,700	3,000
	800	3,300	3,700	4,000
2. *Material purchases*				
	£	£	£	£
Material cost of production	5,600	23,100	25,900	28,000
50% of following month's requirements	11,550	12,950	14,000	
50% of current month's requirements		11,550	12,950	
Purchases	11,550	24,500	26,950	
3. *Wages payments*				
Previous month prodn volume (units)		800	3,300	
× £6 = wages paid in month		£4,800	£19,800	

4. *Variable overhead*	*January*	*February*	*March*
	£	£	£
Variable overhead cost of production	1,600	6,600	7,400
60% paid in following month		960	3,960
40% paid one month later		–	640
		960	4,600
5. *Fixed overhead*			
	£	£	£
One-quarter paid as incurred	1,000	1,000	1,000
One-half paid in following month	–	2,000	2,000
	1,000	3,000	3,000
6. *Sales receipts*			
		£	£
Monthly sales		80,000	90,000
Received in current month × 95% × 20%		15,200	17,100
Received in following month × 50%			40,000
Total receivable		15,200	57,100

The next step is to begin to build up the cash budget so that it is possible to see how much cash is available to pay for the material purchases. The discount for early payment will be taken, as long as this does not cause the cash balance to fall below the minimum required balance of £5,000.

Cash budget for January to March, year 8

	January £	*February* £	*March* £
Sales receipts (W6)	–	15,200	57,100
Cash payments			
Wages (W3)	–	4,800	19,800
Variable overhead (W4)	–	960	4,600
Fixed overhead (W5)	1,000	3,000	3,000
Payments, excluding material purchases	1,000	8,760	27,400
Material payments (W7)	1,097	9,343	28,112
Total cash payments	2,097	18,103	55,512
Net cash flow	(2,097)	(2,903)	1,588
Opening cash balance	10,000	7,903	5,000
Closing cash balance	7,903	5,000	6,588

7. *Payments for material purchases*

	January £	*February* £	*March* £
Opening cash balance	10,000	7,903	5,000
Cash inflow (from budget)	–	15,200	57,100
Cash outflow, excluding materials (from budget)	1,000	8,760	27,400
	(1,000)	6,440	29,700
Cash available	9,000	14,343	34,700
Material payments			
January: 10% of January paid			
10% × 11,550 × 95% (Note 1)	(1,097)		
February: pay for January purchases			
(maximum amount possible) (Note 2)		(9,343)	
March:			
Pay for January balance			(1,052)
February purchases (W2)			(24,500)
10% of March paid: 10% × 26,950 × 95%			(2,560)
Closing cash balance	7,903	5,000	6,588

Notes:

1. The remaining balance of January purchases (£11,550 × 90% = £10,395) is carried forward for later payment.
2. The remaining balance of January purchases (£10,395 − £9,343 = £1,052) must be paid in March.

5.6 Rolling budgets

Rolling budgets can be particularly useful when future events cannot be forecast reliably. The CIMA *Terminology* defines a rolling budget as:

Rolling budget: A budget continuously updated by adding a further accounting period (month or quarter) when the earliest accounting period has expired. Its use is particularly beneficial where future costs and/or activities cannot be forecast accurately.

For example, a budget may initially be prepared for January to December year 1. At the end of the first quarter, that is, at the end of March year 1, the first quarter's budget is deleted. A further quarter is then added to the end of the remaining budget, for January to March year 2. The remaining portion of the original budget is updated in the light of current conditions. This means that managers have a full year's budget always available and the rolling process forces them to continually plan ahead.

It is not necessary for all of the budgets in a system to be prepared on a rolling basis. For example, many organisations will use a rolling system for the cash budget only.

In practice, most organisations carry out some form of updating process on all their budgets, so that the budgets represent a realistic target for planning and control purposes. The formalised budgetary planning process will still be performed on a regular basis to ensure a co-ordinated approach to budgetary planning.

5.7 Forecasting and planning

In preparing budgets it is usually necessary to develop the budget around a set of forecasts. The budget officer needs to know what sales of different products will be, what labour rates will be, what material costs will be and so on. It is not always possible to state with absolute certainty what these figures will be, so certain forecasting techniques may be deployed.

Time series analysis is one such technique. A time series is a series of values that vary over time. When plotted on a graph, a time series may reveal a trend or relationship.

Such exercises can be carried out with varying levels of mathematical refinement. The simplest possible exercise in 'linear regression' is as follows:

Example

Month	*Units produced*	*Costs*
		£
1	100	1,200
2	150	1,550

We are required to forecast costs for month 3 when production of 120 units is planned.

On the assumption that the components of costs are either fixed or fully variable, then a model for cost behaviour can be developed using an equation in the form:

$$y = a + bx$$

where y is monthly costs, a is monthly fixed costs, b is variable cost per unit and x is output. As x rises by 50, y rises by 350, Hence b must be 7 and a is 500.

So we have deduced that the variable cost per unit (b) is £7, the fixed costs per month (a) are £500. So, if planned output (x) in month 3 is 120 units then we can forecast that costs in month 3 will be £1,340 (that is, £500 fixed costs plus (£7 × 120 units) variable costs).

Example

A product called the Unit is on sale. The information below gives the actual monthly and cumulative sales of Units during the period month 1 to month 9.

Month	*Total sales*	*Month sales*
1	1,000	1,000
2	1,580	580
3	2,100	520
4	2,400	300
5	2,650	250
6	2,850	200
7	3,190	340
8	3,510	320
9	3,690	180

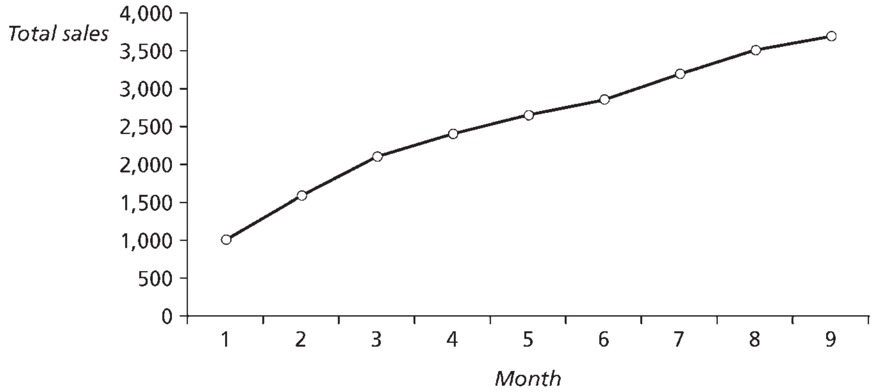


Figure 5.1 Cumulative sales of Units

We are required to produce a forecast for sales of Units in month 10.

Inspection of these figures shows that there is a 'trend'. Monthly Unit sales are declining – but not at an even rate (such as sales each month being 150 Units lower than the previous month). The decline month 1 to month 2 is 420 Units, whereas the decline month 8 to month 9 is only 140 Units.

The figures may be represented graphically as in Figure 5.1.

The trend is apparent but the curve is not smooth. There are probably a number of random elements that are influencing sales – perhaps the amount of rain, what happens to be shown on television or developments in the political situation.

One approach to developing a forecast for month 10 Unit sales is to develop a mathematical model to relate time and Unit sales. Essentially, this involves producing an algebraic equation to link the two. One mathematical technique to do this is known as regression analysis.

The widespread use of PC systems has influenced how this technique is applied.

The relationship between time and cumulative sales is a curve. The simplest algebraic form of a curve is represented by the equation:

$$y = Ax^n$$

In this case we can adopt y as the cumulative sales, x as the months and A as Unit sales in month 1. The figure n is a constant and the analyst has to determine its value.

The figures can be set up on a computer spreadsheet as shown below. The months are entered in the left-hand column. The equation is entered in all the cells in the center column with x being set as the value of the matching month's figure. The value for n in all the cells is linked to a number entered in a reference cell below the main tabulation.

A series of iterations can then be carried out by changing the value of n. It can be determined very quickly that 0.6 gives 'a line of nearest fit'. The resulting tabulation appears as follows:

Spreadsheet

Month	*Total sales*
1	1,000
2	1,516
3	1,933
4	2,297
5	2,627
6	2,930
7	3,214
8	3,482
9	3,737

These figures are not a perfect match – but they closely fit the actual figures recorded above. They follow the general trend but do not allow for the random events that cause minor fluctuations around that trend.

These 'mathematically modelled' figures may be shown graphically as in Figure 5.2.

If the relationship between cumulative months *(x)* and cumulative Unit sales is:

$$y = 1{,}000X^{0.6}$$

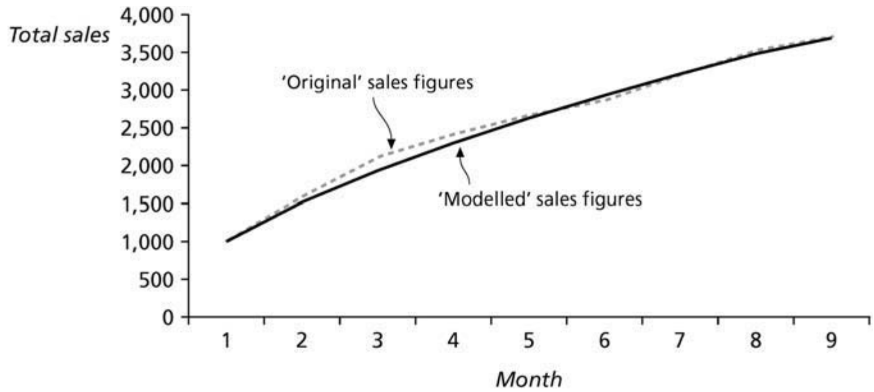


Figure 5.2 Mathematically modelled cumulative sales of Units

therefore, which x is 10, then y (cumulative month 1 to month 10 sales) is 3,981 and forecast month 10 sales is 244 Units. This forecast is unlikely to be perfect, but no forecast ever is.

5.8 Time series

5.8.1 The concept

One practical application of regression analysis in business forecasting is time series analysis. This approach was implicitly used in the previous section, at an elementary level, to prepare forecasts of costs and sales. A time series is the name given to a set of observations taken at equal intervals of time, for example, daily, weekly, monthly, etc. The observations can be plotted on a graph against time to given an overall picture of what is happening. Time intervals are usually plotted on the horizontal axis.

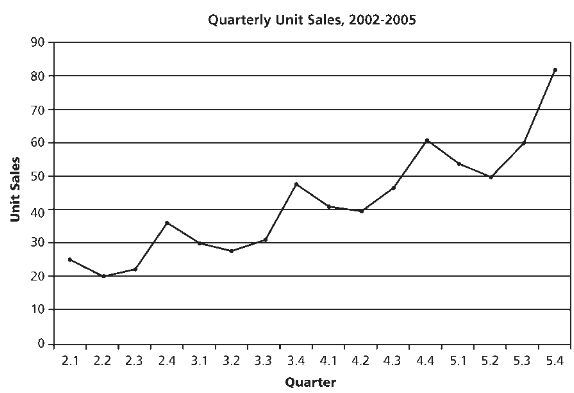
Time series can be constructed for total annual exports, monthly unemployment figures, daily average temperatures, etc.

Example

The following data relates to the sale of Units by ABC ltd. These are the quarterly totals taken over four years from 2002 to 2005.

Year	*Q1*	*Q2*	*Q3*	*Q4*
2002	25	20	22	36
2003	30	28	31	48
2004	41	40	47	61
2005	54	50	60	82

These sales figures may be presented graphically in the form of a time series as follows:



The graph gives a clear impression of how sales have moved over the 4–year period. It can be seen that sales have increased throughout the period but with seasonal variations. Sales seem to surge towards the end of the year then fall back during the middle of the year. Perhaps the Unit is a product with a seasonal sales pattern (e.g. wellington boots being sold mainly in winter or electric razors being sold mainly around Christmas)?

The purpose of time series analysis is to examine the above graph in order to develop a model that will represent how Unit sales move over time. Typically, that model is represented in the form of an algebraic equation or a line drawn on a graph.

In the case shown, we may wish to use time series analysis to develop a model to predict what Unit sales will be in 2006. One complication we have in doing this is that sales do not move over time in a neat, uniform manner. There are a number of factors that may influence how sales move over time.

5.8.2 Factors that cause variations

Various factors may cause a time series to move in the manner shown above. These factors include:

(a) *Long-term trend.* This is the key factor that causes the time series to move when the impact of short-term fluctuations has been ironed out. In the case illustrated above, the long-term trend is for Unit sales to rise. Long-term trends may relate to things such as change in the size or age structure of population, change in average income levels and technological progress.
(b) *Cyclical variations.* This is the way in which long-term cycles in trade cause demand to rise and fall. The UK economy has long been prone to five-year trade cycles whereby the general level of demand in the economy tends to fluctuate around a long-term growth trend. Some observers have claimed that this cycle is associated with the frequency of general elections and the tendency of governments to stimulate the economy in the period before an election. The period considered in the illustrative example is too short to allow the impact of such cyclical variations to be visible.
(c) *Seasonal variations.* This is the way in which sales within a year follow a seasonal pattern. Such a pattern is clearly visible in the example, with sales peaking in winter and bottoming in summer.
(d) *Random variations.* This is the tendency for sales figures to be influenced by utterly random and unpredictable factors. Examples of these are strikes, terrorist attacks, hurricanes, etc.

5.8.3 Time series modelling

As indicated above, the purpose of time series modelling is to develop a model based on past observations of some variable (e.g., unit sales) in order to forecast what unit sales will be in some future period. Typically, a time series model will incorporate the trend and the seasonal variations. Random variations are, by definition, impossible to forecast and are not incorporated in the model. Long term cyclical variations normally lie outside the period for which the model is to be used and are not incorporated in the model.

The normal point of departure in designing a model is to take a number of observations of some variable over time and identify a trend. One can do this with varying degrees of mathematical refinement. The simplest approach is to plot the observations on a graph and draw a line of nearest fit through them. That line is the trend and it may be expressed as an equation in the form $y = a + bx$ (assuming it is a straight line). But, using a curve equation in the form $y = a + bx^n$ is possible and may be appropriate.

Another approach to identify a trend is to use moving averages. For example, go back to the figures used in the example in Section 5.8.1. If we take the observations for all quarters in 2002, add them up (giving 103) and then divide by 4, we arrive at 25.75. This figure may be taken as being on the trend line as at the end of quarter 2, 2002, since the averaging gives a 'de-seasonalised' figure . That exercise can be repeated for subsequent quarters (averaging the observations for the two previous and two subsequent quarters) and this gives a series of de-seasonalised trend figures as follows:

Quarter	
2.2	20.75
2.3	27.00 (i.e. (20 + 22 + 36 + 30)/4)
2.4	29.00
3.1	31.25
3.2	and so on

One can identify a trend using a variety of different methods and alternative levels of mathematical refinement. Be aware that the whole modelling exercise is one in preparing a simplified representation of a complex reality. Using a very basic approach will usually give results of a quality very near to those obtained using a sophisticated approach.

Once a trend has been identified, variations from that trend can be averaged in order to determine the standard seasonal variations – and the time series model is then complete. The model can be used to forecast what sales will be in future time periods.

A time series model can be based on the assumption that the seasonal variations are either (a) fixed lump amounts (the additive model) or (b) constant proportions of the trend (the multiplicative model). One has to exercise judgement in determining which is most appropriate. Clearly if the trend is rising and the seasonal variations appear to be increasing in absolute terms, then a multiplicative model will probably be most appropriate.

Example

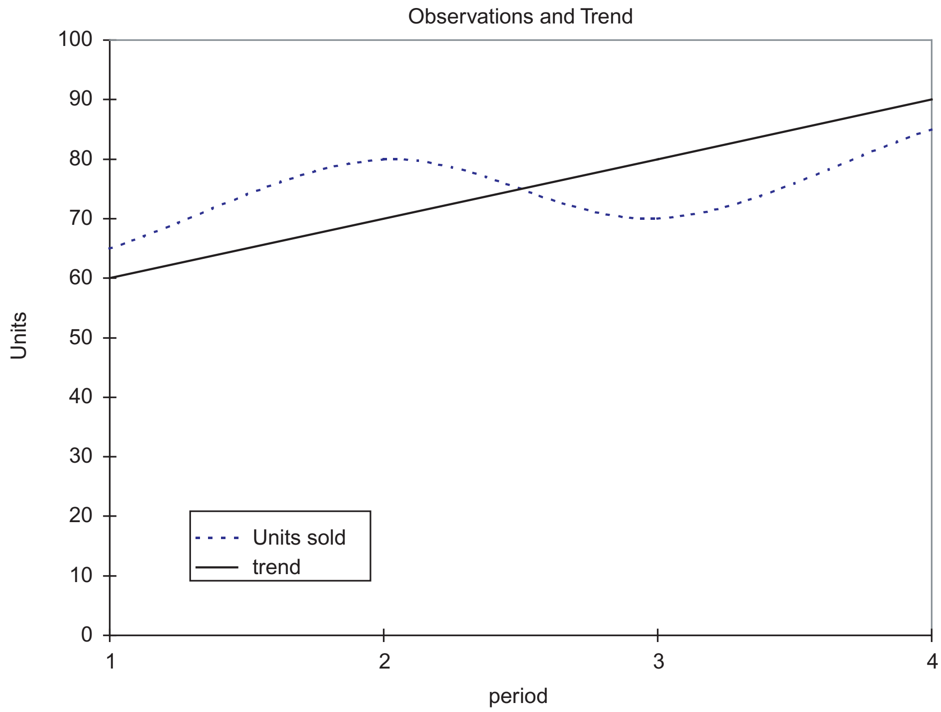
C Ltd sells units, and quarterly unit sales in Year 1 were as follows – 65 (quarter 1), 80 (q2), 70 (q3) and 85 (q4).

Inspection of these figures indicates a trend in unit sales (see Solution) which may be represented by the equation

$$y = 50 + 10x,$$

where y = unit sales and x is the quarter number (with year 1 – quarter 1 being '1').

Solution



How might these figures be used to develop a time series model in order to forecast unit sales in each quarter of year 2, using (a) an additive modelling approach, and (b) a multiplicative modelling approach?.

The point of departure is to take the actual unit sales and compare the trend figures with the actual figures for Year 1 in order to determine the seasonal variation for each quarter. This variation can be expressed as (a) a lump sum for each quarter (the additive model) or (b) a percentage of trend (the multiplicative model).

C Ltd - unit sales time series analysis

	Period	*Units sold*	*Trend*	*(a) Variation*	*(b) var %*
Year 1 q1	1	65	60	5	8.333%
Year 1 q2	2	80	70	10	14.286%
Year 1 q3	3	70	80	−10	−12.500%
Year 1 q4	4	85	90	−5	−5.556%

Note that the multiplicative model season variations may be expressed in several different ways. For example, the quarter 3 factor may be expressed as an indexation 87.5% or 0.875.

One may then apply these variation figures to trend projections in order to produce a quarterly forecast for unit sales in Year 2. The two modelling approaches produce two alternative forecasts under headings (a) and (b).

Unit sales, budget for Year 2

			Year 2 Forecast	
	Period	*Trend*	*Add. (a)*	*Mult. (b)*
Year 2 q1	5	100	105	108
Year 2 q2	6	110	120	126
Year 2 q3	7	120	110	105
Year 2 q4	8	130	125	123

Note that this is the simplest possible example. In particular, we are basing our analysis on only one set of observations (those for Year 1). In practice, one would prefer to calculate the seasonal variations on the basis of the average of two or three sets of observations. Thus if one observed quarter 1 variations from trend (additive model) of 6 (year A), 5 (year B) and 7 (year C) then one would adopt the average of the three (6) as the quarter 1 seasonal variation. The averaging process has the effect of 'ironing out' the impact of random variations over the past period you are considering.

5.9 Sensitivity analysis

There is always a significant degree of uncertainty concerning many of the elements incorporated within a business plan or budget. The budget officer is often required to report on such uncertainty in some way. There are various approaches to this issue and one of the most widely used is 'sensitivity analysis'.

A sensitivity analysis exercise involves revising the budget on the basis of a series of varied assumptions.

Example

The budget for quarter 1 is as follows:

	£
Sales: 100 Units @ £40 per Unit	4,000
Variable costs: 100 Units @ £20 per Unit	(2,000)
Fixed costs	(1,500)
Profit	500

There is some uncertainty over the variable cost per unit and that cost could be anywhere between £10 and £30, with £20 as the 'expected' outcome. We are required to carry out a sensitivity analysis on this.

One approach to this would be to present the budget shown above as an 'expected' case but with two other cases as 'worst' and 'best' possible outcomes.

Worst-case budget (£30 Unit variable cost)

	£
Sales: 100 Units @ £40 per Unit	4,000
Variable costs: 100 Units @ £30 per Unit	(3000)
Fixed costs	(1,500)
Profit/(loss)	(500)

Best case budget (£10 Unit variable cost)

	£
Sales: 100 Units @ £40 per Unit	4,000
Variable costs: 100 Units @ £10 per unit	(1,000)
Fixed costs	(1,500)
Profit	1,500

The position may be represented graphically as in Figure 5.3.

Figure 5.3 indicates that the operation remains profitable over 75 per cent of possible outcomes. The budget user thus obtains an impression of the possible impact of the uncertainty.

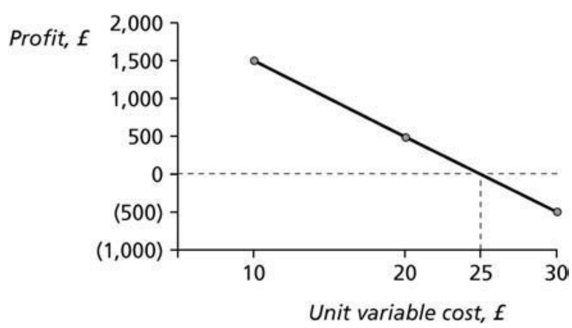


Figure 5.3 Sensitivity to unit variable cost

One can project the sensitivity cases through to the balance sheet as well as the profit and loss account. Let us say that the actual balance sheet at the start of quarter 1 is:

Balance Sheet at start quarter 1

Fixed Assets	5000
Debtors	1500
Cash/(Overdraft)	500
Net Assets	**7000**
Equity	5000
Profit & Loss	2000
Capital	**7000**

We determine that sales are all on 6 weeks' credit and all expenses are paid for immediately they are incurred. Then we can produce three alternative case budget end quarter 1 balance sheets as follows :

Budget Balance Sheets at end quarter 1

	Expected	*Worst*	*Best*
Fixed Assets	5000	5000	5000
Debtors	2000	2000	2000
Cash/(Overdraft)	500	(500)	1500
Net Assets	**7500**	**6500**	**8500**
Equity	5000	5000	5000
Profit & Loss	2500	1500	3500
Capital	**7000**	**6500**	**8500**

Calculation of the individual balance sheet figures should be fairly obvious. But let us consider the Worst case cash balance as an example:

Cash inflow from Sales	£	2,000 (being 50% of Sales)
Cash outflow for expenses		−4,500
Cash inflow from opening debtors		1,500
Opening cash balance		500
End cash balance		−500

In practical budgeting, there may be uncertainty concerning a large number of factors within the budget, and sensitivity analysis may consist of a series of complex 'what if?' enquires – reworking the budget, on the basis of a range of different scenarios. In large organisations with complicated budgets, such exercises may be very demanding. In the pre-computer era the relevant calculations were all carried out manually. This could be a time-consuming and error-prone exercise.

Computer spreadsheets have made the task much easier. However, the spreadsheet has to be designed carefully in order to facilitate sensitivity analysis exercises. A well-designed spreadsheet allows a single correction (on a unit price or an hourly wage rate) to update the whole budget. Spreadsheet modelling is one of the most critical of the practical skills required by management accountants.

5.10 Zero-based budgeting

Certain approaches to the construction of budgets have been developed in recent years. In this and the following sections we will consider three of these – zero based Budgeting (ZBB), programme-planning budgeting systems (PPBS) and activity-based budgeting

(ABB). These three methods have one thing in common – they place an emphasis on the outputs of the process being budgeted for. They all tend to start from the results that the budget is intended to achieve and work backwards to the resources needed to achieve those results, the reverse of more traditional budgeting practices. In the modern context, the process of establishing a budget is an intelligent exercise in business planning wherein alternative means of achieving given objectives are identified and evaluated.

ZBB, PPBS and ABB are probably most applicable to costs which contain a substantial discretionary element and as such they are most commonly encountered in service departments of commercial operations, the public sector and the not-for-profit sector.

Discretionary Cost: A cost whose amount within a time period is determined by, and is easily altered by, a decision taken by the appropriate budget holder. Marketing, research, and training are generally regarded as discretionary costs. Control of discretionary costs is through the budgeting process.

Like all budgeting techniques, zero-based budgeting (ZBB) is designed to be used in setting levels of *future* expenditures. As all cost-reduction techniques must, by definition, relate to the reduction of future costs (past costs being sunk), it follows that cost-reduction programmes and budgeting procedures are inextricably entwined. The CIMA *Official Terminology* defines zero-based/priority-based budgeting as:

Zero-based/priority-based budgeting: A method of budgeting which requires each cost element to be specifically justified, as though the activities to which the budget relates were being undertaken for the first time. Without approval, the budget allowance is zero.

This approach is particularly pertinent in public sector organisations, where funds are determined by tax revenues and government grants and allocations, that is, the income of the organisation is exogenously set. The aim of the fundholder is to achieve the best service levels possible within the given budget.

In traditional budgeting, *existing* expenditure levels form the baseline for discussions about future expenditure. Implicit in the traditional approach is an assumption and acceptance that current expenditure is adding value to the customer, and the focus of its attention is simply the justification of any proposed *increases* in that expenditure – it therefore adopts an incremental philosophy to budgeting. The rejection of this baseline as a starting point is what gives ZBB its name. An incremental approach is most likely to be applied to discretionary costs, as it is these costs that have no demonstrable relationship with volume or activity measures. The ZBB approach requires *all* activities to be justified and prioritised before the decision to devote resources to particular ones is taken.

All activities are subjected to the most basic scrutiny, and answers sought to such fundamental question as:

(a) Should the activity be undertaken at all?
(b) If the company undertakes the activity, how *much* should be done and how *well* should it be done (e.g. should an economy or a deluxe service level be provided)?
(c) How should the activity be performed – in-house or subcontract?
(d) How much would the various alternative levels of service and provision cost?

In order to answer these questions, all existing and potential organisational activities must be described and evaluated in a series of 'decision packages', giving the following four-step process to a ZBB exercise:

1. Determine the activities that are to be used as the object of decision packages – the provision of home support for the elderly or provision of catering facilities for the workforce, for example – and identify the manager responsible for each activity.
2. Request the managers identified in (1) above to prepare a number of alternative decision packages for those individual activities for which they are responsible. (At least three packages are normally requested: one that sets out what could be delivered with funding maintained at the *current* level; one for a *reduced* level of funding, e.g. 80 per cent of the current level; and one for an enhanced level of funding, e.g. 120 per cent of the current level.)
3. Rank the decision packages in order of their contribution towards the organisation's objectives.
4. Fund the decision packages according to the ranking established under (3) above until the available funds are exhausted.

5.10.1 Advantages of ZBB

The following advantages are claimed for ZBB:

(i) It avoids the complacency inherent in the traditional incremental approach, where it is simply assumed that future activities will be very similar to current ones.
(ii) ZBB encourages a questioning approach, by focusing attention not only on the cost of an activity, but also on the benefits it provides, as the relative benefits of different types and levels of expenditure. Forcing managers to articulate benefits encourages them to think clearly about their activities.
(iii) Preparation of the decision packages will normally require the involvement of many employees, and thus provides an opportunity for their view to be considered. This involvement may produce useful ideas, and promote job satisfaction among the wider staff.

5.10.2 Disadvantages of ZBB

The following disadvantages of ZBB need to be pointed out:

(i) The work involved in the creation of decision packages, and their subsequent ranking by top management, is very considerable, and has given rise to the cynical description of the process as 'Xerox-based budgeting'.
(ii) The ranking process is inherently difficult, as value judgements are inevitably. This is a particular problem in public sector bodies, where choices between very disparate programmes must often be made: for example, it would be extremely difficult to formulate criteria that would allow an unambiguous ranking when decision packages related to public health must be measured against those relating to law and order. Nevertheless, such rankings are made, explicitly or implicitly, whatever funds allocation system is used, and bringing the allocation problems into the open could be viewed as an advantage rather than a disadvantage of ZBB. However, without clear and explicit ranking criteria, the human brain finds ranking difficult. If 'a' is preferred to 'b', and 'b'

is preferred to 'c', it should follow that 'a' is preferred to 'c'. Unfortunately, experiments have shown that humans are often unable to produce such logical progressions when face with a large number of choices.

(iii) In applying ZBB, 'activities' may continue to be identified with traditional functional departments, rather than cross-functional activities, and thus distract the attention of management from the real cost-reduction issues. For example, in discussing value-added and non-value-added activities above, it was argued that the costs incurred in a warranty department are largely a function of the reliability of products, which itself is a function of actions and decisions taken elsewhere. If the warranty department is treated as an activity under ZBB, the focus of the decision packages is likely to be on providing the same level of customer service at reduced cost, or enhancing the level of customer service for the same cost. The main driver behind the department's cost – product reliability – may remain unaddressed in ZBB, as it is with the blanket cut approach.

5.10.3 ZBB in practice

ZBB has been adopted more widely in the public sector than the private, although examples of organisations regularly adopting a full ZBB approach are rare. Full-scale ZBB is so resource intensive that critics claim that its advantages are outweighed by its implementation costs. However, it is not necessary to apply ZBB to the whole of an organisation; benefits can be gained from its application to specific areas. For example, in the public sector, a decision could be made regarding the overall size of the childcare budget, and ZBB could be applied to allocate resources within that particular field; similarly, in a business organisation, ZBB could be applied to individual divisions on a rotational basis. This selective application ensures that a thorough reappraisal of activities is undertaken regularly, but not so regularly that the process itself is a major drain on organisational resources.

Notwithstanding the criticisms, the main plank of the ZBB approach – the rejection of past budgets as a planning baseline – is being increasingly accepted. Two surveys of UK local authorities, the first undertaken in 1983 and the second in 1988, showed the use of the approach increasing from 48 to 54 per cent over the period.

5.11 Programme-planning budgeting systems

Programme-planning budgeting systems (PPBS) – a well-understood short title, in the absence of the acronym, is *programme budgeting* – is used quite widely in the public sector and not-for-profit organisation to avoid excessive costs and to ensure that expenditure is focused on programmes and activities that generate the most beneficial results.

As we have seen, traditional budgeting systems, whether in the public or the private sector, are heavily *input*-oriented, with the main emphasis on detailed financial controls. They also lean towards existing organisational units, such as departments or divisions. In contrast, PPBS is expressed in terms of *programmes* (functional groups of activities with a common objective), rather than along traditional subdivisional lines, and is *output*- and *objective*-oriented, focusing on *end* items – the ultimate output of services of the organisation – rather than specific inputs. This form of budget structure has one obvious advantage: namely, the ease with which it identifies the budget appropriations with the organisations's objectives, thus facilitating a more rational allocation of resources.

The steps involved in PPBS can be simply (if rather simplistically) stated:

1. specify the objectives of the various programmes;
2. measure the output in terms of the objectives;
3. determine the total costs of the programmes for several future periods;
4. analyse alternatives, and go for those with the greatest cost–benefit in terms of the objectives;
5. systematically implement the selected alternatives.

Some explanation of these steps is necessary. Effectiveness can be judged only against predetermined benchmarks set by the organisation. Yet the activities performed by public sector and not-for-profit organisations are often difficult to measure in a tangible way, and can take several years to be measurable, while requiring the annual funding of the related programmes; multiple measures will often be required to overcome these difficulties. Many programmes will also have multiple results, and a choice must usually be made regarding the relative weights attached to them. Further, there will often be questions regarding the legitimacy of causal relationships when measuring these results: particular outcomes could be brought about by the actions of more than one programme, given the nature of public sector and not-for-profit organisations and their objectives.

On a more positive note, one feature of PPBS that should be particularly beneficial is that managers making budget requests are expected to be able to state clearly what would happen if their requests were cut by, say, 10 per cent. Thus the director of leisure services in a local authority should be in a position to say that such a cut would reduce the hours that a swimming pool could open, for example, or require that the grass in public parks be cut every ten days instead of once a week. This feature of PPBS is, in its result, somewhat similar to ZBB, since different levels of service are associated with each level of requested funding. The interest in PPBS probably owes much to an increasing public demand for accountability by public and other not-for-profit organisations: taxpayers appear to have become dissatisfied with the performance of central and local government agencies; and donors to charitable caused have expressed concern about the proportion of contributed funds devoted to administrative expenses. PPBS specifies goals clearly, and allows people to see where their money is going and, eventually, to see whether or not it was spent *effectively*.

Exercise

The Alpha Sufferers Group is a national charity offering support to sufferers and funding medical research. You have been invited to attend a trustees' meeting at which the following report on this year's performance and next year's annual budget will be discussed. No further supporting information is provided for the trustees. The trustees have used an incremental approach to determine the budget.

The treasurer has heard of 'PPBS' and wonders if it would be useful in the their not-for-profit organisation.

Criticise the current method of budgeting and explain the application (give specific examples) and possible advantages of PPBS to such an organisation.

	20X3		20X4	
	Budget	*Actual*	*Budget*	*Actual*
	£	£	£	£
Income				
Subscriptions	20,000	18,000	20,000	
Donations received	160,000	200,000	220,000	
Fund-raising	500,000	440,000	484,000	
	680,000	658,000	724,000	
Expenditure				
Employees	60,000	60,000	60,000	
Premises	8,000	8,000	8,000	
Office expenses	28,000	33,000	30,000	
Administration	30,000	42,000	40,000	
Research	300,000	320,000	350,000	
Printing	25,000	30,000	25,000	
Room rental	15,000	12,000	15,000	
Donations made	200,000	230,000	260,000	
	666,000	735,000	788,000	
Excess of income over expenditure	14,000	77,000	(64,000)	

Solution

The approach used to construct the budget is the 'traditional' approach to budgeting: looking at items 'line by line' and for a period of one year only. Presumably the budget for the coming year was set by taking last year's actual figures and 'adding or subtracting' a bit to reflect expectations or intentions and to use up the last year's 'unexpected' surplus of income over expenses.

The major criticisms of this approach in such a not-for-profit organisation are:

1. The emphasis is on annual figures, yet the activities of the charity (support and research) extend over a much longer time period.
2. There is no information in the budget about planned or actual achievements, such as the number of suffers contacted and helped, the level of awareness of the condition, or increased knowledge of cause or treatment. All that is shown is whether the levels of expenditure were as authorised, and if income targets were achieved.
3. There has been no attempt to identify the costs of the different activities. For example, if one objective and activity is to put sufferers in touch with each other, that would incur costs from several categories – employees, premises, office, administration, printing, etc. But it is impossible to tell from the figures presented how much was spent, or authorised, in achieving that individual objective.
4. There is no evidence that resources (cash, employee time, etc.) are being used in the most productive way. Indeed, there is no information at all as to how efficiently or effectively resources are being used.

A PPBS would overcome these problems with the traditional approach, because the emphasis would be on programmes and activities and how best to use resources to achieve the overall effectiveness of the charity in the medium and long term.

Application of PPBS

The trustees must undertake the following steps:

1. Review the charity's long-term objectives – for example, establish likely causes of the condition, put sufferers in touch with each other, etc.
2. Specify the activities and programmes necessary to achieve the overall objectives, for example, offer research grants to universities, fund a laboratory, maintain a database of sufferers, organise regional meetings and social events, distribute a regular newsletter or magazine, etc.
3. Evaluate the alternative activities and programmes in terms of both costs and likely benefit, that is, specify costs of putting sufferers in contact with each other via a newsletter, etc.
4. Select the most appropriate programmes.
5. Analyse the programmes selected, asking such questions as 'if we reduce the resources allocated to this programme by *x* per cent, what will happen to the level of achievement of objectives?'

Advantages of PPBS

By changing to a PPBS approach to budgeting, and thus taking a longer view than just one year, the trustees should be in a much better position to make informed decisions about the optimism use of their resources to achieve their clearly defined and understood objectives.

5.12 Activity-based budgeting

In recent years a body of 'activity-based techniques' (ABTs) has been developed. These include activity-based costing, activity-based management (explored in Chapter 8) and activity-based budgeting (ABB). The logical thrust behind all ABTs is that cost control and management should focus on the outputs of a process rather than on the inputs to that process.

ABT's are, arguably, most applicable to service-sector operations, the public sector, the not-for-profit sector and indirect costs in a manufacturing environment.

The traditional approach to budgeting presents costs under functional headings. That is, costs are presented in a manner that emphasises their nature. Thus, the traditionally arranged budget for a local authority public cleansing department over a given period might appear as follows:

Item of cost	*£*
Wages	140,000
Materials	28,000
Vehicle hire	35,000
Equipment hire	18,000
Total	221,000

The weakness of this approach is that it gives little indication of the link between the level of activity of the department and the cost incurred. The budget might be restated as an activity-based budget as follows:

Activity	*£*	*Number of activities*
Street sweeping	84,000	4,000
School cleaning	68,000	800
Park cleaning	39,000	130
Graffiti removal	30,000	150
	221,000	

This approach provides a clear framework for understanding the link between costs and the level of activity. Using the traditional approach, many of the costs listed under traditional functional headings might simply be considered 'fixed'. However, research often shows that, in the long run, few costs really are fixed. If one can identify appropriate 'cost drivers' then a very high proportion of costs reveal themselves to be variable.

For example, if the department is instructed to increase the frequency of street sweeping by 25 per cent then this will increase the budgeted number of street sweepings (the 'coast driver') from 4,000 to 5,000. A single street sweeping activity appears to cost £21 (that is £84,000 costs divided by 4,000 street sweepings) therefore if the number of street sweepings rises from 4,000 to 5,000 then one might expect costs to increase by £21,000.

Another example is in the review of capacity utilisation. If it is known that the resources devoted to street sweeping have a capacity of 4,800 sweepings and only 4,000 sweepings are being budgeted for, then one might consider the possibility of reducing the capacity in some way.

Of course, ABBs and traditional budgets are not mutually exclusive. The two can be prepared in parallel or they can be integrated.

5.13 Summary

In this Chapter we have explored the budgeting concept. It has been seen that the process of establishing a budget is an exercise in business planning wherein alternative courses of action are identified and evaluated. Once it has been adopted, the budget may be used as a tool of control and a benchmark against which performance may be evaluated.

Modern approaches to budgeting place an emphasis on finding cost effective means of achieving given objectives. The point of departure is to identify the objectives of the organisation and then determine the cheapest combination of resources that can achieve those objectives. Hence, the emphasis is on the outputs of the operation rather than on the inputs.

Readings

5

The nature of the budgeting process is very much influenced by the tools that the budget officer has at his/her disposal. The following article explores the use of computer systems in budgeting.

It is important to appreciate that budgeting is a concept, like standard costing, that is rooted in a particular philosophy and era of management. The idea is that operations should be planned for and performance measured by how far that plan is achieved. Many managers, academics and consultants believe that this philosophy has become dated and inappropriate in the modern economic environment. The second article below introduces us to the 'Beyond Budgeting' debate and we shall return to some of the issues it raises later in the text.

Spreadsheets and databases as budgeting tools

Bob Scarlett, *CIMA student*, July 1999

Most organisations use the spreadsheet as the main tool in budgeting and business planning. However, the spreadsheet was developed and introduced as a personal productivity aid. Its use in budgeting for medium-to large-size organisations may be problematic. A new category of business software has recently emerged, designed for use in budget management. One US software supplier has claimed that sales of this category (including products such as Comshare Commander Budget and Hyperion Pillar) are among the fastest growing in business management software. These products are highly developed database systems.

The limitations of spreadsheets

The process of creating a budget in a large organisation is a complex operation. Each area in the organisation needs to prepare a plan and these plans need to be collated and consolidated. The system must then accommodate adjustments on a top-down and bottom-up basis. A budgeting operation based on spreadsheets has the following problems:

- It is inflexible and error prone. A large number of spreadsheets can be linked and consolidated but this process presents many difficulties. Calculations are complex and mistakes are easily made. Random 'what-if' analyses across centres may become very difficult to carry out.
- It is a single-user tool in a multi-user environment. A large number of spreadsheet users are involved using similar templates over periods of weeks. This involves massive duplication of effort and gives rise to risks relating to loss of data integrity and consistency of structure.
- It lacks 'functionality'. There are many users in the budget management process ranging from cost centre managers to the chief financial officer. All require ready access to the

system in order to input data to it and draw information from it. The budget controller must be able to track revisions. Spreadsheet based systems are notorious for complexity – and they can be anything but easy to use.

Spreadsheet-based budgeting systems may be perfectly adequate for the small and simple operation. However, the limitations of such systems may become increasingly apparent as larger and more complex operations are considered.

User requirements

Modern organisations operate in a dynamic environment where the budgeting process involves numerous iterations and changes carried out at very short notice. The type of changes the budget system must accommodate include basic figures, organisation structure and calculation logic. The budget users have to be able to revise the budget to allow for changed assumptions or changed structures in a matter of minutes.

To expand on this:

Budget holders and cost centre managers need a simple interface with the system which allows them to input data to and draw information from the system without any major learning requirement. It should be possible to view data drawn from the system in simple tabular form.

Budget managers and divisional mangers receive consolidations of the various departmental budgets. They need to be able to determine who has input their contribution to the consolidated budget and who has not. They need to be able to identify changes to the budget which have been entered at a subordinate level. Above all, they need to be able to carry out top-down changes to the budget to accommodate 'what-if' enquiries and changes in the organisational structure which move items of cost and revenue from one area of the budget to another.

System administrators design, operate and update the system. They are usually qualified accountants who have a good knowledge of IT. They need a robust system which is easy to understand and where the various interfaces are not excessively technical. The system should allow its administrator to rearrange the system and bolt new modules onto the system without great IT sophistication.

What is needed is a system consisting of a group of linked modules which can be updated in two directions. Changed data introduced at cost centre level should automatically feed up through to the various summaries. A new expense line, introduced just once, should feed its way down through to every cost centre. The impact of a departmental reorganisation on the budget should be accommodated by a simple re-coding of relevant data items.

The modern budget management system

The preparation of a large and complex budget is an exercise in data processing. The spreadsheet is arguably, not well suited to this. The type of system that meets the above requirements is likely to be a database. Such systems have existed for many years but they have been associated mainly with the collation and reporting of large volumes of data. Specifically, they lacked a capability to allow random top-down, what -if analyses.

It is this last feature that distinguishes the modern budget management systems such as Comshare and Hyperion. Such systems contain a capability that allows the budget manager to undertake what-if analyses. For example, the budget manager can postulate the impact of a 12 per cent increase in fuel costs across all cost centers while all other data is held constant. This facility provides what many US budget managers call 'real-life budgeting'. A budget can be revised instantly without having to alter subordinate databases and rework the whole model.

A true multi-user capability allows shared access to a single database (or set of related databases) where users employ common definitions and data without any duplication of work. However, appropriate arrangements should be incorporated for the security and integrity of data. A developed budget management system should incorporate security features – including restricted access to certain account code items (e.g. management salaries).

Budgeting in a large operations is a complex process that requires the support of all the members of the organisation who are engaged in it. To gain the enthusiastic support of managers it is essential the user interfaces where data is input and information is extracted are both familiar and 'user-friendly'.

Evaluating budget management systems

To summarise the previous discussion, the following are the main features that are sought in a large organisation budget management system

1. Shared and instantaneous access to a common database
2. A multi-dimensional structure that allows bi-directional arithmetic.
3. Facility for instantaneous adjustments to structure and complex calculations.
4. Appropriate audit and security arrangements for access to and updating of data
5. User-friendly and industry standard interfaces.
6. A powerful modeling capability for use in planning and analysis.

Comshare and Hyperion are highly developed applications which satisfy all of the above criteria. However, they are so highly developed that they may require some users to make concessions in regard to their precise requirements and the way in which they prefer to work. Most readers will have experience of adopting systems which force the user to work in a new or less satisfactory manner.

Many users prefer to adopt 'toolkit' systems that allow the user to develop a customised product tailored to their own precise needs. The downside to the toolkit approach is that it probably requires a higher level of sophistication on the part of the user. The user should expect to invest a considerable amount of time in developing, installing and starting operation of a system developed using this approach. Also, it is going to be considerably more difficult to develop a system that satisfies all of the above criteria. That said, the end result may be a more satisfactory system and one which the systems administrator finds easier to run.

Each organisation has its own unique needs having regard to its information requirements, its structure, the resources at its disposal and the personal preferences of its members. It has to adopt a system which provides a good 'fit' to those needs.

Many of the issues which have been discussed above can be explored using a simple PC business suite such as Microsoft Office. The Office suite contains a spreadsheet system (Excel) and a database system (Access). The management accountant can use either of these to develop a budget system – although the spreadsheet route is probably far easier for the smaller operation.

However, the construction of a budget management system using Access is a useful exercise. It gives many insights into the manner in which accounting systems are designed and developed. Also with a little ingenuity, you can design a system that actually satisfies several of the six criteria listed above.

Exercise

You are given the following information for year 1 budget:

	Q1	*Q2*	*Q3*	*Q4*
Sales	400	380	340	280
Variable costs	290	275	265	255
Fixed costs	60	65	65	70

Use a PC database system, such as Access 97, to construct a budget to contain these figures. The system should be able to generate a report giving contribution and profit figures by quarter and annual totals. The system should be able to undertake simple 'what – if' analyses. If you are using Access 97 this will involve a crosstab query and a tabular report. The use of simple account coding is also required.

This exercise is accessible only to readers who are adept in the use of PC systems. You should attempt it if you can but preparing a correct solution is not critical in the present context.

Solution

Code	*Item*	*Q1*	*Q2*	*Q3*	*Q4*	*Total*
1						
	Sales	400	380	340	280	1,400
	Variable costs	−290	−275	−265	−255	−1,085
Summary for 'code' =1 (2 detail records)						
	Sum	110	105	75	25	315
2						
	Fixed costs	−60	−65	−65	−70	−260
Summary for 'code' =2 (1 detail record)						
	Sum	−60	−65	−65	−70	−260
	Grand total	50	40	10	−45	55

Cutting the planning ties that bind

Tom Lester, *The Financial Times, 9 May 2000*. © Financial Times Information Reprinted with Permission

Budgets are the bane of many managers' lives. Months are spent estimating expenditure for everything down to the last paper clip. Yet even by the end of Week 1, some assumptions will be out of date, the constraints and incentives will be inhibiting action and opportunities will be lost. Post-internet timescales are even shorter, and a growing number of companies have decided that conventional budgeting is no longer worthwhile. To them, the reassurance budgets give to nervous chief executives is outweighed by the flexibility needed to create value for shareholders.

Brian Lever, principal consultant at PwC in London, says many companies 'want, in theory, to go ahead and abandon budgeting, but are not sure how'. The hesitation does not just come from the board: staff have become so used to the budget as a means of control, and a ready-make excuse for either spending or not spending money, that they feel naked without it. An initiative by about 20 companies in Europe has resulted in a forum called the Beyond Budgeting Round Table.[1]

Robin Fraser, a director of the forum, says much of the sweat and tears shed by managers over budgets stems from confusion over their purpose.

'It began life as a purely accounting document, used mainly for financial and tax planning. But it came to be used as a target, a forecast – even a quasi-contract for performance, control and rewards,' he says.

The resulting distortions are well known. If an estimate of the likely outcome is realistic, it cannot be a testing target; the budget becomes a floor as well as a ceiling; there is a rush to spend whatever is left in the kitty at the year-end, or else vital moves are delayed to keep within the budget; managers will not risk their bonuses whatever the long-term benefit to the business, and so on. The result stultifying effect, however, is the constriction on managers' freedom to respond to customer demands in a fast-changing market. Old command-and-control management styles are no longer adequate, but empowerment and effective horizontal teamwork cannot be realities if staff are restricted by a vertical, top-down budget.

In 1977, Dr Jan Wallander, then chief executive of the retail bank Svenska Handelsbanken, demonstrated that it was possible to do without budgets, and the bank's outstanding record since is held up by the anti-budget lobby as proof of the benefits. Some other large groups have followed suit, such as SKF, Tetra Laval and, in Copenhagen, Borealis, the merged petrochemical interests that came out of the Finnish Neste and the Norwegian Statoil. Outside Scandinavia, the take-up has been modest.

Sometimes, radical restructuring provides the impetus for change.

Pavi Binning, group financial controller of Diageo, the food and drinks group formed from the GrandMet – Guinness merger in December 1997, says: 'We started with a clean sheet of paper'. As well as the famous stout, the merger brought together many valuable brands. In the new focus on value, rationalising the planning and budgetary process for the brands was an immediate priority. In this respect, Mr Binning sees the finance function as an agent, not an opponent, of change:

'What we needed to create, was a focus on consumers, on people on our brands and their strengths, and on performance. We knew we had to do something to free people from the burden of the budgeting work, and force them to think strategically, but with clear accountability and responsibility. We did a hell of a lot of analysis on the value drivers in each part of the organisation, and then added targets that would take us from the strategy to actual execution.

For example, in the spirits business, a painstaking economic profit analysis was carried out and the markets and brands with the highest value potential selected. Then specific 'value levers' likely to improve profit were identified – it could be volume, price, cost, marketing expenditure, or some other factor.'

Next, strategies and action plans were devised to work on the 'levers', and indicators agreed to track progress against targets, while keeping a check on factors such as brand awareness and market penetration. This now forms the control mechanism at Diageo.

For accounting purposes, the usual monthly returns of sales volume, net sales value and trading profit have been retained. The difference, says Mr Binning, is that these are no longer the only measures of progress, and he claims that now the initial spadework has been done, the business is much more focused on the drivers that will improve performance.

'Most companies analyse monthly results against their forecast. At group level, we now focus on year-on-year performance and on whether the operating unit is delivering against the trajectory agreed in its strategic plan. You immediately know if it is off-track or not. Then every quarter we check on progress against the strategy. We're moving towards a continuous planning process linking strategy and execution.

We started by making changes at the group level. But a significant amount of budgeting actually takes place in operating units, so we've got pilots running at the unit level to develop matching processes.'

Before, GrandMet had worked through a fresh strategic planning process every year. It took two to three months, and was followed by a separate process for the annual plan. At the end, the annual plan often did not resemble the earlier strategic plan. Removing the budget, on the other hand, is only possible once people are ready to accept the responsibility. 'Some managers find it difficult,' says Mr Binning. 'So you need organisational support to change behaviour and build their capabilities. People naturally default to the old behaviour.'

Diageo held workshops to help staff define the critical value drivers and levers. 'From the first,' says Mr Binning, 'we encouraged managers to break down the internal barriers. They are now seeing the key things that are important to performance, not a thick document which includes every conceivable number in the business.'

'The finance and general management community are hugely supportive,' says Mr Binning. 'By redesigning the strategic planning process, we've taken out a chunk of work and begun to free up the organisation so it can focus on driving value.'

He admits that dispensing with the budget 'is a journey, and no one's got there yet. We're making progress and refining it as we go along.'

Note

1. Beyond Budgeting Round Table, Tel: +44 (0) 1202 670 717; www.beyondbudgeting.org

Extract from 'Budgets on a roll: recalculating a business's outlook several times a year'

Randy Myers, Journal of Accountancy, December 2001. © 2001. Reprinted with permission of AICPA

For years, senior managers at REL Consultancy Group handled budgeting and revenue forecasting much the way most other companies do. As year-end approached, they would evaluate performance, set sales targets for the upcoming year and then work to see that everyone met or exceeded the goals.

Unfortunately, the process didn't always produce the intended results.

'Invariably,' recalls Stephan Payne, president of the London-based global management consulting firm, 'one of the account directors would land a couple of good clients early in the year and make his annual budget well before the year closed. More often than not, he'd then take his foot off the gas and coast.'

To make the budgeting process more timely and relevant, the firm embraced a more complex, albeit intuitive, approach to financial forecasting – the rolling budget. Rather than creating an annual financial forecast that remains static for the year, he and his colleagues now produce an 18-month budget and then update projections every month – in effect, recalculating the whole budget. As the firm's actual sales figures come in each month, directors plug them into their forecasting model in place of what they had projected, then roll the budget forward one more month.

No more free rides

The result: an always-current financial forecast that reflects not only the company's most recent monthly results but also any material changes to its business outlook or the economy. In addition, it provides fewer opportunities for account directors to ride the coattails of past performance.

'Now, even the guy who booked a million dollars' worth of business in one month can't sit still because 30 days later, we're going to have an entirely new forecast,' Payne says, adding, 'It's a dynamic process that makes a lot more sense.'

Although traditional one-year budgets are still the norm at most companies large and small, many accountants argue that rolling budgets can be a far more useful tool. Unlike static budgets, they encourage managers to react more quickly to changing economic developments or business conditions. They discourage what is too often a fruitless focus on the past ('Why didn't we meet our numbers?') in favor of a realistic focus on the future. And they produce forecasts that, over the near term, are never more than a few months old, even when companies are rolling them forward on a quarterly basis – the more common approach – rather than REL's monthly basis.

'A static budget simply doesn't reflect the pace of business today,' says Jill Langerman, CPA, president and CFO of the accounting firm Fair, Anderson & Langerman in Las Vegas. 'If at midyear you add a new product to your lineup, you want to calculate the costs and profit margins associated with that and reflected those calculations in your budget OSC to reflect the impact that it will have on your remaining product lines. That way, you can set an accurate performance target and make informed decisions about whether you're now free to invest more in the remaining product lines or perhaps add a new line. If you're not incorporating these new analyses into your budget, it becomes a rather useless document.'

Implementing rolling budgets doesn't necessarily require any fundamental change in the way a company has been doing its budgets – except, of course, it no longer does the job just once a year. However, companies that decide to step up to rolling budgets may want to take advantage of the decision to make a change and consider what else they can do to improve the process. After all, if a company can get everyone on board to make such a fundamental change, a further nudge to make the process more effective and efficient in other ways may be possible, too.

The problem of relevance

In the view of many accountants, traditional budgets too often are useless because they are out of date soon after they are assembled. Assuming that much of the decision making that goes into them gets done in the fourth quarter of the prior year, by the end of the following year, traditional budgets reflect thinking and data more than 12 months old. Not surprisingly, such documents tend to get short shrift from front-line managers. In worst-case scenarios, they can even promote behaviors and business decisions that are counterproductive.

Consider the real-world example of a Fortune 500 company that has been talking with REL about how it might improve its forecasting to produce better financial results. The company uses a traditional static annual budgeting process in which it sets monthly sales goals for each of its products. If the company misses its sales targets in the first month, product managers will typically push those projected sales into the final quarter of the year.

By doing that, corporate management is acting as if the outlook for the full year remains unchanged even though sales were off to a slow start.

But if the slow pace continues and product managers being to realise that their lost sales can't be made up in the last quarter, they start to budget them out over all of the remaining quarters of the year. Frequently, they wind up running massive discounting programs at the end of each quarter to hit their annual targets. Fortunately, the company can afford such budget maneuvering because it enjoys relatively high margins on its products, but such manipulation isn't maximising its return on investment.

Acting rationally

'The static budget encourages managers to create artificial demand for their products, not end-user demand,' observes Payne. In other words, the company stuffs its distribution channel and simply delays further shipments. If the company had a more realistic budget, product managers would be able to act more rationally, eliminating the last-minute forced discounts.

In addition, says Payne, with a better picture of what they were going to sell, they could make better investment decisions. 'Maybe a product manager would decide not to spend another $6 million on a new packaging line, for example, if he knows he's not going to sell the 20 million units he thought he was going to sell. You take the gamesmanship out of the organisation.'

Not only are static annual budgets restrictive, it turns out that many managers don't really like them. 'Most of our clients complain than their current planning process is extremely painful and time-consuming,' says Anne Swaller, general manager of the Stanford, Connecticut, office of Parson Group, a national consulting firm focused on finance, accounting and business systems. Assuming the client is operating on a calendar year, Swaller adds, everyone runs around feverishly in October and November to do budgeting, and then at the end of the process, they're happy to get it over with knowing they don't have to do it again until the next November

Unfortunately, those same managers often have their compensation tied to the budget, which lends it import even when it's no longer accurate. 'If I'm a manager responsible for meeting my monthly numbers,' Swaller says, 'I am going to spend a lot of nonvalue-added time to ensure those numbers are met, even if it means shipping extra product at month's end.'

'It becomes a merry old dance,' agree Payne, who recalls doing work for a British manufacturer that routinely shipped extra product at the end of each year to meet sales targets and then sold only spare parts in January and February. The trouble, is, once you start that process, you have to keep the charade going year after year, Payne explains. 'What this company really needs is a new CEO to come in and say, 'I'm not going to do this anymore.' But anybody who does will realise that they will have to take a big hit to sales and earnings in that first year, and that is quite a lot for anybody to take on.'

Efficiency and effectiveness in the not-for-profit sector

Bob Scarlett – CIMA Student, 2003

The not-for-profit (NFP) sector incorporates a wide range of operations including central government, local authorities, charitable trusts and executive agencies. The central thing about such operations is that they are not primarily motivated by a desire to make profit.

The ultimate objective of a commercial business is to generate a profit for its owners. Such a business may take a short or long-term view of the manner in which it wishes to do this. There are often alternative routes available which are capable of achieving this objective and management has to choose between them. However, there is a clear primary objective from which subsidiary objectives may be derived.

The objectives of NFP organisations may be partly legislated for, partly constitutional and partly political. For example, the Driver and Vehicle Licensing Agency (based at Swansea, UK) is charged with keeping records of vehicle registration and issuing driving licenses and road tax disks to motorists. This is a legal obligation. Mencap (a British Charity) has an obligation to act in order to provide assistance for the mentally handicapped written into its constitution.

Sunderland City Council has an obligation to run local schools – but has a wide measure of discretion over how it does this. It can spend money on salaries for teachers or it can switch some of that money into acquiring IT systems and making greater use of Computer Assisted Learning. It can provide teaching of classical Greek or it can reinforce its sports provision. The relevant choices the Council makes are determined by a political process. Parties contesting local elections will include their spending proposals in party manifestos and the voters will elect the Party with the most popular proposals.

However, practical problems with management in the NFP sector include the following:

objectives may be vague or poorly understood;
objectives may change regularly over time;
radically different means may be available to achieve given objectives.

A further consideration is that the relationship between 'objectives' and 'means' is often poorly understood. For example one public objective is 'to contain street crime within limits considered to be acceptable'. One means of achieving that objective is through the use of traditional police foot patrols. In fact, police foot patrols may be a poor method of containing many forms of street crime. The use of police response units using fast cars is much more cost effective. As soon as a crime is detected by video surveillance or a report from the public, the police can be on the scene quickly. A police officer in a fast car can cover much more ground than an officer on foot. That said, regular police foot patrols may make the public feel more relaxed as they go about their daily business.

However many local politicians will advocate the need to 'have more bobbies on the beat' in their manifestos. This reflects some lack of clarity over objectives. Is the objective of policing to contain crime or to make the public feel more comfortable?. The two are not the same at all. Are police foot patrols a means to achieve an objective, or are they an objective in themselves?.

In recent years, much of the discussion concerning NFP sector management has concerned the promotion of the twin concepts of 'efficiency' and 'effectiveness'.

Efficiency

Efficiency concerns making the maximum possible use of a given set of resources. That is, it involves a straight comparison of output and input, for example, the total cost per kilometre of road resurfaced.

Many UK local authorities in the 1970s were judged to be making an inefficient use of the resources available to them. They undertook most of their activities (such as road resurfacing or refuse disposal) using large numbers of directly employed council staff. It was often found that these in-house operations cost far more to achieve given outputs than comparable private sector operations.

Financial management initiatives in the 1980s required local authorities to put many of their works programmes 'out to tender'. Private contractors may submit bids in order to undertake specific works for the local authorities. The current Private Finance Initiatives involve continuing private sector participation in the maintenance and operation of facilities such as schools and prisons. For example, in the past a contractor may have built a school for a local authority and simply handed it over to the authority. The more modern approach might involve the contractor building the school and then leasing it to the authority. The contractor thus remains responsible for aspects of its maintenance and management after completion. The contractor will now have an incentive to carefully consider the trade-off between construction costs and operating costs. Possible economies in the construction phase may be associated with higher operating costs later on and the contractor now has in interest in both.

Experience over the last twenty years suggests that this process has generally improved efficiency and achieved greater 'value for money' in local authorities – although the concept is not without its critics.

Effectiveness

Effectiveness concerns finding the cheapest combination of means to achieve a given objective.

This concept is a little more difficult to handle than efficiency. An NFP organisation will normally have a number of stated objectives. For example, a public authority may have 'containing youth crime within acceptable levels' as one of its objectives. It has several means by which it may achieve this objective, including:

providing 'school attendance officers' to ensure that children are not truanting from school (Education Department);
providing leisure facilities in the form of sports grounds and youth clubs (Recreation Department);
providing assistance for disadvantaged or problem families (Social Services Department);
providing police patrols to arrest or deter young criminals (Police Department);
providing Young Offenders Institutions at which young criminals may be detained (Prisons Department).

All of these departmental activities contribute to achievement of the objective. The problem is to find the optimum combination of spending for all of the Departments together. Practical solutions to this problem lie at the core of budgeting and planning techniques such as Zero Based Budgeting and Planning Programming Budgeting Systems.

An aggressive policy of arresting and detaining young criminals may achieve the required objective – but at high cost. Imprisoning a criminal is a very expensive 'last resort' and may turn a marginal criminal into a habitual one. Experience suggests that much crime can be deterred by less aggressive methods. A high proportion of crime is committed by young men in the 13–18 age group. Ensuring that children all attend school regularly and that adequate youth recreational facilities are available may address 'the causes of crime'.

An insensitive financial cut back in one area (for example, making a school attendance officer redundant) can have a high cost impact in other areas when truanting schoolchildren commit petty crime. The key to effectiveness is in finding an optimum pattern of spending to achieve a given objective.

Finding that optimum pattern will usually involve determining a programme of activities which cuts right across traditional departmental boundaries. The emphasis in modern public sector planning tends to be on outputs rather than inputs. It should be appreciated that the departments within an organisation may be efficient – but the organisation as a whole may be ineffective if the overall pattern of departmental activity has not been carefully planned. Conversely, an organisation may have detailed inefficiencies in its operation, but be effective nevertheless.

Effectiveness is, by its very nature, rather more difficult to measure than efficiency. However it should be appreciated that performance in an NFP organisation is a function of both efficiency and effectiveness. Performance management and measurement have to take account of this.

This Page Intentionally Left Blank

Revision Questions 5

Question 1

1.1 AW plc is preparing its maintenance budget. The number of machine hours and maintenance costs for the past six months have been as follows:

Month	*Machine hours*	*£*
1	10,364	35,319
2	12,212	39,477
3	8,631	31,420
4	9,460	33,285
5	8,480	31,080
6	10,126	34,784

The budget cost allowance for an activity level of 9,340 machine hours, before any adjustment for price changes, is nearest to

(A) £21,000
(B) £30,200
(C) £33,000
(D) £34,300

1.2 M plc uses time series analysis and regression techniques to estimate future sales demand. Using these techniques, it has derived the following trend equation:

$$y = 10{,}000 + 4{,}200x$$

where y is the total sales units; and x is the time period.

It has also derived the following seasonal variation index values for each of the quarters using the multiplicative (proportional) seasonal variation model:

Quarter	*Index value*
1	120
2	80
3	95
4	105

The total sales units that will be forecast for time period 33, which is the first quarter of years 9, are

(A) 138,720
(B) 148,720
(C) 176,320
(D) 178,320

1.3 Q limited used an incremental budgeting approach to setting its budgets for the year ending 30 June 2003.

The budget for the company's power costs was determined by analysing the past relationship between costs and activity levels and then adjusting for inflation of 6%.

The relationship between monthly cost and activity levels, before adjusting for the 6% inflation, was found to be:

$$y = £(14{,}000 + 0.0025x^2)$$

where y = total cost; and x = machine hours.

In April 2003, the number of machine hours was 1,525 and the actual cost incurred was £16,423. The total power cost variance to be reported is nearest to

(A) £3,391 (A)
(B) £3,391 (F)
(C) £3,740 (F)
(D) £4,580 (F)

1.4 H Limited uses a combination of regression analysis and time series analysis to predict its future sales volumes. An analysis of past data has shown that the underlying trend of the company's sales is well represented by the formula:

$$y = 100x + 2{,}400$$

where

y is the total sales units for a period;
x is the quartely period number

The seasonal variation index values based on the same past data is:

Quarter 1	105%
Quarter 2	96%
Quarter 3	90%
Quarter 4	109%

The increase in budgeted sales volumes between quarter 3 and quarter 4 next year, which are periods 17 and 18, will be

(A) 100 units
(B) 119 units
(C) 432 units
(D) 888 units

(Total marks = 20)

? Question 2

You are given the following information about a company's costs in the past two quarters.

	Q_1	Q_2
Production (units)	10,000	15,000
Sales (units)	9,000	15,000
Costs	£000	£000
Direct material		
A	50	75
B	40	60
Production labour	180	230
Factory overheads	80	95
Depreciation	14	14
Administration	30	30
Selling expenses	29	35

For accounting purpose, the company values inventory of units at a constant standard cost. In quarter 3:

Sales and production will be 18,000 units.
Material A will rise in price by 20 per cent relative to earlier quarters
Production wages will rise by 12.5 per cent relative to earlier quarters.
The selling price per unit will remain constant at £40.
Expenses are all paid in the month in which they are incurred.
Sales are all on two month's credit terms. Seventy per cent sales are paid for on the due date while the remaining 30 per cent are paid for one month after the due date.

Requirements

(a) Prepare a budget profit statement for quarter 3. **(12 marks)**
(b) Prepare a budget cash-flow statement for quarter 3. **(13 marks)**
(Total marks = 25)

? Question 3

R plc is an engineering company that repairs machinery and manufactures replacement parts for machinery used in the building industry. There are a number of different departments in the company including a foundry, a grinding department, a milling department and a general machining department. R plc prepared its budget for the year ending 31 December 2003 using an incremental budgeting system.

The budget is set centrally and is then communicated to each of the managers who have responsibility for achieving their respective targets. The following report has been produced for the general machining department for October 2003:

	Budget	*Actual*	*Variance*
Number of machine hours	9,000	11,320	2,320 (F)
	$	$	$
Cleaning materials	1,350	1,740	390 (A)
Steel	45,000	56,000	11,000 (A)
Other direct materials	450	700	250 (A)
Direct labour	29,000	32,400	3,400 (A)
Production overheads	30,000	42,600	12,600 (A)
Total	105,800	133,440	27,640 (A)

The Manager of the general machining department has received a memo from the Financial Controller requiring him to explain the serious overspending within his department.

The Manager has sought your help and, after some discussion, you have ascertained the following:

the cleaning materials, steel and other direct materials very in proportion to the number of machine hours;
the budgeted direct labour costs include fixed salary costs of $4,250, the balance is variable in proportion to the number of machine hours;
the production overhead costs include a variable cost that is constant per machine hour at all activity levels, and a stepped fixed cost which changes when the activity level exceeds 10,000 machine hours. A further analysis of this cost is shown below:

Activity (machine hours)	3,000	7,000	14,000
Costs ($)	13,500	24,500	45,800

Requirements

(a) Prepare a revised budgetary control statement using the additional information that you have obtained from the Manager of the general machining department. **(10 marks)**

(b) (i) Explain the differences between an incremental budgeting system and a zero based budgeting system. **(4 marks)**

(ii) Explain why R plc and similar organisations would find it difficult to introduce a system of zero based budgeting. **(4 marks)**

(c) Explain the benefits of involving the managers of R plc in the budget setting process, rather than setting the budget centrally as is R plc's current policy. **(7 marks)**

(Total = 25 marks)

? Question 4

Y plc is currently preparing its budgets for the year ending 30 September 20X1.

The sales and production budgets have been completed and an extract from them is shown below.

	Production units	*Sales units*	*Sales value*
	000	000	£000
January	900	1,000	50,000
February	850	800	40,000
March	1,000	900	45,000
April	1,200	1,100	55,000
May	1,250	1,300	65,000
June	1,175	1,200	60,000
July	1,100	1,150	57,500
August	*	1,050	52,500

* To be determined

Budgeted production costs are:

	£/unit
Direct materials	14
Direct labour	12
Variable overhead	6
Fixed overhead*	8
Production cost	40

* Fixed overheads are absorbed on a unit basis assuming a normal production level of 14m units per year.

Direct materials are purchased in the month of usage and, where settlement discounts are available, Y plc's policy is to pay suppliers so as to receive these discounts. It is expected that 60 per cent of Y plc's material costs will be received from suppliers who offer a 2 per cent discount for payment in the month of purchase. Other material suppliers are to be paid in the month following purchase.

Direct labour costs are paid 75 per cent in the month in which they are incurred, and 25 per cent in the following month.

Variable overhead costs are paid in the month in which they are incurred.

Fixed overhead costs include £16m depreciation. Fixed overhead expenditure accrues at a constant rate throughout the year and is paid 40 per cent in the month in which it is incurred and 60 per cent in the following month.

In addition to production costs, Y plc expects to incur administration overhead costs of £500,000 per month and selling overhead costs of 2 per cent of sales value. These costs are to be paid in the month in which they are incurred.

Y plc's customers are expected to pay for items as follows:

in the month of sale	20 per cent
in the month after sale	55 per cent
in the month two months after sale	15 per cent
in the month three months after sale	5 per cent

Customers paying in the month of sale are given 1 per cent discount. Five per cent of sales are expected to be bad debts.

In addition to the above, Y plc expects that:

new machinery is to be acquired on 1 February 20X1, costing £15m. This is to be paid for in May 20X1.
corporation tax of £10m will be payable in June 20X1.
a dividend of £7.5m will be paid to shareholders in July 20X1.
the bank balance at 1 April 20Xl will be £14.5m.

Requirements

(a) Prepare Y plc's cash budget for the period April–July 20X1, showing clearly the receipts, payments and resulting balances for each month separately. **(20 marks)**

(b) Use your answer to part (a) to explain clearly:
  (i) feed-forward control;
  (ii) feedback control. **(5 marks)**

(Total marks = 25)

2005.1

? Question 5

PMF plc is a long-established public transport operator that provides a commuter transit link between an airport and the centre of a large city.

The following data has been taken from the sales records of PMF plc for the last 2 years:

Quarter	*Number of passengers carried*	
	Year 1	*Year 2*
1	15,620	34,100
2	15,640	29,920
3	16,950	29,550
4	34,840	56,680

The trend equation for the number of passengers carried has been found to be

$$x = 10{,}000 + 4{,}200q$$

where x = number of passengers carried per quarter and
q = time period (year 1 quarter 1: q = 1)
(year 1 quarter 2: q = 2)
(year 2 quarter 1: q = 5)

Based on data collected over the last two years, PMF plc has found that its quarterly costs have the following relationships with the number of passengers carried:

Cost item	*Relationship*
Premises Costs	y = 260,000
Premises staff	y = 65,000 + 0.5x
Power	y = 13,000 + 4x
Transit staff	y = 32,000 + 3x
Other	y = 9,100 + x

where y = the cost per quarter (£), and x = number of passengers per quarter.

Requirements

(a) Using the trend equation for the number of passengers carried and the multiplicative (proportional) time series model, determine the expected number of passengers to be carried in the third quarter of year 3. **(7 marks)**

(b) Explain why you think that the equation for the Transit staff cost is in the form $y = 32{,}000 + 3x$. **(3 marks)**

(c) Using your answer to part (a) and the cost relationship equations, calculate for each cost item and in total, the costs expected to be incurred in the third quarter of year 3. **(3 marks)**

(d) Explain briefly why there may be differences between the actual data for the third quarter of year 3 and the values you have predicted. **(5 marks)**

(e) Prepare a report, addressed to the Board of Directors of PMF plc, that briefly explains the following in the context of measuring the *effectiveness* of the transport services:
why the company should consider the use of non-financial performance measures;
three non-financial performance measures that could be used. **(7 marks)**

(Total marks = 25)

Question 6

Nossex County Council (NCC) is responsible for the normal range of services associated with a major local authority. NCC is organised into departments each responsible for a particular activity, for example education, social services, parks and gardens, etc. Each department has an annual budget that is used in both the planning and control of activities.

After its budgets for 20X4/X5 had been approved by NCC's finance committee it is found that due to government restrictions on the level of NCC's council tax, total expenditure will have to be reduced to a level 8 per cent below that originally planned for.

Shortly after receiving news of this, NCC's finance committee chairman (councillor Ron Scroggs) makes the following statement during the course of an interview on Radio Nossex:

> We do not like what has happened but we shall have to make the best of things. It seems to me that the fairest thing to do is to cut back the present 20X4/X5 budget for each department by 8 per cent. In this manner the misery will be spread evenly and everyone will suffer the same. The details of how this cut back will affect particular services can be left to the individual departmental heads to decide.

Requirements

In your capacity as chief executive of NCC write a report for NCC's finance committee on the situation explaining why you agree or disagree with the approach that Scroggs advocated in the radio interview. **(25 marks)**

Question 7

MNO Ltd manufactures a product known as the Unit. A large number of other companies also manufacture the Unit and the market price of the Unit is forecast to be £210 during 20X1. Market demand for the Unit is highest towards the end of the year. Customers prefer to place orders with manufacturers who are able to deliver Units immediately from their inventory.

A summarised version of MNO's balance sheet at 31 December 20X0 is shown below.

MNO Ltd: summarised balance sheet at 31 December 20X0

	£
Plant and equipment (net)	780,000
Inventory	80,000
Debtors	125,000
Cash at bank	30,000
Creditors	(20,000)
Net assets	995,000
Share capital	100,000
16% loan from shareholders	500,000
Retained earnings	395,000
Capital	995,000

During 20X1 MNO is committed to:

- repaying £125,000 of the 16 per cent loan from shareholders in June and paying £40,000 interest on the loan in June and £30,000 interest in December;
- paying interest on its bank overdraft at a rate of 5 per cent per quarter on the balance outstanding on the last day of each quarter;
- incurring fixed overhead costs (excluding depreciation) at a rate of £200,000 per quarter (all such costs are paid in the month in which they are incurred);

incurring variable production costs at a rate of £100 per unit (75 per cent of these costs are paid for in the month they are incurred and 25 per cent in the month after they are incurred).

MNO's accounting policies include:

Providing for depreciation at a rate of 5 per cent per quarter on the net book value (that is, cost less depreciation) of plant and equipment outstanding at the end of each quarter; valuing inventory (or 'stock') at a standard production cost of £160 per Unit.

In early January 20X1, MNO's executives meet in order to discuss commercial strategy for the coming year. The sales director advocates an aggressive strategy (Strategy 1), involving new investment, high inventories and an expansion of sales. The finance director advocates a conservative strategy (Strategy 2) involving no new investment, minimising inventories and the adoption of a 'tight' credit policy on sales.

Relevant details concerning the two strategies are as follows:

Strategy 1

In January, acquire new production equipment at a cost of £360,000.

Offer 60 per cent (by sales value) of customers two months' credit and require the rest to pay immediately.

Make sales at a rate of 900 units per month (quarters 1 and 2) and 1,30 units per month (quarters 3 and 4).

Produce at the rate of 1,200 units per month (quarters 1 and 2) and 1,100 units per month (quarters 3 and 4).

A review of outstanding debts at the end of 20X1 is forecast to result in a bad debt write-off totalling £64,000 (all relating to quarter 4 sales).

Strategy 2

Continue the existing credit policy of offering 50 per cent (by sales value) of customers one month's credit and require the rest to pay immediately.

Make sales at a rate of 800 units per month (quarters 1 and 2), 1,000 units per month (quarter 3) and 1,100 units per month (quarter 4).

Produce at a rate of 850 units per month (quarters 1 and 2) and 1,000 units per month (quarters 3 and 4).

A review of outstanding debts at the end of 20X1 is forecast to result in a bad debt write-off totalling £10,000 (all relating to quarter 4 sales).

Requirements

(a) Prepare a cash-flow budget and a profit budget for MNO on the basis of Strategy 1. The budgets should be split into quarterly intervals showing cash-flow and profit forecasts for each individual quarter. **(20 marks)**

(b) Prepare a cash-flow budget and a profit budget for MNO on the basis of Strategy 2. The budgets should be split into quarterly intervals showing cash flow and profit forecast for each individual quarter. **(20 marks)**

(c) Compare and contrast the two sets of budgets you have prepared in answer to requirements (a) and (b). Advise MNO's management on the relative merits of the two alternative strategies. Advise which strategy should be adopted. **(10 marks)**

(Total marks = 50)

Note: in preparing your answer you may assume that cash is held on current account where it earns no interest and any cash deficit requirement is satisfied by drawing down on the overdraft facility.

? Question 8

'Traditional budgeting systems are incremental in nature and tend of focus on cost centers. Activity-based budgeting links business planning to the budgeting process with a view to finding the most costeffective means of achieving objectives.'

Requirements

(a) Explain the weaknesses of an incremental budgeting system. **(5 marks)**

(b) Describe the main features of an activity-based budgeting system and comment on the advantages claimed for its use. **(10 marks)**

(Total marks = 15)

This Page Intentionally Left Blank

Solutions to Revision Questions 5

Solution 1

1.1

Use high and low points to determine the cost behaviour pattern based on past data:

	Machine hours	*£*
High	12,212	39,477
Low	8,480	31,080
Difference	3,732	8,397

$$\text{Variable cost per machine hour} = \frac{£8{,}397}{3{,}372} = £2.25$$

By substitution the fixed cost is:

$£39{,}477 - (12{,}212 \times £2.25) = £12{,}000$

For an activity level of 9,340 machine hours, the budget cost allowance would be:

$£12{,}000 + (9{,}340 \times £2.25) = £33{,}015$

Therefore the answer is (C)

1.2

$x = 33$, so trend value is$=10{,}000 + (4{,}200 \times 33) = 148{,}600$
Seasonal variation index value = 120
Forecast sales units = $148{,}600 \times 120\% = 178{,}320$

Therefore the answer is (D)

1.3

The budget cost allowance for 1,525 machine hours is:

$$\begin{aligned} & £14{,}000 + 0.0025\,(1{,}525^2) \\ = \; & £14{,}000 + (0.0025 \times 2{,}325{,}625) \\ = \; & £14{,}000 + £5{,}814 \\ = \; & £19{,}814 \end{aligned}$$

Add 6% for inflation = £21,003
Thus the total variance is: $£16{,}423 - £21{,}003 = £4{,}580$ (F)

Therefore the answer is (D)

1.4

Quarter 3 units = (100 × 17) + 2,400 × 90% = 3,690
Quarter 4 units = (100 × 18) + 2,400 × 109% = 4,578
Difference = 888

Therefore the answer is (D)

Solution 2

The question gives two sets of figures linked to alternative levels of output and sales. A simple linear regression approach can be used to determine the cost structure of the business and thus forecast costs for quarter 3.

Note that some costs vary with production and some costs vary with sales.

Applying a linear regression approach to the figures supplied, the cost structure forecast for quarter 3 is as follows:

	Unit VC	*Quarter FC*
	£	£
Material A	6.00	
Material B	4.00	
Production labour	11.25	90,000
Factory overheads	3.00	50,000
Depreciation		14,000
Administration		30,000
Selling expenses	1.00	20,000
Total	25.25	204,000

(a) The budget profit statement for quarter 3 is:

	£	£
Sales revenue		720,000
Costs:		
Materials	180,000	
Wages	292,500	
Factory overheads	104,000	
Depreciation	14,000	
Administration	30,000	
Selling expenses	38,000	
		658,500
Profit		61,500

(b) The budget cash-flow statement for quarter 3 is:

	£	£
Cash inflow:		
Q2 month 1		60,000
Q2 month 2		200,000
Q2 month 3		200,000
Q3 month 1		168,000
		628,000
Cash outflow:		
Materials	180,000	
Wages	292,500	
Factory overheads	104,000	
Administration	30,000	
Selling expenses	38,000	
		644,500
Net cash flow		(16,500)

Seventy per cent of month 1 sales from Q_2 will be paid during Q_2. The other 30 per cent of those sales will be paid in Q_3. Q_2 month 1 sales therefore give rise to a £60,000 cash inflow (that is, 5,000 units × £40 × 30%) in Q_3. The same logic is applied to sales in later months.

Solution 3

(a) Analyse budget cost of direct labour:

	$
9,000 hours total cost	29,000
Fixed cost	(4,250)
Therefore variable cost of 9,000 hours	24,750

$$\text{Variable cost per hour} = \frac{\$24{,}750}{9{,}000} = \$2.75$$

Therefore:

Budget cost of 11,320 hours:	$
Variable (11,320 × $2.75)	31,130
Fixed	4,250
	35,380

Use high/low technique to analyses production overheads (ignore 14,000-hour activity level to eliminate the effect of the step fixed cost):

	Hours	*$*
High	7,000	24,500
Low	3,000	13,500
Difference	4,000	11,000

$$\text{Variable cost} = \frac{\$11{,}000}{4{,}000}\text{hours} = \$2.75 \text{ per hour}$$

Variable cost of 14,000 hours = 14,000 × $2.75 = $38,500
Total cost of 14,000 hours = $45,800
Fixed cost (for activity levels above 10,000 hours) = $7,300

	Original budget	*Flexed budget*	*Actual*	*Variance*
Number of machine hours	9,000	11,320	11,320	
	$	*$*	*$*	*$*
Cleaning materials	1,350	1,698	1,740	42 (A)
Steel	45,000	56,600	56,000	600 (F)
Other direct materials	450	566	700	134 (A)
Direct labour	29,000	35,380	32,400	2,980 (F)
Production overheads	30,000	38,430	42,600	4,170 (A)
Totals	105,800	132,674	133,440	766 (A)

(b) (i) An incremental budgeting system is a system whereby budgets are prepared by adjusting the previous period's budget/actual values for expected changes in the level of activity and for expected price changes.

A zero-based budgeting system is a system whereby all proposed activities have to be justified. Once the activity itself has been justified, then the method of carrying out the activity needs to be considered and the chosen method justified on a cost benefit basis.

(ii) R plc is an engineering company that operates in the repairs and maintenance sector of engineering.

This type of business has difficulty in predicting the exact nature of its customer's requirements as this depends on their needs in response to machinery failures.

For R plc and similar organisations to introduce zero-based budgeting, assumptions would have to be made as to the exact nature of the customer requirements. If these assumptions were to differ significantly form the actual customer requirements, the budget would be invalid.

(c) The main benefits of involving managers in the budget setting process include:

Goal congruence – the manager sees their organisational target as a personal target because, by their setting it, they believe it to be achievable;

Motivation – the manager will be motivated to achieve the target, because not to do so would be a personal failure;

Accuracy/detail – the manager will have the detailed knowledge to prepare a budget that accurately identifies the resource requirements needed to achieve the target set.

Solution 4

(a) Cash budget

	April *£000*	*May* *£000*	*June* *£000*	*July* *£000*
Receipts				
Sales	44,140	51,870	58,130	56,885
Payments				
Material	15,478	17010	16,673	15,635
Labour	13,800	14,850	14,325	13,425
Variable overhead	7,200	7,500	7,050	6,600
Fixed overhead	8,000	8,000	8,000	8,000
Administrative overhead	500	500	500	500
Selling overhead	1,100	1,300	1,200	1,150
Machinery	–	15,000	–	–
Corporation tax	–	–	10,000	–
Dividend	–	–	–	7,500
	46,078	64,160	57,748	52,810
Balance b/f	14,500	12,562	272	654
Net cash movement	(1,938)	(12,290)	382	4,075
Balance c/f	12,562	272	654	4,729

Workings

	April *£000*	*May* *£000*	*June* *£000*	*July* *£000*
Direct material				
Purchases	16,800	17,500	16,450	15,400
Payment in month	9,878	10,290	9,673	9,055
One-month credit	5,600	6,720	7,000	6,580
	15,478	17,010	16,673	15,653
Direct labour				
Monthly cost	14,400	15,000	14,100	13,200
Payment in month	10,800	11,250	10,575	9,900
One month in arrears	3,000	3,600	3,750	3,525
	13,800	14,850	14,325	13,425
Sales receipts				
20% in month (×99%)	10,890	12,870	11,880	11,385
55% in month after sale	24,750	30,250	35,750	33,000
15% two months after sale	6,000	6,750	8,250	9,750
5% three months after sale	2,500	2,000	2,250	2,750
	44,140	51,870	58,130	56,885

	£000	
Each year		
Fixed overhead	112,000	
Less: depreciation	16,000	
Cash expense	96,000	= £8,000,000 per month

(b) (i) Feed-forward control occurs when, in compiling the budget, the cash flows predicted differ from those desired, resulting in the amendments to budgets or activities. Feed-forward is a proactive form of control, exercised before the event. For example, the capital expenditure on machinery might be deferred or financed differently to avoid the anticipated cash deficit in May.

(ii) Feedback control, on the other hand, is exercised after the activity has taken place, and involves comparing actual outcomes with those predicted in the budget. It is reactive control, and would result in an explanation being required should the cash expenditure on material in a given month differ by more than (say) 5 per cent of budgeted value.

☑ Solution 5

(a) The trend values for quarter 3 of each year based upon the equation

$$X = 4{,}200q + 10{,}000$$

can be calculated as:

Year 1 $(4{,}200 \times 3) + 10{,}000 = 22{,}600$ passengers
Year 2 $(4{,}200 \times 7) + 10{,}000 = 39{,}400$ passengers

This can be compared with the past data provided to establish the seasonal variation:

	Trend	*Past data*	*%*
Year 1	22,600	16,950	75
Year 2	39,400	29,550	75

Thus it seems that the quarter 3 values are 75% of their equivalent trend values.

The trend value for the third quarter of year 3, adjusted for the seasonal variation will thus be

$$[(4{,}200 \times 11) + 10{,}000] \times 75\% = 42{,}150 \text{ passengers}$$

(b) The reason for the cost equation for the Transit staff being in the format shown is that it is a mixed cost, that is, it comprises a fixed element of £32,000 and a variable element of £3 for each passenger. This could be because the remuneration package provides for a fixed salary plus a bonus.

(c)

Cost item	*Relationship*	*Cost*
		£
Premises costs	$y = 260{,}000 + 0x$	260,000
Premises staff	$y = 65{,}000 + 0.5x$	86,075
Power	$y = 13{,}000 + 4x$	181,600
Transit staff	$y = 32{,}000 + 3x$	158,450
Other	$y = 9{,}100 + x$	51,250
		737,375

(d) There are a number of reasons why the actual data may differ from that predicted:

The prediction of the number of passengers carried assumes that the underlying growth shown by the trend equation will continue into year 3;

The prediction of the number of passengers carried assumes that the seasonal variation in the third quarter of year 3 will be the same as it was in the same quarter in previous years;

The predicted costs are based on simple linear cost relationships that have probably been derived from past data using of linear regression analysis techniques on past data. In reality, costs rarely behave in a linear fashion, though this may be a reasonable approximation;

Actual costs may be affected by a number of cost drivers other than or in addition to the number of passengers carried;

The calculation does not consider the effects of price changes on the costs.

(e) **Report**

To:	Board of Directors of PMF plc	From:	Management Accountant
Subject:	Non-financial performance measures	Date:	21 November 2001

Introduction

Further to our recent meeting, I have considered some of the non-financial performance measures that we may use in addition to our existing budgetary control procedures.

Findings

As a public transport operator, we operate in a service sector where the quality of the service we provide is paramount to our continued success. We should, therefore, focus on the needs of our customers and our employees to ensure that we continue to deliver the service required.

Among the measures that we can use to measure our effectiveness are:

the percentage of trains that arrive within 2 minutes of schedule;
the percentage of trains that depart within 2 minutes of schedule;

the percentage of trains cancelled in a period;
the failure rate of our ticket machines;
the failure rate of our ticketing gates;
the failure rate of the escalators in our stations;
the failure rate of our signaling system; and
the number of injuries per thousand passengers carried.

> **Examiner's Note:**
> Candidates were required to identify any **three** suitable measures and briefly describe them.

Conclusion

These non-financial measures are as important as those that we currently use to control our costs and revenues. If we can improve our customers' perceptions of our performance, then we will continue to remain profitable and can improve still further in the future.

Signed: Management Accountant.

☑ Solution 6

The critical thing to note here is that the approach advocated by Councillor Scroggs places an emphasis on 'inputs' to the process. It shows little awareness of outputs and objectives.

The question invites you to discuss modern budgeting practices such as ZBB and PPBS.

From: Chief executive
To: Finance committee
Re: Budget savings

What the chairman is proposing is a course of action based on the incremental approach to budgeting. This approach seeks to determine budgets by taking past patterns of spending and using them as the basis for determining future patterns. For example, in establishing the budget for this year, one might take last year's budget and add or subtract an equal percentage to/from the spending of each department.

This approach is simple and avoids having to think too hard about what one is doing. It also avoids difficult political disputes by seeking to maintain an established *status quo* between spending departments.

However, the incremental approach to budgeting is essentially passive. It is generally considered to have various adverse features including the following:

An 8 per cent cut in the budget for parks and gardens may cause far less misery than a 5 per cent cut in the budget for social services; blanket spending cuts can have very uneven effects in terms of the misery they cause.

A given public objective (e.g. the welfare of old people) is best achieved by a carefully integrated pattern of spending within several departments (e.g. residential homes, meals on wheels, home helps and mobile libraries); unselective spending cuts in one area (e.g. home helps) might cause substantial new requirements to be created in others (e.g. residential homes) if obligations are to be fulfilled.

A selective rearrangement of spending may have far less impact on the standard of services than blanket cuts; for example, a reduction in police officer numbers might be partly offset by small increases in spending on 'traffic calming' measures and video surveillance in public areas.

The incremental approach to budgeting is not considered to be the most satisfactory available. A variety of proactive approaches to budget determination exists including PPBS and ZBB. It is suggested that these might be used to good effect on this occasion.

☑ Solution 7

This question addresses many of the issues explored in this and the preceding two chapters. It can be worked through without the use of a computer spreadsheet but it provides a good spreadsheet modelling exercise. If you are adept in the use of a spreadsheet then you may be able construct the required four budgets very quickly indeed.

Note that the profit budget tends to follow on from the cash flow budget because of the calculation of overdraft interest. This suggest the sequence in which the budgets should be arranged.

The two sets of budgets should be constructed in a manner that allows them to be readily compared.

When comparing the two strategies, be aware that profitability is not the sole relevant measure of performance.

(a) MNO Ltd: cash-flow budget for 20X1, Strategy 1

	Q1	*Q2*	*Q3*	*Q4*	*20X1*
	£	£	£	£	£
Opening cash balance	30,000	(435,540)	(623,217)	(459,393)	(30,000)
Customer receipts	465,200	567,000	718,200	819,000	2,569,400
Capital expenditure	(360,000)				(360,000)
Variable costs	(350,000)	(360,000)	(332,500)	(330,000)	(1,372,500)
Fixed overheads	(200,000)	(200,000)	(200,000)	(200,000)	(800,000)
Loan interest		(40,000)		(30,000)	(70,000)
Loan repayment		(125,000)			(125,000)
Cash flow	(444,800)	(158,000)	185,700	259,000	(158,100)
'Initial' closing balance	(414,800)	(593,540)	(437,517)	(200,393)	
Overdraft interest	(20,740)	(29,677)	(21,876)	(10,020)	(82,312)
'Final' closing balance	(435,540)	(623,217)	(459,393)	(210,413)	(210,412)

MNO Ltd: profit budget for 20X1, Strategy 1

	Q1	*Q1*	*Q3*	*Q4*	*20X1*
	£	£	£	£	£
Sales	567,000	567,000	819,000	819,000	2,772,000
Opening stock	(80,000)	(224,000)	(368,000)	(272,000)	(80,000)
Variable costs	(360,000)	(360,000)	(330,000)	(330,000)	(1,380,000)
Fixed overheads	(200,000)	(200,000)	(200,000)	(200,000)	(800,000)
Depreciation	(57,000)	(54,150)	(51,443)	(48,870)	(211,463)
Closing stock	224,000	368,000	272,000	176,000	176,000
Loan interest	(20,000)	(20,000)	(15,000)	(15,000)	(70,000)
Overdraft interest	(20,740)	(29,677)	(21,876)	(10,020)	(82,312)
Bad debt write-off				(64,000)	(64,000)
Net profit	53,260	47,173	104,682	55,110	260,225

(b) MNO Ltd: cash-flow budget for 20X1, Strategy 2

	Q1	*Q2*	*Q3*	*Q4*	*20X1*
	£	£	£	£	£
Opening cash balance	30,000	121,250	5,250	118,000	30,000
Customer receipts	545,000	504,000	609,000	682,500	2,340,500
Capital expenditure					–
Variable costs	(253,750)	(255,000)	(296,250)	(300,00)	(1,105,000)
Fixed overheads	(200,000)	(200,000)	(200,000)	(200,000)	(800,000)
Loan interest		(40,000)		(30,000)	(70,000)
Loan repayment		(125,000)			(125,000)
Cash flow	91,250	(116,000)	112,750	152,500	240,500
'Initial' closing balance	121,250	5,250	118,000	270,500	
Overdraft interest	–	–	–	–	–
'Final' closing balance	121,250	5,250	118,000	270,500	270,500

MNO Ltd: profit budget for 20X1, Strategy 21

	Q1	*Q2*	*Q3*	*Q4*	*20X1*
	£	£	£	£	£
Sales	504,000	504,000	630,000	693,000	2,331,000
Opening stock	(80,000)	(104,000)	(128,000)	128,000	(80,000)
Variable costs	(255,000)	(255,000)	(300,000)	(300,000)	(1,110,000)
Fixed overheads	(200,000)	(200,000)	(200,000)	(200,000)	(800,000)
Depreciation	(39,000)	(37,050)	(35,198)	(33,438)	(144,685)
Closing stock	104,000	128,000	128,000	80,000	80,000
Loan interest	(20,000)	(20,000)	(15,000)	(15,000)	(70,000)
Overdraft interest	–	–	–	–	–
Bad debt write-off				(10,000)	(10,000)
Net profit	14,000	15,950	79,802	86,562	196,315

(c) The most conspicuous feature in comparing the two alternative strategies is that Strategy 1 yields about £60,000 more profit than Strategy 2. So, is Strategy 1 automatically preferable? The following observations are relevant in answering this question:

Strategy 2 follows existing sales policies and the associated sales forecasts are therefore probably reliable; Strategy 1 follows new sales policies and the associated sales forecasts must incorporate estimates/assumptions about what will happen; the reliability of these estimates/assumptions may be uncertain and this makes Strategy 1 riskier than Strategy 2.

Strategy 1 involves accumulating a £200,000 overdraft balance; this is a cause for some concern even though such a balance need not be a problem for a profitable company with an annual turnover approaching £3 m.

Strategy 2 results in a cash surplus of £270,000 to be accumulated by the end of 20X1; this can be paid out to MNO's shareholders as dividends – thus reducing the capital employed in the business and without any adverse impact on its profitability.

Taking into account the above factors, it seems that Strategy 2 might be preferred under certain circumstances. Those circumstances might apply if the owners of MNO are anxious to follow a low-risk strategy and extract funds from the business.

Solution 8

(a) Incremental budgeting uses year 1 budget as the starting point for the preparation of year 2 budget. It is assumed that the basic structure of the old budget is acceptable and that adjustments will be made to allow for changes in volume, efficiency and price levels. The focus, therefore, tends to be on the existing use of resources rather than on identifying objectives and alternative strategies for the future budget period. It is argued that incremental budgeting does not question sufficiently the costs and benefits of operating a particular resource allocation structure.

Incremental budgeting may, therefore, be argued to have weaknesses in that:

- the resource allocation is not clearly linked to a business plan and the consideration of alternative means of achieving objectives;
- there is a tendency to constrain new high-priority activities;
- there is insufficient focus on efficiency and effectiveness and the alternative methods by which they may be achieved;
- it often leads to arbitrary cuts being made in order to meet overall financial targets;
- it tends not to lead to management commitment to the budget process.

(b) The main features and potential advantages of activity-based budgeting are:

(i) The major focus is on the planning of resource allocation that aims at efficiency, effectiveness and continuous improvement. Features may include:
  - the impact of change from the present activity levels are made more apparent;
  - key processes and constraints are identified and resource requirements related thereto are quantified;
  - efforts are made to identify critical success factors and the performance indicators that are most relevant for such factors.

(ii) Activities are seen as the key to effective planning and control.

(iii) It is argued that activities consume resources and that efforts should be focused on the control of the cause of costs not the point of incidence.

(iv) Costs are traced to activities with the creation of 'cost pools' that relate to an activity.

(v) It is easier to eliminate non-value-adding activities.

(vi) Focus may be on total quality management with emphasis on process control through identification of cost drivers.

Budgetary Control

6

Learning Outcomes

When you have completed study of this chapter you will be able to:

- explain the ideas of feedback and feed-forward control and their applications in the use of budgets for control;
- explain the concept of responsibility accounting and its importance in the construction of functional budgets that support the overall master budget;
- identify controllable and uncontrollable costs in the context of responsibility accounting and explain why 'uncontrollable' costs may or may not be allocated to responsibility centers;
- evaluate performance using fixed and flexible budget reports;
- explain the impact of budgetary control systems on human behaviour.

6.1 Introduction

In the previous chapter we explored the basic concepts, approaches and techniques that are used in the establishment of budgets. In this chapter, we consider the manner in which budgets are used to control the operations of an organisation. Budgetary control is the practice of systematically comparing actual results achieved with those budgeted for. The results of this comparison are used to direct the attention of management to problems and opportunities through the 'principle of exception'. Broadly, those areas that perform to budget are considered satisfactory while those that depart from budget are identified and investigated. Where components of a budget relate to the responsibilities of individual executives then budgetary control may act as a means of securing adherence of those executives to corporate objectives.

The practice of standard costing and variance analysis (considered in Chapters 2 and 3) provides the means by which a budgetary control report might be prepared.

The point of departure in is to consider basic business control system theory and explore the use of that theory in the practice of budgetary control. We will then go on to consider practical aspects of budgetary control with particular emphasis on responsibility accounting and behavioural/motivational issues.

6.2 The Theory of Systems

A system is a set of related parts co-ordinated to accomplish a set of goals. In accountants' daily activities they will encounter constant references to a variety of systems such as a transportation system, a communication system, a reward system, a budgeting system or a stock control system. Any situation which involves the handling or manipulation of resources, be they human, financial or information, may be structured by way of a system to produce an output or goal.

6.3 System design

6.3.1 The characteristics and components of a system

There are a number of key characteristics and components of a system:

(a) inputs,
(b) process,
(c) outputs,
(d) environment,
(e) boundary.

We shall now consider each of these in turn.

(a) *Inputs*. Inputs may take the form of people, energy, materials, equipment, money or data. These inputs may be received individually or in combination and can originate from a number of diverse sources.
(b) *Process*. Some form of activity is carried out as a result of receiving input, with the aim of adding value to that input to produce an output. These processing activities may include assembling, machining, recording, etc.
(c) *Outputs*. Once processing is complete, the finished, processed product or service is passed out to the environment. This may involve the delivery of goods to a customer or the transmission of goods or information to a new system or subsystem.
(d) *Environment*. A system's environment is often defined as those external elements that have direct or indirect influence on the process and the elements of a system. Every system operates within the context of an environment and it interacts with the environment by receiving inputs from it and delivering outputs to it. For example, a manufacturing company will receive its raw materials from specific component suppliers, but when these components are processed they will be delivered to the customer. Business environment can be viewed as internal environment and external environment. Factors that fall within the boundaries of the organisation constitute internal environment, factors beyond the organisational boundaries form the external environment.
(e) *Boundary*. The systems boundary separates the system and its components from its environment. Systems boundaries may or may not be physical. However, sometimes boundaries are not easily identifiable. Whether physical or not, the system boundary defines and separates the components of a system from the environment and from any other systems within that environment.

6.3.2 Control systems

A control system is designed to facilitate the operation of a process through the reporting of information generated by the process and prompting appropriate changes to the inputs in response to appraisal of that information. The different ways in which information may be used to prompt changes in inputs to the process are the following.

Feedback control systems

Most budgetary control systems work on the feedback principle. Information on actual results experienced is obtained from the process and compared with control data (a plan, budget or standard). Deviations from the control data will usually prompt feedback in order to bring actual results back in line with plan. This is negative feedback – where action is prompted to return the process to its original planned course. For example, if costs are rising above budget then negative feedback will prompt managers to cut costs.

But a control system can work with positive feedback. In this case, feedback prompts actions to reinforce a deviation from plan, for example, if unit sales are rising above budget in some areas then this may imply an opportunity and positive feedback will prompt attempts to increase unit sales still further.

Feedforward control systems

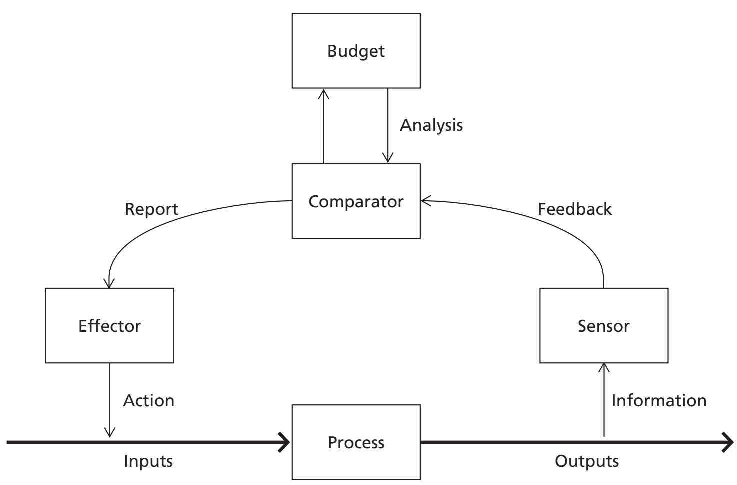
In some situations, feedback control is inappropriate. It involves acting 'after the event' to bring the process back to its planned course. This may be costly if things have gone badly wrong. By contrast, feedforward control works on the basis of forecast results.

For example, if *forecast* costs start to rise above budget then action may be prompted on the feedforward principle to prevent such a deviation from ever actually occurring. 'Target costing' (discussed in Chapter 8) is sometimes described as a system in feedforward control. A target rate of return is set for a product or project and if it is forecast that this target is not going to be achieved then action is prompted (by way of product re-engineering or other similar management initiative) in order to ensure that the target is achieved.

6.4 Feedback control loops and system operation

Control within budgetary control systems is conventionally exercised by feedback loops that gather information on past performance from the output side of a system, department or process, which is then used to govern future performance by adjusting the input side of the system.

The manner in which a feedback control loop might work in the context of a budgetary control system may be illustrated by the following diagram.



The components of the control system illustrated are the following.

Sensor. Sensors are the measuring and recording devices of the system. In the context of budgetary control, the basic management accounting system acts as the sensor by collecting and reporting information on costs and revenues.

Comparator. This is the mechanism by which actual results are compared with plan. In the context of a budgetary control system, the exercise of preparing a monthly control report (commonly called operating statistics or something similar) is the comparator. The report seeks to reconcile budget with actual results through the calculation of variances. Reporting of those variances prompts actions intended to eliminate adverse variances or exploit favourable variances.

Effector. The usual effector is a manager or supervisor acting on the report containing the results of the comparison between actual and budget, and taking the actions required for adjustment to be made. An effector could also be an automatic process, such as an automated stock reordering system that checks stock levels and automatically reorders when the preset reorder quantity is reached.

The general subject of systems design is explored more fully in CIMA's Paper P4 – Organisational Management and Information Systems.

6.5 Budgetary control information

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.

6.5.1 Budget centres

The CIMA *Official Terminology* defines a budget centre as:

Budget centre: A section of an entity for which control may be exercised and budgets prepared.

Each budget center 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. Costs attributed to individual budget centres may be classified as 'controllable' or 'uncontrollable'. Controllable costs relate to those factors over which the management of the budget centre have direct control, for example, labour hours. Managers may be held fully responsible for controllable costs but less so for uncontrollable costs.

The structure of budget centres that an organisation adopts will normally correspond to its own organisational structure. Thus each division, department, or section will have its own budget. For example, an equipment manufacturer may be organised in the form of three operating divisions, each working from its own factory site:

(1) heavy equipment manufacture division;
(2) medium equipment manufacture division;
(3) light equipment manufacture division.

Each division will have its own budget for both costs and sales revenues. Not only is each division a budget centre, but it is also a 'responsibility centre' for the purposes of management accounting. The costs and revenues associated with the operations of each division will be collated and reported periodically for the purposes of comparison with budget. Responsibility centres are discussed more fully in Chapter 9.

It should be appreciated an organisation might be organised on regional rather than functional lines – and there might be North, South and East regional divisions. In such a case both the budget and responsibility centres would match the organisational structure. The general point being that budgetary control would follow the responsibility accounting principal. Each divisional budget would relate to a clearly defined organisational unit with its own manager. That manager would be held responsible for achieving the budget.

The individual divisional budgets could be split into subsidiary departmental budget. For example, the costs contained in the budget for (1) heavy equipment manufacture division could be split into budgets for:

(1.1) Assembly line A
(1.2) Assembly line B
(1.3) Paint Shop

Again, each of these is a budget centre and a responsibility centre – with actual costs incurred being periodically reported for each and compared with a budget. The departmental managers would be responsible for keeping departmental costs within budget.

Key issues to consider in the design and operation of budget centres include:

The budget centres should strictly match organisational units. Any departure from this breaches the responsibility accounting principal since no one manager is responsible for achieving a particular budget.

The responsibility centres should strictly match the budget centres. Any departure from this means that the nature of the costs reported does not strictly match those being budgeted for. If some actual costs are being charged to one department but are in the budget of another then the whole budgetary control exercise is debased.

The extent to which 'uncontrollable' costs are attributed to individual departments should be minimised. But consider our earlier discussion (see Chapter 4) concerning activity-based costs. Few costs really are 'uncontrollable' – it is just a matter of determining which activities such costs relate to and who controls the level of those activities.

6.5.2 Budgetary control reports

If managers are to use the budgets to control effectively, they must receive regular control information.

The budgetary control reports should be:

(a) *Timely*. The information should be made available as soon as possible after the end of the control period. Corrective action will be much more effective if it is taken soon after the event, and adverse trends could continue unchecked if budgetary reporting systems are slow.

(b) *Accurate*. Inaccurate control information could lead to inappropriate management action. There is often a conflict between the need for timeliness and the need for accuracy. The design of budgetary reporting systems should allow for sufficient accuracy for the purpose to be fulfilled.

(c) *Relevant to the recipient*. Busy managers should not be swamped with information that is not relevant to them. They should not need to search through a lot of irrelevant information to reach the part that relates to their area of responsibility. The natural reaction of an individual faced with this situation could be to ignore the information altogether.

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. Subsidiary information could be provided on those items that are in line with the budget.

Many control reports also segregate controllable and non-controllable costs and revenues, that is, the costs and revenues over which managers can exercise control are highlighted separately in the reports.

(d) *Communicated to the correct manager*. Control information should be directed to the manager who has the responsibility and authority to act upon it. If the information is communicated to the wrong manager its value will be immediately lost and any adverse trends may continue uncorrected. Individual budget-holders' responsibilities must be clearly defined and kept up to date in respect of any changes.

Budgetary control reports can be prepared with varying degrees of frequency, timeliness, accuracy and detail. For example, you can report at weekly, monthly or quarterly intervals. You can report figures accurate to the nearest £0.1 million or to the nearest penny.

Obviously, the greater the volume and sophistication of control reporting then the greater is its cost. In determining the style of reporting appropriate to an organisation one should have regard to the costs and benefits of reporting. The marginal benefits of additional reporting start to decline as the volume of reporting and the associated cost of reporting rise. An optimum position should be sought having regard to the needs of the organisation.

The design of a budgetary control report depends very much on the inclination of users. We have already seen examples of budgetary control reports in our earlier study of standard costing. In those cases, the reports took the form of reconciliations of budget and actual profit through the calculation of cost and sales variances.

But, alternative styles are possible. A simple example to illustrate a common format is:

ABC Manufacturing Ltd

Operating Statement

September 2004

£ millions	*Quarter (01/06–30/09)*			*Year to Date (01/01–30/09)*		
	Actual	*Budget*	*Variance*	*Actual*	*Budget*	*Variance*
Sales	24.1	22.9	+5.2%	84.0	92.4	−9.1%
Costs	18.6	18.8	−1.1%	69.6	70.1	−0.7%
Profit	5.5	4.1	+34.1%	14.4	22.3	−35.4%

In this case, the 'variances' are (actual–budget)/budget. These variances are not the same as the costs and sales variances we considered in Chapters 2 and 3. A plus percentage means that Actual exceeded Budget-it does not mean that it had an adverse impact on Profit.

A common feature in modern control reports is a forecast to year end position. Adding such a feature to the above report would involve inserting a third set of columns under the heading 'Forecast to Year End (01/01–31/12). This adds an element of feedforward to the report.

6.6 Fixed and flexible budgets

When managers are comparing the actual results with the budget for a period, it is important to ensure that they are making a valid comparison. The use of flexible budgets can help to ensure that actual results are monitored against realistic targets.

Example

A company manufactures a single product and the following data shows the actual results for the month of April compared with the budgeted figures.

Operating statement for April

	Actual	*Budget*	*Variance*
Units produced and sold	*1,000*	*1,200*	*(200)*
	£	£	£
Sales revenue	110,000	120,000	(10,000)
Direct material	16,490	19,200	2,710
Direct labour	12,380	13,200	820
Production overhead	24,120	24,000	(120)
Administration overhead	21,600	21,000	(600)
Selling and distribution o/head	16,200	16,400	200
Total cost	90,790	93,800	3,010
Profit	19,210	26,200	(6,990)

Note: variances in brackets are adverse. Also, the figures described as variances (budget–actual) are not variances for standard costing and variance analysis purposes.

Looking at the costs incurred in April, a cost saving of £3,010 has been made compared with the budget. However, the number of units produced and sold was 200 less than budget, so some savings in expenditure might be expected. It is not possible to tell from this comparison how much of the saving is due to efficient cost control, and how much is the result of the reduction in activity.

Similarly, it is not possible to tell how much of the fall in sales revenue was due to the fall in activity. Some of the sales revenue variance may be the result of a difference in the sales prices but this budget comparison does not show the effect of this.

The type of budget in use here is a fixed budget. A fixed budget is one that remains unchanged regardless of the actual level of activity. In situations where activity levels are likely to change, and there is a significant proportion of variables costs, it is difficult to control expenditure satisfactorily with a fixed budget.

A flexible budget can help managers to make more valid comparisons. It is designed to show the expected revenue and the allowed expenditure for the actual number of units produced and sold. Comparing this flexible budget with the actual expenditure and revenue it is possible to distinguish genuine efficiencies.

6.6.1 Preparing a flexible budget

Before a flexible budget can be prepared managers must identify which costs are fixed and which are variable. The allowed expenditure on variable costs can then be increased or decreased as the level of activity changes. You will recall that fixed costs are those costs that will not increase or decrease over a given range of activity. The allowance for these items will therefore remain constant.

We can now continue with the example.

Management have identified that the following budgeted costs are fixed.

	£
Direct labour	8,400
Production overhead	18,000
Administration overhead	21,000
Selling and distribution overhead	14,000

It is now possible to identify the expected variable cost per unit produced and sold.

	Original budget (a)	*Fixed cost (b)*	*Variable cost (c) = (a) − (b)*	*VC per unit (c)/1,200*
Units produced and sold	1,200			
	£	£	£	£
Direct material	19,200	–	19,200	16
Direct labour	13,200	8,400	4,800	4
Production overhead	24,000	18,000	6,000	5
Administration overhead	21,000	21,000	–	–
Selling and distribution o/head	16,400	14,000	2,400	2
	93,800	61,400	32,400	27

Now that managers are aware of the fixed costs and the variable costs per unit it is possible to 'flex' the original budget to produce a budget cost allowance for 1,000 units produced and sold.

The budget cost allowance for each item is calculated as follows:

Cost allowance = budgeted fixed cost +
(number of units produced and sold × variable cost per unit)

For the costs that are wholly fixed or wholly variable the calculation of the budget cost allowance is fairly straightforward. The remaining costs are semi-variable, which you will recall means that they are partly fixed and partly variable. For example, the budget cost allowance for direct labour is calculated as follows:

Cost allowance for direct labour = £8,400 + (1,000 × £4) = £12,400

The budgeted sales price per unit is £120,000/1,200 = £100 per unit. If we assume that sales revenues follow a linear variable pattern (i.e. the sales price remains constant) the full flexible budget can now be produced.

Flexible budget comparison for April

	Cost/revenue allowances			*Actual*	
	Fixed	*Variable*	*Total*	*cost/revenue*	*Variance*
	£	£	£	£	£
Sales revenue			100,000	110,000	10,000
Direct material	–	16,000	16,000	16,490	(490)
Direct labour	8,400	4,000	12,400	12,380	20
Production overhead	18,000	5,000	23,000	24,120	(1,120)
Administration overhead	21,000	–	21,000	21,600	(600)
Selling and distn. o/h	14,000	2,000	16,000	16,200	(200)
	61,400	27,000	88,400	90,790	(2,390)
Profit			11,600	19,210	7,610

Note: variances in brackets are adverse.

This revised analysis shows that in fact the profit was £7,610 higher than would have been expected form a sales volume of 1,000 units.

The largest variance is a £10,000 favourable variance on sales revenue. This has arisen because a higher price was charged than budgeted. We know this because flexing the budget has eliminated the effect of changes in the volume sold, which is the only other factor that could have increased sales revenue.

Could the higher sales price have been the cause of the shortfall in sales volume? We do not know the answer to this, but without a flexible budget comparison it was not possible to tell that a different selling price had been charged. The cost variances in the flexible budget comparison are almost all adverse. These overspendings were not revealed when a fixed budget was used and managers may have been under the false impression that costs were being adequately controlled. In Chapter 1 you learnt how each total cost variance can be analysed to reveal how much of the variance is due to higher resource prices and how much is due to higher resource usage.

6.6.2 Using flexible budgets for planning

You should appreciate that whereas flexible budgets can be useful for control purposes they are not particularly useful for planning. The original budget must contain a single target level of activity so that managers can plan such factors as the resource requirements and the product pricing policy. This would not be possible if they were faced were faced with a range of possible activity levels. The budget can be designed so that the fixed costs are distinguished from the variable costs. This will facilitate the preparation of a budget cost allowance for control purposes at the end of each period, when the actual activity is known.

6.6.3 Flexible budgets

Now that you have got the idea of how a flexible budget can be prepared, work through the following exercise to consolidate your understanding.

In this exercise, as in practice, you will need to investigate the cost behaviour patterns to determine which costs are fixed, which are variable and which are semi-variable.

The first step in investigating cost behaviour patterns is to look at the cost data. You should be able to easily spot any fixed costs because they remain constant when activity levels change.

The easiest way to identify the behaviour patterns of non-fixed costs is to divide each cost figure by the related activity level. If the cost is a linear variable cost then the cost per unit will remain constant. For a semi-variable cost the unit rate will reduce as the activity level increases.

You will then need to recall how to use the high–low method to determine the fixed and variable elements of any semi-variable costs.

Exercise

Lawrence Ltd operates a system of flexible budgets, and the flexed budgets for expenditure for the first two quarters of year 3 were as follows:

Flexed budgets – quarters 1 and 2

	Quarter 1	*Quarter 2*
	Units	*Units*
Sales	9,000	14,000
Production	10,000	13,000
	£	£
Budget cost allowances		
Direct materials	130,000	169,000
Production labour	74,000	81,500
Production overhead	88,000	109,000
Administration overhead	26,000	26,000
Selling and distribution overhead	29,700	36,200
Total budget cost allowance	347,700	421,700

Despite a projected increase in activity, the cost structures in quarters 1 and 2 are expected to continue during quarter 3 as follows:

(a) The variable cost elements behave in a linear fashion in direct proportion to volume. However, for production output in excess of 14,000 units the unit variable cost for production labour increases by 50 per cent. This is due to a requirement for overtime working and the extra amount is payable only on the production above 14,000 units.
(b) The fixed cost elements are not affected by changes in activity levels.
(c) The variable elements of production costs are directly related to production volume.
(d) The variable element of selling and distribution overhead is directly related to sales volume.

Prepare a statement of the budget cost allowances for quarter 3. The activity levels during quarter 3 were:

	Units
Sales	14,500
Production	15,000

Solution

If you divide each cost figure by the relevant activity figure, you will find that the only wholly variable cost is direct material, at £13 per unit.

You can also see that the only wholly fixed cost is administration overhead since this is a constant amount for both activity levels, £26,000.

For the remaining costs you will need to use the high–low method to determine the fixed and variable elements.

Production labour

	Production units	£
Quarter 2	13,000	81,500
Quarter 1	10,000	74,000
Change	3,000	7,500

$$\text{Variable cost} = \frac{£7,500}{3,000} = £2.50 \text{ per unit}$$

$$\text{Fixed cost} = £81,500 - (£2.50 \times 13,000) = £49,000$$

Production overhead

	Production units	£
Quarter 2	13,000	109,000
Quarter 1	10,000	88,000
Change	3,000	21,000

$$\text{Variable cost per unit} = \frac{£21{,}000}{3{,}000} = £7 \text{ per unit}$$

Fixed cost = £109,000 − (£7 × 13,000) = £18,000

Selling and distribution overhead

	Sales units	£
Quarter 2	14,000	36,200
Quarter 1	9,000	29,700
Change	5,000	6,500

$$\text{Variable cost per unit sold} = \frac{£6{,}500}{5{,}000} = £1.30 \text{ per unit}$$

Fixed cost = £36,200 − (£1.30 × 14,000) = £18,000

We can now prepare a statement of the budget cost allowances for quarter 3.

	£	*Quarter 3 Budget cost allowance* £
Direct material (15,000 units × £13)		195,000
Production labour:		
Fixed	49,000	
Variable up to 14,000 units (14,000 × £2.50)	35,000	
Variable above 14,000 units (1,000 × £3.75)	3,750	
		87,750
Production overhead:		
Fixed	18,000	
Variable (15,000 × £7)	105,000	
		123,000
Administration overhead: fixed		26,000
Selling and distribution overhead:		
Fixed	18,000	
Variable (14,500 × £1.30)	18,850	
		36,850
Total budget cost allowance		468,600

6.6.4 Extrapolating outside the relevant range

In the preceding example you were told that the cost structures would remain unaltered despite the increase in activity. In examinations, and in practice, if you need to do a similar extrapolation outside the range for which you have available data, you should always state the assumption that the observed behaviour patterns will still be applicable.

6.7 Behavioural aspects of budgetary control

Throughout the previous discussion on the budgetary control concept, the emphasis has been on economic considerations. There is, however, another very important aspect of budgetary control systems and this is its impact on the human beings who will operate and be judged by those systems.

It is only comparatively recently that the results of years of study of personal relationships in the workplace have percolated into the field of management accounting. It is now recognised that failure to consider the effect of control systems on the people affected could result in a lowering of morale and a reduction of motivation. Further, those people may be induced to do things that are not in the best interests of the organisation.

Specific behavioural issues encountered in budgeting include the following.

6.7.1 Motivation and co-operation

To be fully effective, any system of financial control must provide for motivation and incentive. If this requirement is not satisfied, managers will approach their responsibilities in a very cautious and conservative manner. It is often found that adverse variances attract investigation and censure but there is no incentive to achieve favourable variances. Failure to distinguish controllable from uncontrollable costs in budgetary control can alienate managers from the whole process.

Personal goals and ambitions are, in theory, strongly linked to organisational goals. These personal goals may include a desire for higher income and higher social standing. To simultaneously satisfy the goals of the organisation and the goals of the individual there must be 'goal congruence'. That is, the individual manager perceives that his/her own goals are achieved by his/her acting in a manner that allows the organisation to achieve its goals. The problem is that reliance on budgetary control systems does not always result in goal congruence.

The success of a budgetary control system depends on the people who operate and are affected by it. They must work within the system in an understanding and co-operative manner. This can only be achieved by individuals who have a total involvement at all stages in the budget process. However, it is often found that:

- A budget is used simply as a pressure device. If the budget is perceived as 'a stick with which to beat people' then it will be sabotaged in all sorts of subtle ways.
- The budgeting process and subsequent budgetary control exercises induce competition between individual departments and executives. Managers may be induced to do things in order to 'meet budget' that are not in the best interests of the business as a whole.

6.7.2 Failure of goal congruence

It has been seen that an essential element in budgetary control is performance evaluation. Actual results are compared with budget or standard in order to determine whether performance is good or bad. What is being evaluated is not just the business operation but the managers responsible for it. The purpose of budgetary control is to induce managers to behave in a manner that is to the best advantage of the organisation. Compliance with budget is enforced by a variety of negative and positive sanctions.

When adverse variances are reported for operations then this implies poor performance by the managers of the operations. If they are unable to correct or explain away the adverse variances then they may suffer negative sanctions. They may have forgo salary increases, or they may be demoted to a less prestigious post. Other more subtle negative sanctions are possible that anyone who has ever worked for a large organisation will be aware of.

Positive inducements may be offered to encourage managers to avoid adverse variances. A manager who meets budget may be granted a performance-related salary bonus, promotion, a new company car or use of the executive dining room.

Consequently, the manager has a considerable incentive to ensure that the department or operation he is responsible for achieves its budgeted level of performance. However, there are a variety of ways of doing this that might not be to the advantage of the organisation as a whole.

For example, the manager of a production line can cut costs and hence improve its reported performances by reducing quality controls. This may result in long-term problems concerning failure of products in service, loss of customer goodwill and rectification costs – but these are not the concern of the production line manager. This is a clear failure of goal congruence.

The control system is capable of distorting the process it is meant to serve – or 'the tail wages the dog'. The enforcement of a budgetary control system requires sensitivity if this is not to happen.

6.7.3 The budget as a pot of cash

In some environments managers may come to consider the budget as a sum of money that has to be spent. This arises particularly in service departments or public sector organisations, the performance of which is gauged mainly through comparison of actual and budget spending.

The manager of a local authority 'street cleaning' department may be given an annual budget of £120,000 to clean the streets. The manager knows that she will be punished if she spends more than £120,000 in the year. She also knows that if she spends less than £120,000 in the year then her budget will probably be reduced next year. Such a reduction will involve a personal loss of status in the organisation and will make her job more difficult in the next year.

In order to ensure that she does not overspend her annual budget in the current year the manager may spend at a rate of £9,000 per month for the first 11 months of the year. This can be achieved by reducing the frequency of street cleaning and using poor-quality materials. It allows a contingency fund to be accumulated in case of emergencies.

However, in the final month of the year the manager has to spend £21,000 if she wishes to ensure that her whole budget is fully used. She might achieve this by using extra labour and high-quality materials.

Does this behaviour make sense? Of course it does not. The whole pattern of behaviour is distorted by the control system. It means that local residents have a substandard service for eleven months of the year and money is wasted in the twelfth month.

It is, however, a fact that suppliers to government departments and local councils often experience a surge in orders towards the end of the financial year. This surge is caused by managers placing orders at the last moment in order to ensure that their full budget for the year is committed.

6.7.4 Budget negotiation

Budgets are normally arrived at by a process of negotiation with the managers concerned. A budget may actually be initiated by departmental managers and then corrected as a result of negotiation with the budget officer.

Clearly, a manager has an incentive to negotiate a budget that is not difficult to achieve. This produces a phenomenon known as 'padding the budget' or 'budgetary slack'. A manager will exaggerate the costs required to achieve objectives. This has the following results:

- If the manager succeeds in padding his budget then the whole control exercise is damaged. Comparison of actual with budget gives no meaningful measure of performance and the manager is able to include inefficiencies in his operation if he wishes.
- A successful manager becomes one who is a hard negotiator. The problem with this is that the negotiations in question are between colleagues and not with customers. 'Infighting' may become entrenched in the management process.

A great deal of time and energy that could be directed to the actual management of the business is distracted by what are essentially administrative procedures.

These are all examples of a control system distorting the processes they are meant to serve.

6.7.5 Influence on accounting policies

Any management accountant who has been engaged in the preparation of financial control reports will be familiar with attempts by managers to influence the accounting policies that are used. For example, the apportionment of indirect costs between departments often contains subjective elements. Should security costs be apportioned on the basis of floor space or staff numbers?

The manner in which the indirect costs are apportioned can have a considerable impact on how the performance of individual departments is perceived. This position creates the scope and incentive for managers to argue over accounting policies.

If a manager perceives that her department's performance is falling below budget then she may sift through the costs charged to her department and demand that some be reclassified and charged elsewhere. The time and energy that goes into this kind of exercise has to be diverted from that available for the regular management of the business.

6.7.6 Budget constrained management styles

When the performance of a manger is assessed by his ability to meet budget, then he is likely to adopt a conservative approach to new business opportunities that appear. The immediate impact of new business ventures is likely to be a rise in capital and operating costs – with an adverse impact on current period profit. The benefits of such ventures may only be felt in the long term. Hence, when a new opportunity appears, the manager evaluating it may only perceive that its acceptance will result in below-budget performance in the current period – and turn it down on this ground alone. Another consideration is that reliance on budgetary control is an approach to management that involves sitting in an office and reading financial reports. Such an approach (in conjunction with features such as executive dining rooms) may result in an unsatisfactory corporate culture based on hierarchies and social divisions. Large organisations that rely heavily on budgetary control systems often take on an 'ossified' character.

The general conclusion concerning this and previous points is that good budgetary control can offer certain benefits. However, when budgetary control is enforced in a rigid or insensitive manner it may end up doing more harm than good.

6.7.7 Budgets and motivation

Much of the early academic work on budgets concerned the extent to which the 'tightness' or 'looseness' of a budget acted as an incentive or disincentive to management effort. This was the issue of 'budget stretch'. Seminal works in this general area included studies by A.C. Stedry (see his 1960 text 'Budget Control and Cost Behaviour') and G.H. Hofstede (see his 1968 text 'The Game of Budget Control').

The main thrust of the findings that emerged from these studies was:

loose budges (i.e. ones easily attainable) are poor motivators,
as budgets are tightened, up to a point they become more motivational,
beyond that point, a very tight budget ceases to be motivational.

The role of budget participation and the manner in which aspirations and objectives are stated was also explored in certain studies. It was suggested that the participation of managers in budget setting was a motivational factor – but see earlier discussion concerning budget padding and negotiation.

6.8 Modern developments in control systems

6.8.1 The problem of discretionary costs

'Discretionary costs' are so called because of their lack of a clear relationship between the input to the process and the output of that process. Such costs are encountered in all operations but are particularly significant in services. For example, the output of a firm's legal department is hard to measure, making it very difficult to determine the amount of resource that the organisation should devote to this type of activity. This can be contrasted with direct material input requirements for a production process – here, the process is well understood, and it is relatively straightforward to budget for the input required to arrive at any particular desired output.

The techniques discussed in this text with reference to engineered (or 'variable') costs can also be applied to discretionary costs. One obvious way to make the budgeting of discretionary costs easier is to convert such costs from the discretionary category to the engineered category. This necessarily demands the development of suitable output measures for discretionary costs, and requires that there is at least some understanding of how the input to a process impacts on these required outputs. For example, some decades ago, in an insurance company, the processing of insurance claims may have been considered to be a discretionary cost. However, in most insurance organisations, this has now been converted to an engineered cost, as analysis of the work undertaken has enabled an understanding to be gained of the amount of time that is typically required to process a claim, and thus the relationship between the number of claims to be processed and the resources required to facilitate this. Obviously, this relationship will not be a direct one, and would not be expected to hold for any individual claim; there will inevitably be a great variability in the time taken between the shortest and the longest claims processed. Nevertheless, over a reasonable time period, an average can be established that will enable a budget to be set on a more rational basis than the traditional incremental approach. Similarly, the analysis required for activity-based costing (see Chapter 8) will also facilitate an understanding of the relationship between inputs and outputs of a process, and offers the possibility for more rational budgeting of discretionary costs. Where discretionary costs *cannot* be converted to approximate engineered costs, ZBB (see Chapter 5) offers an approach to determining the level of resource to be given to this type of activity.

Engineered costs can be controlled on a short-term basis using traditional standards. Discretionary costs, by definition, cannot be controlled on the basis of *output*, because of the difficulty in measuring or specifying outputs in financial terms. Nevertheless, *some* output measures for discretionary costs should be developed, where possible, in order to set minimum standards of performance. For example, a company's legal department may have a service requirement to respond to legal queries within 2 hours of receipt of the query, or the training department may be required to run a minimum number of programmes with in financial year.

Inputs to discretionary categories can also be controlled. For example, discretionary departments may have 'staff numbers' budgets in addition to financial budgets.

6.8.2 Developments from financial modelling and budgeting packages

The use of 'budgeting packages' has been encountered earlier in this text (see 'Spreadsheets and databases as budgeting tools' in the Readings section of Chapter 5).

When such packages were first introduced in the 1960s and 1970s their impact was to free accountants and managers from many of the time and resource constraints of manual systems:

- Computer accounting provided basic data faster and in more detail.
- Consolidation of monthly management accounts could be faster and more complete.
- Processing problems and limitations no longer precluded the preparation and review of alternative budgets and forecasts, assuming the formulation of detailed alternative hypotheses.

The advent of PCs in the 1980s made computer systems available to small- and medium-sized enterprises for the first time. In some cases, this made the operation of full management accounting systems to become economic. In the pre-PC era many smaller businesses did not prepare monthly management accounting reports or used crude approximations in place of proper accounting practices.

For example, backflush accounting is introduced in Chapter 8 as a 'modern' accounting system. In fact, variations on backflush accounting were widely used in the pre-PC era as a 'cheap and cheerful' means of preparing monthly management accounts. The standard cost of goods completed was deducted from costs incurred to give both monthly cost of sales and end month stock figures.

6.8.3 Rethinking the purpose of the monthly report and decision support systems

Various organisations will emphasise different priorities, but possible system aims include:

- monitoring progress towards a range of predetermined performance measures, including budgets and standards, financial requirements and cost improvement or service improvement targets;
- direction attention to significant variations and to events that could produce significant deviations in the future;
- acting as an agenda, a way of structuring regular discussion of results and progress and plans;
- providing an overall view of all the activities, not necessarily to answer specific questions, but possibly aimed at a non-executive director broad view.

There is considerable scope for discussion of the list of potential objectives for and determinants of management accounting systems. Such discussion goes beyond the scope of this book, but be aware that within the academic community there are two main schools of thought over the design of management reporting systems:

1. Contingency theory – particularly associated with the academic David Otley. The idea here is that reporting systems develop in response to the individual needs of particular businesses and sectors. For example, a business operating in a 'certain, static and calm' environment may well find that a reporting system based on traditional standard costing and budgetary control is entirely satisfactory. But this becomes progressively less likely to be the case as one moves further into an uncertain, dynamic and turbulent business environment.

2. Institutional theory – associated with the academics Paul Di Maggio and Walter Powell. The idea here is that reporting systems develop in response to the internal dynamics of organisations. Rather than responding to individual environmental needs, reporting systems tend to follow industry norms regardless of specific advantage.

The term 'isomorphism' (or, 'change making things equal') is commonly encountered in the discussion of institutional theory. Organisations adopt reporting systems that they perceive to be normal or best practice in their sector (mimetic process). The practice of benchmarking is an example of mimetic process. In order to adopt what they perceive to be best practice, organisations adopt the systems and processes of sector leaders without thinking too hard about whether or not those systems and practices are well suited to their own particular needs.

6.8.4 Beyond budgeting

The whole concept of budgeting turns around the idea that the operation of an organisation can be meaningfully planned for in some detail over an extended period into the future. Further, that this plan can be used to guide, control and co-ordinate the activities of numerous departments and individuals within the organisation.

The traditional budgeting concept has its critics:

In one division with 300 employees and $100m in annual costs, their operating budget was more than four inches thick and involved over 100 business units. They completed the budget six months into the current fiscal year with managers and directors under great pressure to revise the budget to meet corporate goals. But each revision was just an editorial exercise in changing the numbers, not in revising operating activities. These were only changes in a lengthy and cumbersome document that few understood. Budget complexity drives out meaning and relevance.

Bruce Neumann, Streamlining Budgeting in the New Millenium (*Strategic Finance* 12/2001)

The modern economic environment is associated with a rapidly changing environment, flexible manufacturing, short product life-cycles and products/services which are highly customised. The 'lean business' and the 'virtual business' are responses to this. Such businesses own limited assets of the traditional kind but assemble resources as and when needed to meet customer demand. The keys to their operation are flexibility and speed of response. They are able to move quickly to exploit opportunities as they arise and do not operate according to elaborate business plans.

In an age of discontinuous change, unpredictable competition, and fickle customers, few companies can plan ahead with any confidence – yet most organisations remain locked into a 'plan-make-and-sell' business model that involves a protracted annual budgeting process based on negotiated targets and that assumes that customers will buy what the company decides to make. Such assumptions are no longer valid in an age when customers can switch loyalties at the click of a mouse.

J Hope and R Fraser. Beyond Budgeting (*Strategic Finance* 10/2000)

Since the late 1990s, many high profile companies are reported to have been abandoning traditional budgeting. Svenska Handelsbanken ('a model for the New Economy') is the case most commonly quoted within management literature in this regard. The apparent modern trend is to move to an approach wherein an organisation is able to respond quickly to events, possibly at the expense of low unit production cost.

The Beyond Budgeting model explored in the two articles quoted above is associated with high levels of delegation and employee empowerment. This is consistent with the modern philosophy of total quality management (see Chapter 8) and most compatible with newer approaches to performance evaluation such as benchmarking (see Chapter 7).

6.9 Summary

Budgetary control is one of the classic management accounting techniques. It allows performance to be monitored by systematically comparing actual results achieved with budget. A variety of practices have been developed to make this comparison meaningful – but the management accountant should be aware that budgetary control can easily distort the processes it is meant to serve.

Readings

6

Beyond Budgeting (extract)

J Hope and R Fraser, *Strategic Finance,* October 2000

Published by the Institute of Management Accountants, Montevale, NJ. For more information about reprints from Strategic Finance Contact PARS International.

The traditional performance management model is too rigid to reflect today's fast-moving economy. Two new approaches – devolution and strategic performance management – have risen in popularity, but they are equally frustrated by unyielding budgeting systems.

In an age of discontinuous change, unpredictable competition, and fickle customers, few companies can plan ahead with any confidence – yet most organisations remain locked into a 'plan-make-and-sell' business model that involves a protracted annual budgeting process based on negotiated targets and resources and that assumes that customers will buy what the company decides to make. But such assumptions are no longer valid in an age when customers can switch loyalties at the click of a mouse.

Organisations need to find a new model that effectively empowers front-line managers to make fast decisions based on current information. The 'Beyond Budgeting' model represents a set of information-age best practices – from organisation design and devolution of authority to planning and performance management – that leading-edge companies are now using to respond much faster to customer demands. Understanding what these practices are and what you need to do to adopt them is increasingly likely to determine whether or not your company is able to compete effectively in the new economy.

[*Author's note: it is important to be aware that this was written in 2000 at the height of the 'dot com bubble'*.]

Such companies as Svenska Handelsbanken, Volvo Cars, IKEA, SKF, Borealis, Fokus Bank and Boots have all abandoned the budgeting model in one form or another in recent years. And the momentum is gathering pace. Ericsson, Diageo and British cider maker Bulmers are among the latest companies to see the light. Such is the current interest that in 1998 a Consortium for Advanced Manufacturing–International (CAMI) research forum known as the Beyond Budgeting Round Table (BBRT) was established to understand and report on these developments.

After two years' research and numerous case visits, the BBRT has concluded that not only do firms need more effective strategic management, but they also need to redesign their organisations to devolve authority more effectively to the front line. Crucial to success, however, is the recognition that these two elements of the beyond budgeting model must be given equal attention.

Organisation design and devolution

Most attempts at redesigning organisations and developing decision making have focused on flattening hierarchies, re-engineering processes, and introducing team working.

[*Author's note: the reference is to total quality management, explored in Chapter 8*.]

Invariably, such approaches simply lead to the delegation of control within a strict regime of coordination and accountability, with budgets as the primary weapon for policing this control.

Delegation and coordination don't make comfortable bedfellows. A constant battle is being waged in most large organisations between the forces of decentralised initiative (usually the losers) and the forces of centralised coordination (invariably the winners). The difference is the centralising power of the budgeting system that emphasises coercion rather than coordination (you will cooperate, won't you?), focuses on cost reduction rather than value creation, stifles initiative, and keeps planning and execution apart, thus reinforcing the separation between thinkers and doers. Other symptoms of failure include cost allocations that are non-negotiable and middle managers who remain 'commanders and controllers'.

In the information economy, it's not so much decentralisation that's required but autonomy within boundaries. Autonomy is much more than decentralisation and few steps beyond empowerment. Autonomy is a Greek word meaning self-governance. It means the freedom to act and the capability to act. The key to autonomy isn't to try to empower cost centers (it doesn't work) but to give more responsibility and accountability to a greater number of business units for value creation. Effective devolution is tough, and it takes many years of painstaking effort to hold back the forces of centralisation, but such efforts usually prove worthwhile as they lead to a self-renewing organisation with strong values, dispersed responsibilities, and a performance culture that no longer depends on one or two inspirational leaders at the top. Its features include:

- Governing through shared values and clear boundaries, enabling local managers to make fast decisions knowing that they are within agreed parameters.
- Creating as many autonomous profit centers as possible, providing enterprising people with the opportunity to 'run their own business'.
- Coordinating the organisation through market forces, thus, for example, creating an 'internal market' in which central services units see operating units as internal customers that must be serviced and satisfied.
- Providing front-line managers with fast and open information networks that convey up-to-the minute knowledge about critical issues. Because everyone receives important information at the same time, controls are distributed (making them stronger) and bad news is shared immediately.
- Giving managers the freedom to act and the responsibility to deliver results, placing the onus of responsibility on front-line people to perform.
- Giving managers the training and tools to think and act decisively, providing managers with the capability to make fast decisions at the point of contact with the customer.

Performance management

In the latter decades of the 20th century the role of budgets mutated from a set of coordinated financial plans to a wide-ranging management system for controlling the business, driving management behavior, and rewarding performance. The underlying thread was one of control. The vision of the chief executive was translated into the strategic plan by the planners and handed down the hierarchy to operational managers who prepared their budgets. Once these were agreed, all that was demanded was adherence to the plan. The head office didn't like surprises. Control reports were constantly fed back up the line, and if they showed that performance was veering off track, new directives would be issued from the head office. It isn't hard to see why the budgeting system became essential to success. It was the core management process and provided much needed stability and continuity in an increasingly competitive business world.

But despite attempts to fine-tune this model by introducing zero-base or faster (for example, quarterly) budgeting (neither of which takes the firm toward more effective devolution or strategic performance), such a model is now out of kilter with a fast-changing business world. A number of new approaches have been promoted over the past 10 years to overhaul the traditional model and build performance management processes that enable managers to steer their firms toward clear strategic goals.

But despite the undoubted success of tools such as the Balanced Scorecard, there is often such a gulf between theory and practice that relatively few companies sustain their interest at the highest level. Most collide rather than connect with the budgeting process. The group finance people are often to blame. They see themselves as the guardians of the budget, and if a business unit or division is veering off its agreed performance track, then corrective action must be taken, and they are the ones that must enforce such action. This may well involve directives aimed at (unplanned) cost reductions. Of course, the first costs to be cut tend to be so-called discretionary investments in, for example, employee skills and management training, customer satisfaction programs, and 'special' projects such as those that improve quality and increase the speed of operations. The trouble is that these are also the very investments that underpin the success of the medium-term strategy as laid down in the Balanced Scorecard. Other pitfalls await the inexperienced scorecard user.

For example, if the planning process remains locked into an annual cycle with a highly deterministic approach to strategy, then much of the promise from so-called strategic management will be unfulfilled. A 'take that hill' strategy (to use a military metaphor) is of little value if the hill itself has moved in the meantime. Incentive schemes too heavily weighted toward achieving the fixed plan reinforce this inflexibility. Moreover, there's a fine line between 'alignment' and 'control,' and there's a real danger of using the scorecard (wittingly or unwittingly) for top-down control (in the same way as a budget with some non-financial measures).

In the beyond budgeting model, an effective performance management system should be aimed at supporting self-governing business units. Its principal features should include:

- Targets that are relative to the competition (internal or external) and thus are always self-adjusting and stretching the performance of the business unit.
- Effective anticipatory management systems (including rolling forecasts) that enable managers to continuously adjust strategy and manage investments and shareholder expectations.
- A rolling strategy process (with appropriate cycles) that is devolved to business unit teams and that operates within clear boundaries and values.
- An investment management process that forces managers to build flexibility and 'exit routes' into their forecasts and in which execution is made at the latest possible time.
- Distributed controls aimed at supporting front-line managers and keeping senior managers informed (by exception).
- Rewards based on relative performance at a business unit or company level that encourage team performance and cross-company sharing at various levels.

The beyond budgeting model – more than the sum of the parts

To create new wealth, firms need both the benefits of effective devolution (such as fast decision making) and the benefits of effective performance management (such as fast, open and relevant information). The power of this dual approach was recognised more than 25 years ago by Dr. Jan Wallander, the architect of the Svenska Handeisbanken business model.

Management books and journals are replete with success stories that support one management model or another, but how many can point to companies that have consistently beaten their rivals for almost 30 years without having a dominant market position (Handelsbanken only has 15 per cent of the highly deregulated Swedish market)?

What's the reason for this sustained success? It's the combination of effective devolution and effective performance management that makes the Handelsbanken case so special and has pointed many more companies in the right direction. It paves the way for companies to simplify their performance management processes, reduce the cost and complexity of the organisation, and create a firm that is strategically focused and much more innovative and responsive.

Yet the gravitational force of the budgeting system makes it extremely difficult for most firms to escape the world of compliance and control. This is not a comfortable message for a measurement industry that believes it alone has the power to drag the traditional model kicking and screaming into the information age. Only by overcoming the constraints of the traditional budgeting approach can managers build a business model that operates at high speed; it self-questioning, self-renewing, and self-controlling; and rewards innovation and learning.

Svenska Handelbanken – a model for the New Economy

Since 1972, annual contributions to the Handelsbanken groupwide profit-sharing fund have been based on the margin by which it beats the average return on capital of all its Nordic rivals and, apart from 1973, it has always made significant contributions. Yet inside the firm there is no annual budget or target-setting process. The bank and its constituent parts are all continuously striving to improve their place in a series of performance league tables geared to key measures such as return on capital, cost-to-income ratio, and profit per employee. It is these league tables and their constituent measures, underpinned by intense peer pressure, that drive continuous improvement at local and regional levels. Beating the competition rather than some negotiated budget goes to the heart of the Handelbanken model.

Branch managers run their own business with high levels of freedom and responsibility. This means deciding which products to offer individual customers (there are no centrally imposed targets), which central services to use (services and prices are negotiated), and how many staff are needed. This freedom to act is supported by the capability to act. For example, there is a fast and open information system geared to measuring customer acquisitions and defections, work productivity, and customer and branch profitability. Information is online and is seen by local, regional, and group managers at the same time, but it is how they use it that's important.

Managers are empowered to make decisions and to fix mistaken (higher-level managers only interfere when absolutely necessary). The result is a very flat organisation with a multitude of semiautonomous work units (600 for the whole blank) with peer pressure (using performance league tables) driving performance improvement.

The benefits are evident everywhere you look. Employee turnover is extremely low, reflecting high levels of satisfaction (redundancies are unknown). Talented graduates want to join Handelsbanken more than any other financial services company in Sweden, not because it offers the highest salaries and benefits but because young managers are given exceptional levels of responsibility within a radically decentralised structure. It is perhaps because branches 'own' their customers (no matter where transactions take place), make fast decisions, and provide flexible products and services that Handelsbanken has the lowest number of complaints in its sector and consistently tops the customer satisfaction charts in Sweden. Costs are also the lowest in the industry (half the level of the European average taken as a percentage of assets). One reason is that costs are constantly challenged (rather than protected by the budgeting system); another is that bad debts are exceptionally low, largely due to the company's policy of devolving credit responsibility to front-line people who know the customer.

[*Author's note: this article contrasts the modern concepts of the New Economy and Total Quality Management with traditional aspects of management encapsulated within budgetary planning and control. We shall encounter further aspects of this debate as we proceed through the text.*]

Exercise

In this and the preceding two chapters, various aspects of budgeting and performance management have been considered, ranging from the technical detail of spreadsheet modelling to the incorporation of strategic objectives in the design of budgets.

Before proceeding to the revision questions (question 2 in particular) you may find it useful to obtain access to a computer spreadsheet system. You should give careful thought to the design of spreadsheets to be used in budget planning, strategy appraisal and sensitivity analysis. You should remember that a well-designed spreadsheet is one that allows the budgets to be quickly, easily and accurately re-formulated to allow for changes in base information.

Streamlining budgeting in the new millennium (extract)

Bruce Neumann, *Strategic Finance*, December 2001

Published by the Institute of Management Accountants, Monteuale, NJ. For more information about reprints from Strategic Finance Contact PARS International.

Is your budget causing dysfunctional behavior within your organisation? If employees pad, stuff, under-and over-forecast revenue during the budgetary process, then the budget isn't serving as a useful tool like it could. So how do you create a budget that motivates employees to achieve targets and doesn't get filed it the bottom of a drawer? Two formats – the activity budget and the global budget – promptly provide more useful information to department managers, unlike traditional resource-oriented budgets that are bogged down with needless details. You might consider this leading-edge approach 'hotrod budgeting.'

Companies obviously need budget. After all, the budget addresses the major area of concern to the business: allocating resources to produce the most cost-effective and, therefore, best profits and return on investment. It links together all of the activities that the firm undertakes into one clear set of targets, but, to be successful, the operational budgeting process will involve all of the following steps:

Planning;
Controlling;
Coordination;
Motivation; and
Evaluation.

Let the operational management and staff own the budget

There are approaches to the budgetary process that motivate employees to achieve targets and others that do the opposite. I've observed two common attitudes toward budgets in large, centrally run organisations. First, the central planners think that they are in charge and often act as police over the rest of business, which creates resentment and results in an 'us-and-them' attitude. If senior managers dictate the budget, operational personnel are alienated from ownership of the budget, and if a budget is implemented as a stick to use on managers, it will waste time, effort and money.

Second, the budget may to tossed into the bottom drawer and forgotten until next year: 'We have satisfied the accountants this year, so let's get on with the real job.' The result: Employees in operations then use their own guidelines to run the business, and the whole budget process has been an almost complete waste of time.

So why not let operational managers implement the budget? Where operational managers put the budgets in place, they are then responsible for those targets and are more likely to try to achieve them. When circumstances change due to unforeseen happenings, then operational managers shouldn't be held responsible for such events.

Before undertaking the budget process, consider the 'Three Cs' of motivation:

1. Choice: the importance of included employees in making substantive decisions concerning the budget.
2. Collaboration: a structure that supports teamwork. Collaboration can be enhanced by encouraging communication across multi-functional teams and by rewarding groups for achieving predetermined corporate goals. To help ensure that teamwork takes places, incentives and rewards should be separate from the budget process. Much of the management literature now suggests that if budget incentives are implemented, there's a strong likelihood that the entire budget process will fail.
3. Content: the nature of the tasks that people engage in. Keep the following advice in mind: "If you want people motivated to do a good job, give them a good job to do." Rather than breaking tasks into elemental components, consider giving each individual responsibility for a larger portion of the entire process. For example, empower each individual with a range of customer responsibilities rather than assigning one person to make initial contacts, another to take orders, another to confirm orders, and another to handle collections.

Once fully armed with accurate targets and an undertaking by senior management not to cut budgets arbitrarily, managers are then more likely to aim for realistic production and sales levels. In addition, overheads will be trimmed where they are wasteful if 'stretch targets' are used. Stretch targets represent attainable improvement over prior results that effective managers can achieve, often by eliminating slack or unnecessary overhead costs.

The role of ERP systems

In order to manage their organisations more effectively, many large- and mid-sized firms are turning to enterprise resource planning (ERP) software.

[*Author's note: ERP systems are explored in Chapter 8, they are planning systems which allow the resource requirements of given output levels to be projected.*]

The goal of many technology-driven budgeting and planning processes is to link the general accounting system with all other finance systems and also with marketing management (sales orders), procurement, human resources management, inventory management, etc. In brief, ERP is designed to provide seamless interfaces among all operating and managerial systems in the in the organisation.

All of the linkages in the ERP model must be included in the budget document. Consequently, meaningful relationships may be obscured. Here's an example. I'm currently conducting activity-based costing (ABC) studies in on large organisation where the ERP model is so complex no one understands it.

In one division with 300 employees and $100m in annual costs, their operating budget was more than four inches thick and involved over 100 business units. They completed the budget six months into the current fiscal year with managers and directors under great pressure to revise the budget to meet corporate goals. But each revision was just an editorial exercise in changing the numbers, not in revising budgetary relationships or operating activities. Very few managers understood the linkages in the budgeting model. In other words, no real events were likely to change as a result of preparing the budget. There were only changes in a lengthy and cumbersome document that few understood.

Budgeting in the new millennium will continue to use ever-more-complex ERP systems. In the event that ERP models continue to expand, it's likely that budgets will again be relegated to the bottom drawer. Budget complexity, unfortunately, drives out meaning and relevance at a time when budget reality and relevance should be paramount. Since obscuring meaningful relationships in complex budget models will most likely accelerate, budget directors and line managers should attempt to reverse this trend. I'll show you how.

How to streamline the budget

As finance professionals, you can use activity budgeting and global budgeting or 'morph' the two to simplify and streamline budgetary documents. These budgets can be motivational to those who use them because they're easy to understand and department managers can see the changes flow through them. They're user-oriented. Because they aren't bogged down in details and complex financial terms, simplified budgets will get used by department managers for strategic management and cost management activities rather than being filed and forgotten.

Activity Budgeting. In this new millennium, activity-based costing (ABC) will expand into strategic cost management or activity-based management (ABM) and activity budgeting. Modeled on ABC or ABM, activity budgeting is a new budget format whereby budget costs are arrayed according to the expected costs of activities rather than products, services or resources. When a budget reflects activities in the business units, it's easy to understand and use. Functional categories – such as materials and labor – collapse, and new process-oriented categories – such as acquiring customers, retaining customers and providing IT services – replace them. Most ABC experts recommend the magic seven activities, where most organisational units can represent their key activities with seven descriptors.

The results

You'll end up with highly summarised budget formats that are much more understandable than budget formats reflecting the general ledger. Leave the general ledger to finance and accounting professionals because operating managers don't need that level of detail anyway. They can better understand and use activity budgets than documents that are four inches thick.

I forecast the activity budgets will supercede resource budgets because of their inherent linkages that present a cause-and-effect relationship between activities and products or services (cost objects). Process modifications, quality improvements and systems design changes aren't easily linked to traditional resource budgets, but such changes are easily entered into activity budgets.

For instance, if a management position is eliminated, you can see in an activity budget how this action may affect certain quality levels or whether the action would degrade a process. Separate columns can be used to show anticipated effects under each scenario. You should also include explanatory notes to show the effects of proposed changes.

The 'less-is-more' concept also applies to global budgeting. Global budgeting is a general concept in that managers will find the document easy to read and easy to use because it offers a relatively unencumbered and straightforward budget document with few spending lines. Note that I am not using the term global budgeting as it is sometimes used by national governments to allocate funds to healthcare providers.

Any budget can be recast into a global budget by taking a traditional approach and distilling it down to a simpler, understandable format where you lump categories: instead of salaries and fringe benefits on two lines, they can appear on one line under total compensation. After all, the IT manager most likely wants an overall total number anyway. And overhead can be induced with its related categories, such as building, marketing and IT, rather than appearing on the budget as three uninterpretable quantities.

Because a global budget describes broad categories of costs, managers will discover a certain sense of creativity and flexibility when using such budgets. They won't be constrained by detailed spending limits but rather by overall guidelines – budget totals. In a sense, global budgets represent a trade-off between more strategic thinking and innovation in contrast to relaxing some control elements that often encumber traditional budget formats.

The state of Colorado has learned that a budget with limited categories, that is, with few budget lines, provides flexibility and stimulates innovation. For years Colorado required very detailed and lengthy budgets, particularly for higher education. The state legislature and other funding entities changed their budget format in the late 1970s and, since then, colleges and universities in Colorado have grown significantly, developed new programs, and limited the budgetary games that were previously the norm. The secret of their success? Dramatic simplification and streamlining of the state's required budgetary documents.

Getting started

The key is to refine your budget formats to reflect a few simple and direct categories. By doing so, you'll empower managers to use budgets creatively and imaginatively to achieve results that were previously considered impossible. Managers will be better able to forecast the effect of proposed changes. They'll concentrate on more effective strategies rather than on merely improving budgetary targets. They'll also give more attention to the needs of their customers (both internal and external) rather than budget directives.

Consider using a budget format with no more than three revenue categories and no more than five cost categories. Although at least one should be a fixed-cost category, most should be variable costs with identified cost drivers that are easy to understand and monitor. Most of the cost categories should relate to activities rather than functions and could include the following:

Cost categories

Volume of inventory (units, costs),
Labor costs incurred,

Cost of materials used,
Wastage,
Overhead costs (planned, incurred).

Activities (potential)

Number of units produced or sold,
Product mix, intended vs. actual,
Labor hours (available, used, idle),
Number of transactions,
Number of items ordered,
Defects (target vs. actual).

You can measure these items on a daily, weekly, or monthly basis and compare the results to production or sales forecasts.

You also can incorporate features from the activity and global budgets. Using an activity budget, especially as a way to formulate a global budget, will tend to improve the behavioral climate in the organisation and might even improve budgetary achievement. Managers will take on greater responsibility and ownership of an activity budget as compared to a typical functional budget. Their performance will improve as they focus on activities that have a positive long-term effect on the bottom line.

Use the budget as a guide

No matter what format you choose – global, activity or even traditional – you need to remember that budgets are a view of how the future will look in one, two, or more years and, unless the business is in a very stable environment, budgets are invariably wrong! So mangers and staff alike should view them as a guideline that gives direction – not as a document that must be achieved at all costs.

So don't build a rules-based spending limit where department managers lose the money if they don't spend it all. On the other side, if more money is spent, then managers should provide understandable reasons to explain the overage. The worst possible performance report contains only budget, actual and variance columns. The most important information for managers to use in future decision making is the set of reasons explaining why budget goals were exceeded or not achieved. Where they are stated in terms of activities the explanations will be most useful in having a favorable effect on the future.

An intense adherence by senior management to an annual budget isn't practical and defies what's happening in the marketplace. Rolling budgets are particularly useful for organisations within volatile industries because they help reduce reaction time to non-budgeted changes in the marketplace. They are flexed and adjusted for current circumstances to provide senior management with a far better view of what is likely to happen in the coming periods. Measures to put the company back on couse will come from knowing what is really happening – not from what management hopes is happening.

Games people play

While I observed that fewer games are played under global or activity budgeting, there will always be potential for manipulation. In addition, staff will engage in gamesmanship if they realise that senior management isn't sincere in its objectives. If management follows a familiar trend in cutting costs once the initial budgeting round is completed, then staff will act accordingly and predictably. If they know that management will always arbitrarily cut 10% after the first round, staff will generally pad their budgets to end up with what they think they really need. The fatal part of this scenario is budgeting correctly at the start and then being told later to cut expenditures because this will lead to necessary costs being cut. Alternately, area managers may set their estimated revenues low in order to meet income targets more easily. The result of gamesmanship is adverse variances due to biased budgetary inputs.

The budget should include worst, best and expected scenarios for sales and costs. These will give senior managers a view as to how volatile or malleable the budgets can be to achieve the targets they've set. Where the scenarios produced don't achieve the targets, then the game of budget slashing or cutting will begin.

Get in the fast lane

It's perplexing why companies continue to produce budgets that just don't used and are the cause of dysfunctional behavior such as padding the budget. If you find the traditional budget doesn't get used by operational managers, then stop creating it. Instead, provide the managers with an activity or global budget from which they can easily glean the information they need. You'll be glad you did because the budgetary process will no longer be a waste of time, effort and money, and everybody will have a more realistic picture of the company's finances and operations.

Revision Questions

6

Question 1

1. Within the context of a budgetary control system:

1.1 Explain the distinction between information feedback and feedforward
1.2 Explain the distinction between a controllable cost and an uncontrollable cost
1.3 Explain the distinction between a fixed and a flexible budget
1.4 Explain the term 'failure of goal congruence'
1.5 Explain the term 'budget slack'

Question 2

(a) Explain briefly the differences between fixed and flexible budgets. **(5 marks)**

(b) Prepare a report, addressed to the board of directors, clearly explaining the advantages/disadvantages of using fixed/flexible budgets as part of a budgetary control system. **(10 marks)**

(c) Spreadsheets are often used by accountants to assist in the preparation of budgets.

Describe how a spreadsheet may be used to prepare a sales budget and explain the advantages of using spreadsheets to assist in this task. (Your answer should refer to input, use of formulae, and output reports.) **(10 marks)**

(Total marks = 25)

Question 3

(a) The following report has been prepared, relating to one product for March 20X7. This has been sent to the appropriate product manager as part of PDC Ltd's monitoring procedures.

Monthly variance report – March 20X7

	Actual	*Budget*	*Variance*	%
Production volume (units)	9,905	10,000	95 A	0.95 A
Sales volume (units)	9,500	10,000	500 A	5.00 A
Sales revenue (£)	27,700	30,000	2,300 A	7.67 A
Direct material (Kg)	9,800	10,000	200 F	2.00 F
Direct material (£)	9,600	10,000	400 F	4.00 F
Direct labour (hours)	2,500	2,400	100 A	4.17 A
Direct labour (£)	8,500	8,400	100 A	1.19 A
Contribution (£)	9,600	11,600	2,000 A	17.24 A

The product manager has complained that the report ignores the principle of flexible budgeting and is unfair.

Requirements

Prepare a report addressed to the management team that comments critically on the monthly variance report.

Include as an appendix to your report the layout of a revised monthly variance report that will be more useful to the product manager.

Include row and column headings, but do not calculate the contents of the report.

(15 marks)

(b) Explain the differences between budgetary control and standard costing/variance analysis. In what circumstances would an organisation find it beneficial to operate both of these cost control systems? **(5 marks)**

(c) Explain briefly how a database may be used to collect the information required to prepare a report such as that illustrated in part (a) above. **(5 marks)**

(Total marks = 25)

? Question 4

The following monthly budgeted cost values have been taken from the budget working papers of MZ Ltd for the year ended 30 September 20X0.

	Activity level		
	60%	*70%*	*80%*
	£	£	£
Direct materials	30,000	35,000	40,000
Direct labour	40,500	47,250	54,000
Production overhead	46,000	52,000	58,000
Selling overhead	15,000	17,000	19,000
Administration overhead	28,000	28,000	28,000
	159,500	179,250	199,000

During September 20X0, actual activity was 1,292 units (which was equal to 68 per cent activity)

	£
Direct materials	33,500
Direct labour	44,000
Production overhead	46,250
Selling overhead	16,150
Administration overhead	27,800
	167,700

Requirements

(a) Prepare a budgetary control statement for MZ Ltd on a flexible budget basis for the month of September 20X0. **(7 marks)**

(b) Explain the difference between fixed and flexible budgets, and state when each should be used to control costs. **(8 marks)**

(c) The preparation of budgets is an important task that relies on the identification of the principal budget factor.

Explain the term 'principal budget factor' and state its importance in the budget preparation process. **(5 marks)**

(d) Explain the role of the budget committee in the budget preparation process. **(5 marks)**

(Total marks = 25)

? Question 5

The chief executive of your organisation has expressed concern about the expenditure on staff training. Individual costs are often mentioned in discussing departmental budgets but he is not aware of the overall activities or the control mechanism. He has requested that a training programme be prepared and submitted for his approval.

Requirements

(a) Explain the nature of training costs from a control view point. **(5 marks)**

(b) List the costs you would include in a training programme. **(5 marks)**

(c) State how a training programme report could be prepared and the advantages such a report would offer. **(5 marks)**

(d) Explain briefly how the performance of the training function could be controlled and evaluated. **(5 marks)**

(Total marks = 20)

? Question 6

The following statement was made by a business consultant:

The problem with any control system is that it can distort the process it is meant to serve. Budgeting and budgetary control can distort the operations of the organisation they are being applied to. This distortion often takes a subtle form that people are unaware of, but it can increase costs and reduce the quality of the service that is being provided.

Requirements

(a) Explain the various ways in which budgeting and budgetary control can distort the processes they are meant to serve. **(5 marks)**

(b) Explain the manner in which such distortions can increase costs and reduce the quality of the service being provided. **(5 marks)**

(c) Suggest approaches to budgeting and budgetary control that might help to avoid the problems referred to in (a) and (b). **(5 marks)**

(Total marks = 15)

? Question 7

MPL Ltd is a company specialising in providing consultancy services to the catering industry. MPL Ltd prepared its operating statement for period 5 of the year ending

31 August 2000. This was as follows:

	Budget	*Actual*	*Variance*
Chargeable consultancy hours	2,400	2,500	100
	£	£	£
Administration staff salaries – fixed	15,000	15,750	750
Consultants' salaries – fixed	80,000	84,000	4,000
Casual wages – variable	960	600	360
Motor and travel costs – fixed	4,400	4,400	–
Motor and travel costs – variable	1,600	2,610	1,010
Telephone – fixed	600	800	200
Telephone – variable	2,000	2,150	150
Printing, postage & stationary – variable	2,640	2,590	50
Premises and equipment costs – fixed	3,200	3,580	380
Total costs	110,400	116,480	6,080
Fees charged	180,000	200,000	20,000
Profit	69,600	83,520	13,920

While the directors are pleased that the actual profit exceeded their budget expectations they are interested to know how this has been achieved. After the budgets had been issued to them, the consultants expressed concern at the apparent simplicity of assuming that costs could be classified as being either fixed or varying in direct proportion to chargeable consultancy hours.

Requirements

(a) As the newly appointed management accountant, prepare a report addressed to the board of directors of MPL Ltd that:

(i) explains the present approach to budgeting adopted in MPL Ltd and discuss the advantages and disadvantages of involving consultants in the preparation of future budgets; **(10 marks)**

(ii) critically discusses the format of the operating statement for period 5; **(5 marks)**

(b) explains how a spreadsheet could be set up so that a flexed budget and variance calculations could be rapidly produced by inserting only the actual data, assuming that variable costs are thought to vary in line with chargeable consultancy hours. **(10 marks)**

(Total marks = 25)

? Question 8

AHW plc is a food processing company that produces high-quality, part-cooked meals for the retail market. The five different types of meal that the company produces (Products A to E) are made by subjecting ingredients to a series of processing activities. The meals are different, and therefore need differing amounts of processing activities.

Budget and actual information for October 2002 is shown below:

Budgeted data

	Product A	*Product B*	*Product C*	*Product D*	*Product E*
Number of batches	20	30	15	40	25
Processing activities per batch					
Processing activity W	4	5	2	3	1
Processing activity X	3	2	5	1	4
Processing activity Y	3	3	2	4	2
Processing activity Z	4	6	8	2	3

Budgeted costs of processing activities:

	£000
Processing activity W	160
Processing activity X	130
Processing activity Y	80
Processing activity X	200

All costs are expected to be variable in relation to the number of processing activities.

Actual data
Actual output during October 2002 was as follows:

	Product A	*Product B*	*Product C*	*Product D*	*Product E*
Number of batches	18	33	16	35	28

Actual processing costs incurred during October 2002 were:

	£000
Processing activity W	158
Processing activity X	139
Processing activity Y	73
Processing activity Z	206

Requirements

(a) Prepare a budgetary control statement (to the nearest £000) that shows the original budget costs, flexible budget costs, the actual costs, and the total variances of each processing activity for October 2002. **(15 marks)**

Your control statement has been issued to the Managers responsible for each processing activity and the Finance Director has asked each of them to explain the reasons for the variances shown in your statement. The Managers are not happy about this as they were not involved in setting the budgets and think that they should not be held responsible for achieving targets that were imposed upon them.

(b) Explain briefly the reasons why it might be preferable for Managers **not** to be involved in setting their own budgets. **(5 marks)**

(c) (i) Explain the difference between fixed and flexible budgets and how each may be used to control production costs and non-production costs (such as marketing costs) within AHW plc. **(4 marks)**

(ii) Give two examples of costs that are more appropriately controlled using a fixed budget, and explain why a flexible budget is less appropriate for the control of these costs. **(3 marks)**

Many organisations use linear regression analysis to predict costs at different activity levels. By analyzing past data, a formula such as

$$y = ax + b$$

is derived and used to predict future cost levels.

(d) Explain the meaning of the terms y, a, x and b in the above equation. **(3 marks)**

(Total = 30 marks)

This Page Intentionally Left Blank

Solutions to Revision Questions

6

Solution 1

1.1 Feedback involves obtaining information from the past operation of a process and using that information as a guide for the control of that process. Feedforward involves forecasting information in regard to the future operations of a process and using that as a guide for control. Both approaches may feature in a budgetary control report (feedback being year-to-date figures, with feedforward being forecast-to-year-end figures).

1.2 A controllable cost is one which is influenced by decision of the budget holder. An uncontrollable cost is one which is not so influenced. It is often argued that uncontrollable costs should not be brought within the remit of the budgetary control process. However, the contrary argument is that few costs really are uncontrollable if they are studied to determine the activities they relate to and who determines the level of such activities.

1.3 A fixed budget is one which is based on given levels of output and/or activity. A flexible budget is one which is based on the actual level of output/activity that takes place but at given price levels, wages rates and efficiency levels. The comparison of actual with flexed budget therefore eliminates 'volume variances' and allows a more immediate comparison of the two sets of figures.

1.4 A failure of goal congruence occurs when a manager is induced by a business control system to do something that is not in the best interests of the organisation as a whole. For example, a departmental manager may be induced to reduce quality control costs in his department in order to stay within his overall operating cost budget. Such a measure may keep the manager within his budget but it may give rise to a reduction in product quality that impacts adversely on the performance of the organisation as a whole.

1.5 Budget slack is considered to arise when a budget holder negotiates a budget that involves a lower level of performance than that which is realistically possible. For example, a departmental manager may negotiate a cost budget in excess of that which is really required to enable the department to perform its function. Such a budget will make the manager's task easier in the current period. The gap between required costs and budget costs is the budget slack.

Solution 2

This is fairly straightforward question that invites comment on the material we have explored in the chapter. In answering it you may care to consider the distinction between a flexed budget and the standard cost for the output achieved. Why are the two likely to differ?

The requirement concerning spreadsheets may now seem rather dated to the average reader. In fact this question is now some years old.

(a) A fixed budget is one which is set before the beginning of an accounting period, and that shows, in financial terms, the results of the budgeted, or planned, activities for the forthcoming period. The budget therefore is based on single-point estimates with respect to the variables such as sales quantity, production volume, production mix, etc. The fixed budget is used for planning purposes.

Whereas a fixed budget is useful for planning, it is deficient when used as a control device. This is because actual activity will almost always differ from that envisaged in the budget, and therefore the budget, if it is to be used as a comparator, must be flexed to the actual level of activity. Thus, the actual outcome is compared with a flexed budget, set after the event, which portrays the budgeted costs and revenues of the activity that actually took place.

(b) **Report**

To: Board of directors
From: Management accountant
Date: 20 November 20X6
Subject: Fixed and flexible budgets

A fixed budget is a budget such as the master budget, which is set before the start of the financial year, and which formalizes our expectations of the likely activities undertaken in the year.

The advantages of such a budget are:

- in compiling the budget the various elements of the organisation are co-ordinated;
- it is useful as a comparator for the actual outcomes;
- without a formalized budget it would be difficult to achieve focus around the desired strategy;
- it may be useful in external negotiations with banks and other lenders.

The disadvantages are:

- like any financial statement, it may give a false impression of accuracy;
- it grows increasingly out of date, and therefore loses its validity as time passes;
- inappropriate use, as for example in budgetary control, may be harmful.

Flexible budgets are those that recognise cost behaviour and that are changed, after the event, to reflect the actual level that took place. Their advantages are:

- they are primarily intended for use in budgetary control, and are appropriate as comparators;
- the variances that are produced give valid indications of relative performance.

The disadvantages of flexible budgets are:

- fairly obviously, a flexible budget cannot be used for planning purposes because of the multiple levels of activity involved;
- focus on control of costs/revenues against a flexible budget may distract attention from strategic issues, such as the fact that market share is dropping;

there is always a problem in separating costs by behaviour. If this cannot be undertaken with some accuracy, the quality of the flexible budget and its usefulness as a control tool suffer.

(c) A spreadsheet that would produce a sales budget would normally contain three areas:

1. An input area, into which is input raw data, for example, on sales volumes, sales prices, discounts allowable, mix of sales growth rates predicted, etc.
2. A working area, containing relationships between the inputs. This is where the calculations take place. Cells within this area will draw upon information into the required output. Cells in this area may be protected, to maintain the integrity of the model.
3. An output area, where the sales budget and supporting schedules are presented in a form suitable for use. This may allow a multi-dimensional analysis of sales revenue, showing it by product, currency unit, geographical area, customer type, etc.

Such a spreadsheet can be used to perform repetitive or predetermined calculations, for example in situations such as in sales budgeting, where prices, volumes, etc., can be fed into the spreadsheet that contains the required model. This will, thereafter, almost instantly produce the required output, whether this is a budget for total sales, for sales by region, by sales outlet or by product.

The creation of a spreadsheet model can be seen as being similar to devoting resources to capital expenditure. It takes time and resources to build the initial model, but having done this, the task of producing budgets becomes much more efficient, and budget variations can be accomplished with ease ('what if?' questions). Without a spreadsheet, in a complex organisation, such variations may be impossible due to their time requirement.

The sales budget created on a spreadsheet will therefore have the advantage of being less time-consuming, and therefore cheaper to produce than a manual equivalent. Of greater significance, however, is its ability to be easily amended and interrogated, so that its value in use is incomparably greater than that of the manually created budget.

Signed: Management Accountant

☑ Solution 3

This question can be answered at varying levels of refinement. However, the preparation of a full answer requires you to draw on all you have learned about accounting.

In particular, you should introduce what you have studied in previous chapters concerning standard costing and variance analysis.

(a) **Memorandum**

To: Management team
From: Management accountant
Date: 21 May 20X7
Re: Format of monthly variance reports

I have recently undertaken a review of the formats used for the monthly variance reports on product performance that are utilised throughout this organisation, and have concluded that as they stand they could well mislead users. The problem is caused largely by the way in which product information is presented, rather than in the information itself, and therefore I have a number of recommendations to make.

1. Volumes and values should be separated, and reported separately to avoid confusion.
2. The report computes variances by comparing financial figures that result from dissimilar volume levels. Volume levels should be the same, to ensure comparability.
3. The percentage variance figures may draw attention away from the absolute impact of each variance, which is illustrated by the monetary value of the variance.
4. No indication is given of the out-turn that would have been expected from the actual level of activity (flexed budget).
5. No controllable fixed costs are included. If such exist, they should be separately identified.
6. Year-to-date information should be shown as well as information for the reporting period.

A more appropriate layout is shown in Appendix A attached.

Appendix A

	Per unit	*Original budget units*	*Flexed budget units*	*Actual units*	*Quantity variance*	*Price variance*	*Total variance*
Sales volume		x	x	x			
Production volume		x	x	x			
	£	£	£	£	£	£	£
Sales	x	x	x	x	x	x	x
Direct material	x	x	x	x	x	x	x
Direct labour	x	x	x	x	x	x	x
Stock adjustment			x	x			
Contribution	x	x	x	x			x
Fixed costs		x	x	x		x	x
Profit		x	x	x			x

An identical layout might also be used for the presentation of year-to-date information.

(b) A standard cost is the cost of an individual product component or operation, whereas a budget is the cost or value associated with a larger organisational unit such as a department. Budgetary control focuses on various techniques in order to control what may be largely negotiated or discretionary cost, whereas standard costing uses work and method study and design engineering to reduce operation times, material requirements and unit costs.

A single organisation may use standard costing to control manufacturing costs, and budgetary control to control the costs of support services and departments such as personnel or marketing.

(c) A database could be used to hold the inputs of information, which may come a different times, and from different sources, and which are held centrally before being input to the variance report. Staff may either input information manually to the database, or it may be picked up automatically from accounting records or production reports, thus saving on time and reducing the risk of error or omission. From the information in the database, the required output can be produced in any format, perhaps by using macros.

✓ Solution 4

(a) Materials cost is variable at £500 per 1 per cent of activity.
Labour cost is variable at £675 per 1 per cent of activity.

Production overhead costs are £10,000 fixed and vary at £600 per 1 per cent of activity. Selling overhead costs are £3,000 fixed and vary at £200 per 1 per cent of activity. Administration overhead costs are fixed.

Budget at 68 per cent activity

	Flexed budget	*Actual*	*Variance*
	£	£	£
Direct material	34,000	33,500	500 Fav
Direct labour	45,900	44,000	1,900 Fav
Production overhead	50,800	46,250	4,550 Fav
Selling overhead	16,600	16,150	450 Fav
Administration overhead	28,000	27,800	200 Fav
	175,300	167,700	7,600 Fav

(b) Budgets show the planned costs and revenues which an organisation expects in a future period. They can be divided into two categories.

Fixed budgets are set before the start of an accounting period, are not susceptible to change, and are used as a plan for the future. Their use is most appropriate where resources have to be tightly controlled, as in cash control.

Fixed budgets may be set before or after the actual performance is known. If they are set after the event, they are set on the basis of the level of activity which was actually undertaken. This allows valid comparison to be made against the costs and revenues which were actually recorded, facilitating operational control. Budget flexing can also be undertaken before activity commences, to show predicted costs/revenues at a number of activity levels (as per the budget working papers). This gives management a prior understanding of the financial consequences of a number of possible activity levels.

The use of flexible budgets is most appropriate where activity levels are likely to change, and a substantial proportion of the costs is variable.

(c) The principal budget factor is a constraint, around which the budget is constructed. In any organisation there will be one area of operations which constrains the ability of the organisation to improve its financial performance. This is frequently sales volume, but it equally may be availability of skilled staff, of processing equipments, of material, etc. The starting point of the budget should be a consideration of the principal budget factor. This acts as a co-ordination device, allowing the budget to be produced in a way which allows the budget of each functional department, or budget centre, to be co-ordinated and linked.

(d) The preparation of a budget requires inputs from a number of different departments, each of which, while working towards the overall objective(s) of the organisation, may have its own particular priorities and interests. The role of the budget committee is to prevent the focus of the organisation from being lost through factors such as inertia, or the pursuit of self-interest on the part of individual managers. The budget committee, therefore, ensures that all proposals which are accepted for inclusion in the budget are co-ordinated and realistic, and further the goals of the organisation, so that the final budget which is approved represents an integrated series of departmental and functional targets achievable by all parties. The members of the budget committee should have sufficient experience and seniority to be able to ensure that the budget targets set are realistic, and should meet regularly to review the budgetary planning process and to resolve problems.

✓ Solution 5

The critical thing to appreciate is that training costs are normally 'discretionary' in character. That is, they do not relate directly to the volume of output or productive activity in the business.

In answering the question you should draw on your full knowledge of business training. What is the full range of activities and practices that might be classified as 'staff training'? Staff training involves both inputs and outputs. The control and evaluation of training costs should relate to both of these. One problem with discretionary costs is that it is sometimes difficult to identify the outputs that flow from them.

(a) *The nature of training costs from a control viewpoint*

From a control viewpoint, training costs are discretionary costs. In other words, management decide what levels of training they wish to achieve and then budget for the expenditures that will be required to achieve those training levels. The decision as to the training levels required is a technical on – the result of training technology and experience – rather than an accounting one. The expenditure budgeted for training reflects that required objective. It is not normally susceptible to changes in volume of output, though it might be to the number of personnel or to the skills or length of service of personnel. Thus, from a control viewpoint, training costs will tend to be substantially fixed.

(b) *Training costs included in a training programme*

These costs would be for:

(i) External courses – Fees, travel, subsistence, expenses, etc.; and
(ii) Internal courses – Space charges for buildings used, e.g. rentals, depreciation on buildings, maintenance and cleaning of buildings, light and heat.
- Depreciation on training equipment used, e.g. overhead projectors, desks, etc.
- Consumables, e.g. paper, flip charts, etc.
- Labour on training staff (direct costs on courses, e.g. internal and external lectures), support administrative staff and managerial training/personnel staff.
- Catering expenses, etc., for students and staff.
- Extra costs or loss of production by employees on courses and away from their normal work.

(c) *Preparation of a training programme report*

The training programme report would consists of:

1. a statement of what the training programme aims to achieve, analysed by different types of training and/or courses;
2. the costs of each type of training activity/course, analysed by types of expenditure as listed in part (b) above. If possible, these would be separated into direct costs per activity/course and other fixed costs incurred for the whole activity;
3. the expected benefits from each type of course/activity.

The advantages of such a report would be that it would:

1. show the net benefits per class of training course/activity;
2. show the assumptions on which benefits from training are calculated;
3. provide an opportunity to compare internal costs with charges by outside organisations that offer training facilities/courses;

4. highlight the relative incremental benefits of each type of course;
5. give an analysis of how the total budget is spent.

(d) *Controlling the performance of the training function*

Control of the training function would arise as indicated in (a) above, that is, by comparing expected benefits with the discretionary costs budgeted and by comparing actual costs with those budgeted.

In evaluating the training function, it would be advisable to try to check on the benefits actually obtained. This might require sample surveys; or 'before and after' surveys on, for example, production levels or reject costs; or post-course surveys, to learn of benefits that students had achieved. There is, nevertheless, a big element of 'faith' in the concept of benefit from training in industry.

☑ Solution 6

This is a discursive question that invites discussion of various behavioural issues associated with financial control systems.

(a) Both the process of establishing a budget, and the use of that budget in the control process, can distort a business operation. To the extent that a budget provides a target and a performance yardstick, failure to achieve budget may be perceived by managers as an indication of poor performance that carries personal sanctions. A manager who fails to achieve budget mauy forgo promotions or salary increases.

A manager has, from the outset, an interest in securing an 'easy' budget. The process of establishing a budget may therefore become an exercise in bargaining and negotiation. The manager is thus distracted from running his department, and the budget that emerges from the process may be more a reflection of the manager's negotiating skills than any sort of objective statement.

Once a budget is established, a manager may be induced to do things that are not in the best interest of the business to ensure that he achieves it. Such things might include declining new business that offers only long-term advantages, or reducing costs in areas (such as quality control) that may have no immediate impact on the manager's own department. It can work the other way, too: a manager may incur unnecessary expenditure in order to ensure that all his budget is used, in order to prevent the next year's budget from being cut back.

(b) The process of budget negotiation may result in a pattern of spending that reflects the internal politics of an organisation and the bargaining position of individual managers. Such a pattern is unlikely to enable the organisation to achieve its objectives in the most cost-effective manner. This is particularly critical in a public sector or service organisation where the nature of output is not always tangible.

Where one departmental manager acts in a manner intended primarily to ensure that his own department achieves current period budget, unnecessary costs can arise in the long run. A cutback in quality control costs may result in more in-service failures of finished goods and lower customer satisfaction. However, the costs associated with these factors may not be attributable to the individual departmental manager.

It is frequently found that control systems linked to periodic reporting can induce cyclical behaviour in a manufacturing organisation. A manager who has a production budget for the quarter may be tempted to organise production in a manner calculated to maximise completions in the current quarter. This may involve splitting one 600-unit production batch into two batches of 300 units, since it is only possible to complete a 300-unit batch in one quarter. This allows current-period budget to be achieved, but it may not be the most economic pattern of production.

(c) As with many things in life, it is not the idea behind budgeting that is the problem, but the way in which it is used.

If a budget is perceived to be a form of sanction and failure to achieve budget is thought to result in punishment, then the likelihood of the sort of problems described above is high.

The personal performance of individual managers should be assessed using a range of indicators, and achievement of budget should be only one of these. In any event, it is particularly critical that performance should be considered over a long period, not merely over the current budget control period.

Solution 7

The question invites comment on a variety of behavioural, quantitative, presentational and IT issues relevant to budgeting and budgetary control.

Note that the question does not actually invite preparation of a flexed budget.

Report

To: Board of directors
From: Management accountant
Date: 5 February 2000
Subject: Budgets and performance measurement

Introduction

Further to our brief discussion I have considered the matters that you have raised and I set out detailed responses below.

(a) (i) *Present approach to budgeting*

As the budgets were 'issued to' the consultants it seems that they were set centrally and imposed on them. As one of the purposes of a budget is to motivate people to improve their performance, care is needed to ensure that the efficiency level of the budget is in line with the consultants' expectations of reasonableness. This is referred to as the *consultants' aspiration level*.

An alternative approach is to encourage the consultants to participate in the budget-setting process. This should lead to the creation of a target that is accepted by the consultants as being *their own* target. The consultants are motivated to achieve their own target, or feel that they have failed personally.

The danger of allowing consultants to participate in the budget-setting process is that they may try to set an 'easy' target, particularly if their performance is being measured against it. The inclusion of budgetary slack by the consultants can be difficult to remove once it has been included in a draft budget.

(ii) *Format of the operating statement*

The operating statement identifies those costs that are fixed and variable in relation to chargeable consultancy hours. However, no attempt is made in the statement to determine the costs that would be expected in respect of the *actual* chargeable consultancy hours.

The variable costs should be flexed to the actual activity level and the variances recalculated, with indications as to whether the variances are adverse or favourable.

Further, the report should identify the controllable costs so that the consultants' attention is focused towards these variances so that, if they are significant, action is taken.

(b) A spreadsheet could be set up as follows to automate the variance calculation process.

Column headings: original budget, flexed budget, actual, variance.
Row headings: chargeable consultancy hours, costs (by item of cost).

A possible layout is shown below.

	Original budget	Flexed budget	Actual	Variance
Chargeable consultancy hours				
Administration staff salaries				
Consultants' salaries				
Casual wages				
Motor and travel costs				
Telephone				
Printing, postage and stationery				
Premises and equipment costs				
Total costs				
Fees charged				
Profit/(loss)				

A separate input area within the spreadsheet can be used to hold budget cost data expressed as a rate per consultancy hour, budget hours and actual hours. This can be used to produce the budget column above and also to provide the basis for the flexible budget. An alternative is to input the budget data and then to insert formulae to flex the original budget variable cost values by multiplying them by:

$$\frac{\text{Actual chargeable consultancy hours}}{\text{Original budget chargeable consultancy hours}}$$

to determine the total expected variable cost of the actual activity. This is added to the budgeted fixed cost (which is not expected to change in relation to activity-level changes). This gives the flexible budget.

Actual costs are then inserted into the spreadsheet, and other formulae are input in order to compare actual costs with the flexible budget, thus determining the variances.

Solution 8

(a) Cost driver rates:

$$W \quad \frac{£160{,}000}{(20 \times 4) + (30 \times 5) + (15 \times 2) + (40 \times 3) + (25 \times 1)} = £395$$

$$X \quad \frac{£130{,}000}{(20 \times 3) + (30 \times 2) + (15 \times 5) + (40 \times 1) + (25 \times 4)} = £388$$

$$Y \quad \frac{£80{,}000}{(20 \times 3) + (30 \times 3) + (15 \times 2) + (40 \times 4) + (25 \times 2)} = £205$$

$$Z \quad \frac{£200{,}000}{(20 \times 4) + (30 \times 6) + (15 \times 8) + (40 \times 2) + (25 \times 3)} = £374$$

Actual activities during October 2002:

W $(18 \times 4) + (33 \times 5) + (16 \times 2) + (35 \times 3) + (28 \times 1) = 402$
X $(18 \times 3) + (33 \times 2) + (16 \times 5) + (35 \times 1) + (28 \times 4) = 347$
Y $(18 \times 3) + (33 \times 3) + (16 \times 2) + (35 \times 4) + (28 \times 2) = 381$
Z $(18 \times 4) + (33 \times 6) + (16 \times 8) + (35 \times 2) + (28 \times 3) = 552$

Budgetary control statement

Processing activity	*Original budget*	*Flexible budget*	*Actual costs*	*Variance*
	£000	*£000*	*£000*	*£000*
W	160	159	158	1 (F)
X	130	135	139	4 (A)
Y	80	78	73	5 (F)
Z	200	206	206	0
Totals	570	578	576	2 (F)

(b) It might be preferable for Managers not to be involved in setting their own budgets because:

budgetary slack is avoided, and more appropriate targets produced;
they cannot use budgets to play games which disadvantage other budget holders;
they may not have sufficient time available to devote to the budgeting process because of other pressures and thus the budgets that they prepare are rushed and inappropriate;
they may have little knowledge of budgeting and be unprepared for such a task.

(c) (i) A fixed budget is a budget based upon a single level of activity, whereas a flexible budget recognises the relationships between costs and activity and allows target costs to be determined for the actual level of activity achieved.

Where costs are caused by activity, a flexible budget provides a fairer basis of comparison with actual results than a fixed budget. Fixed budgets should be used to control discretionary costs within AHW plc.

(ii) *Research* and *Advertising*. Since these costs are not directly related to activity, they should both be controlled against a pre-set expenditure limit, which is a form of fixed budget.

(d) The terms in the equation mean:

y = total cost of the period;
a = variable cost/unit of activity;
x = activity level of the period;
b = period fixed cost.

This Page Intentionally Left Blank

7 Budgeting and Performance Evaluation

Learning Outcomes

When you have completed study of this chapter you will be able to:

- evaluate projected performance by calculating key metrics including profitability, liquidity and asset turnover ratios;
- discuss the role of non-financial performance indicators and compare and contrast traditional approaches to budgeting with recommendations based on the 'balanced scorecard';
- evaluate the criticisms of budgeting particularly from the advocates of techniques that are 'beyond budgeting'.

7.1 Introduction

In the previous two chapters, we have explored the budgeting concept and the manner in which budgets can be used to plan and control the operations of an organisation. We have also encountered the criticisms that have been levelled at the use of budgets, having particular regard to changes in the economic and business environment that may have limited the usefulness of more traditional budget practices.

> The gravitational force of the budgeting system makes it extremely difficult for most firms to escape the world of compliance and control. Only by overcoming the constraints of the traditional budgeting approach can managers build a business model that operates at high speed; is self-questioning, self-renewing and self-controlling.
>
> J. Hope & R. Fraser, Beyond Budgeting (Strategic Finance, October 2000)
> (*Note:* Most of the article is included as a Reading item in Chapter 6)

In this chapter, we will consider the manner in which the performance of a business, organisation or function may be evaluated. In doing this we will have regard to both budget figures, actual results and innovative approaches which fall under the heading of 'beyond budgeting'.

7.2 Performance evaluation

The manner in which analysis of published financial reports can be used to evaluate performance is explored fully in CIMA's Paper P8 Financial Analysis. Many of the techniques encountered therein can also be deployed in the review of budgets and internal financial control reports. However, the analyst should be aware that the preparation of budgets and internal reports may be less constrained by accounting standards and statutory requirements than is the case with published reports.

With that caveat, let us consider the key metrics used in performance evaluation. These can be applied to both budgets to give a measure of projected performance and actual reported results. Bear in mind that we may be considering the performance of individual organisational segments as well as a whole business or organisation.

7.2.1 The profit and loss account

(a) Turnover

An understanding of the profitability of the business could start with a review of turnover. Turnover is important in both absolute and relative terms. Increases or decreases in sales may be attributable to changes in selling prices or sales volume, or a combination of both.

Turnover of a business may be varied in nature. There may be seasonal differences, many products or segments, and different product mixes.

Understanding the reasons for movements in the level and structure of turnover may explain why performance has improved or worsened in the past and give us insights as to what might happen in the future.

(b) Profitability

There are a number of profit figures appearing in the profit and loss account. Each may be used to evaluate the profitability of the business.

Gross profit margin: Gross profit/Turnover

Factors relevant to an appreciation of the gross profit margin may include:

breakdown by product, geographical area or other segment;
purchase details such as bulk discounts, purchasing errors, wastage or theft;
selling prices of products over the period.

Operating profit margin: Operating profit/Turnover

Factors relevant to an appreciation of the operating profit margin may include:

the manner in which overheads are distributed between products and organisational segments;
the technology used by an organisation which determines the relative proportion of its costs chargeable to gross and operating profit.

Net profit is rather less useful than gross or operating profit for the purposes of performance evaluation. Net profit is profit after deduction of finance costs and these are influenced by decisions which do not relate to the economic performance of the business.

(c) Elements of cost

Individual elements of cost may be reported, for example:

telephone cost ratio = telephone costs/sales;
Advertising cost ratio = advertising costs/sales.

7.2.2 Return on capital employed

The overall performance of a business operation depends on the operating profit that it is generating relative to the value of the capital engaged in achieving that profit. The simplest measure of this is return on capital employed, as shown below.

Operating profit/capital employed.

Capital employed is the book value of the Net Assets employed by the business or business segment that is under review. The term return on investment (RoI) is often used almost interchangeably with ROCE. However, the term RoI is more commonly applied to the performance of a project rather than a business.

We will encounter ROCE and its variants when we consider detailed aspects of responsibility centre accounting in Chapter 9.

7.2.3 Asset turnover

The asset turnover shows the amount of turnover the business generates relative to the capital it employs.

Asset turnover = Turnover/capital employed

This metric gives an impression of the efficiency with which capital is being used. Obviously, it contributes to overall performance as measured by ROCE, since:

Operating profit margin × Asset turnover = ROCE

If asset turnover can be raised then ROCE will also rise.

One may consider the efficiency with which individual components of Assets are being used. For example:

Stock days = (Stock held/purchases) × 365
Debtor days = (Debtor balance/sales) × 365

These figures give the average number of days trade held in the form of stock and debtors – the working capital of the business. The lower these figures are then the higher is ROCE. One wishes to operate a business with the lowest possible levels of stock and debtors. That said, these working capital items are assets which do contribute to the operating profit of the business.

Factors that one might consider in obtaining an appreciation of the various aspects of asset turnover include:

stock holding policy having regard to the calculation of optimum stock holding levels, just-in-time production strategies or commercial initiatives that have stock holding implications;
credit sales policy, having regard to the fact that sales on credit terms might be made at enhanced prices;
the technology that is being used having regard to the fact that one may operate a labour intensive production operation as the alternative to holding high capital assets.

The mirror image of asset turnover is liability turnover. The main example of this is:

Creditor days = Creditor balance/purchases $\times$ 365

This figure reports the average time the business takes to pay its suppliers. In theory, keeping this figure high will increase ROCE – but at the possible cost of damage to supplier relationships.

7.2.4 Liquidity

While not central to the aspects of performance evaluation we are considering, liquidity is another aspect of management that might be considered. Liquidity, as broad concept, refers to the manner in which cash is circulated through the business – and it should not be confused with 'solvency' which is a legal consideration.

There are several metrics which may be used to measure liquidity and these include:

Current (or 'liquidity') ratio = Current assets/current liabilities
Cash conversion period = Stock days + debtor days − creditor days

In considering these metrics it will be appreciated that the lower they are then the higher will be ROCE. On the other hand, very low values for these metrics may imply some difficulty in meeting financial obligations as they become due.

Management of working capital is one area of administration that contributes to the performance of a business operation. If the business can be run in a manner that allows its CCP to be kept low then this will keep Capital Employed low and minimise operating costs relating to the holding of stock and debtors.

7.3 Exercise

Let us explore the use of the metrics specified above through use of a simple exercise.

Exercise

In early 2004 your client has been requested to sell a large volume of goods on extended credit terms to a potential new customer called GHI Ltd, which has been trading for three years. GHI is a wholesaler and most of its business costs are purchases. Your client has expressed some doubts about the financial stability of GHI and has asked for your advice.

You have obtained copies of the two most recent sets of GHI's audited accounts which are summarised as follows:

All figures in £'000	*2002*	*2003*
Equipment net of depreciation	1,200	1,100
Premises	800	450
Stock	280	540
Debtors	160	490
Cash/(Overdraft)	80	(90)
Creditors	(140)	(390)
Net Assets	2,380	2,100
Share Capital	800	800
Loan from Directors	1,100	700
Cumulative Retained Profits	480	600
Capital	2,380	2,100
Turnover (Sales)	2,400	2,900
Operating Profit	160	210
Dividends Paid	40	90

The Managing Director of GHI has made the followings statement to your client:

GHI has a consistent history of profitability. We are investing in the future of the company and this has strained our cash flow position. However, GHI is poised for growth and our acceptance of you as a supplier will be an opportunity for you to participate in our inevitable success.

Requirements

(a) Calculate the following business metrics for GHI in 2002 and 2003 – return on capital employed, profit margin on sales, liquidity (or current) ratio, debtor days, stock days, creditor days and cash conversion period.

(b) Critically appraise the Managing Director's comment quoted above and advise your client on whether or not he/she should extend significant amounts of credit to GHI.

✓ Solution

(a) GHI Ltd – key business metrics

	2002	*2003*
ROCE	6.7%	10.0%
Profit margin	6.7%	7.2%
Liquidity	3.7	2.1
Debtor days	24	62
Stock days	46	73
Creditor days	23	53
CCP	47	82

Most of the figures given above are fairly obvious. But some imagination is required in certain cases. For example, in calculating stock days and creditor days one needs to know 'purchases' – a figure which is not given. What we can do in this case is adopt operating costs as a proxy for purchases. Operating costs is sales minus operating profit. We are told that most business costs are purchases so the resultant stock and creditor days figures are meaningful and allow a clear inter-period comparison.

For example, Stock days for 2002 is:

$$(280/(2{,}400 - 160)) \times 365 = 46 \text{ days}$$

that is, end 2002 Stock balance divided by 2002 operating costs. Note that our stock and creditor days positions for 2003 are both based on end 2003 balances. One could argue that it would be more appropriate to base these figures on an average of end 2002 and end 2003 balances. The argument against such an averaging is that the end 2002 balance is old history, and what was happening at end 2003 is far more current.

(b) The performance of this business appears to have been both respectable and improving having regard to both ROCE and profit margin. Those are the key performance metrics, but they do not tell the whole story. The asset turnover and liquidity position of the business has changed in a manner that should prompt some serious questions:

Stock days has risen dramatically. Why has this happened? Does the extra stock really exist and how has it been valued?

Debtor days has risen dramatically. Why has this happened? Do the extra debtors actually exist and what is the chance of bad debts arising?

Creditor days has risen dramatically. Why has this happened? Are suppliers continuing to make deliveries as normal?

That apart, there is clear evidence of assets being stripped out of the business by its owners. Property has been sold, a director loan partly repaid and dividends have been increased. These may not impact immediately on the key performance metrics – which are essentially 'backward looking' measures reporting only what has happened over a short period in the immediate past. But what is happening suggests a clear lack of commitment on the part of its directors that might impact on performance in the longer term.

To form a fuller evaluation of performance one would need to obtain a range of forward looking indicators – linked to things like market share, quality of service, response time to customer orders, proportion of customer repeat business being achieved, staff turnover and relationships with suppliers. These are considered in the discussion of non-financial performance indicators below.

7.4 Understanding the business

It is sometimes considered that financial analysis involves the direct application of a routine set of numerical calculations to a set of financial reports. This is only one part of the task. In order to interpret those calculations it is important to understand the relationships between the data and the underlying reasons for the current situation.

Financial analysis requires an understanding of the products, services and operating characteristics of the business. The business operates within an industry consisting of businesses with similar operating characteristics. If the analysis invites comparison of the business with the industry norms, it is important to identify the key characteristics of the industry and so establish benchmarks such as gross profit ratios, debtor collection days, etc.

However, one should exercise care in evaluating performance on the basis of comparison with industry 'benchmarks' (a concept introduced in Chapter 2). No two businesses are the same and one can never be sure that one is comparing likes. For one thing, ROCE and related metrics tend to move with the plant replacement cycle. A business with old, heavily-depreciated equipment is likely to report a higher ROCE than one with new equipment. But this does not imply that the former is performing better than the latter in a strictly economic sense.

7.5 Reporting a performance evaluation

Broadly, the following approaches to reporting an evaluation are possible.

(a) Horizontal analysis

Horizontal analysis involves a line-by-line comparison of one set of data with another (e.g. the current year's accounts with those of the previous year or with budgets). Identifying the percentage movements in this way can reveal indicators of the performance of the business, but more importantly, it can prompt further lines of enquiry. We have seen examples of this at several point earlier in this text.

(b) Trend analysis

Trend analysis is horizontal analysis extended over several years. The GHI example considered above involves use of a form of trend analysis. The most significant observations were drawn from consideration of the movement in metrics between 2002 and 2003.

(c) Vertical analysis

Vertical analysis involves expressing the data as a percentage of a critical component of the financial statements. Components of the balance sheet are usually expressed as a percentage of total assets. The profit and loss account items are usually expressed as a percentage of total sales. This type of analysis can give important clues as to the financial condition and operations of the business. For example, a company may maintain a high percentage of assets in cash, stocks or debtors in order to increase its liquidity.

The reporting of a performance evaluation can be carried out for a whole business or for individual segments of a business. In this context your attention is drawn to the discussion of budget centres and responsibility centres elsewhere in this text. Budgets should be assembled and results reported in a manner that is consistent with the organisational structure. This allows the performance of individual responsibility areas to be budgeted for and then evaluated.

Let us consider the following simple financial control report:

Light manufacturing division:

Operating statement for September 2004

	£'000	*units*	*£ per unit*	*% Sales*
Sales	450	1,200	0.375	100
Costs:				
Materials	120		0.100	27
Labour	240		0.200	53
Overheads	40		0.033	9
Total	400		0.333	89
Profit	50		0.042	11

Is a material cost of £120,000 good or bad? In itself, the figure tells you very little. But if you express it relative to something else then it takes on more meaning. When expressed as £0.10 per unit or as 27% of Sales value then one gets a clearer idea of what is involved.

If you are told that the corresponding figures for materials £ per unit were £0.08 per unit in 9/03 and £0.07 per unit in 9/02 – then you get a much clearer view of how performance is moving. If you are told that the light manufacturing industry average materials £ per unit is £0.09 – then you get still more insights into what is happening.

One key thing to be aware of is that consideration of a given figure or performance metric may tell you little when considered in isolation. It becomes most meaningful only when set in some context – compared with previous years results to reveal a trend, compared with budget to reveal a divergence from plan or compared with an industry benchmark to reveal a departure from the norm. Even then, caution should be exercised in drawing conclusions too easily.

7.6 Non-financial performance indicators

The use of traditional financial performance metrics is widespread, but the practice has its problems. For example:

- They only tell you what has happened over a limited period in the immediate past.
- They give you no indication of what is going to happen in the future.
- They are vulnerable to manipulation and to the choice of accounting policy on matters such as depreciation and stock valuation.
- They do not relate to the strategic management of the business and may induce 'short-termism' – an issue explored further in Chapter 9.

So, if we wish to obtain a fuller evaluation of performance then we have to turn to a range of NFPIs.

Certain academic writers have developed models of performance evaluation for strategic advantage and these are considered more fully in CIMA's Paper P6 Business Strategy. The general thrust behind these is that performance indicators should be developed that relate to the long-term strategic development of the organisation.

This follows the principle advocated by management guru/writer Tom Peters:

What gets measured gets done.

The performance indicators adopted for a given business or business segment should relate to its key success factors – those things that are most likely to determine its success or failure. NFPIs can be expressed in either quantitative and qualitative terms. For example, it might be reported that we have a 5% market share (a quantitative measure) and we are first supplier of preference to almost all our established customers (a qualitative measure).

Let us consider a number of NFPIs, how they might be expressed and relevant information relating to them might be gathered.

(a) *Competitiveness:*
 sales growth by product or service,
 size of customer base,
 market share by product, service or customer group.
 Regular market surveys drawing both on internal and external sources of information can be used to compile reports.

(b) *Activity level:*
 number of Units sold,
 labour and machine hours worked,
 number of passengers carried,
 number of overdue debts collected.
 Relevant information could be drawn mainly from internal sources, with appropriate checks to ensure accuracy.

(c) *Productivity:*
 manufacturing cost per Unit produced,
 capacity utilisation of facilities and personnel,
 average number of Units produced per day or per man-day
 average setting up time for new production run.
 Again, most of this information could be drawn from internal sources.

(d) *Quality of service:*
 number of Units rejected in manufacturing,
 number of Units failing in service,
 number of visits by representatives to customer premises,
 number of new accounts gained or lost,
 number of repeat customer orders received.
 Again, most relevant information would be available from internal sources but this could be reinforced by periodic customer surveys.

(e) *Customer satisfaction:*
 average time taken to respond to customer enquiry or order,
 expressed customer satisfaction with sales staff,
 expressed customer satisfaction with technical representatives,
 number of customer complaints received.

Relevant information would have to come mainly from customer surveys although some internal sources could be selectively used. Customer surveys can be carried out on a regular structured basis or on an occasional informal basis. If a sample of customers is being used to compile information then care has to be taken that the sample is significant in size and representative in structure.

(f) *Quality of staff experience:*
days absence per week,
staff turnover rate,
number of new qualifications/courses completed by staff,
number of new staff skills certified,
expressed job satisfaction,
qualification levels of newly recruited staff.

Some information could be taken from internal sources but much would have to come from colleges and external trainers. Exit interviews and confidential staff opinion surveys could also be used.

(g) *Innovation:*
number of new products or services brought to market,
proportion of Sales relating to new products,
technical lead relative to competitors,
lead time to bring new products to market.

This kind of information would have to be taken from a variety of internal and external sources. The slightly subjective nature of what constitutes a 'new product' is such that this may be an area where an external assessor or consultant might be used to prepare the report.

These sort of performance indicators have the advantage of being 'forward looking'. That is, they are likely to address factors that relate to how well or badly the business will perform in the future.

For example, a service business with a high staff turnover rate is at a disadvantage. If experienced and qualified staff are constantly leaving and being replaced, then this may not contribute to the quality of service being offered to customers. We have all experienced visits to a shop, travel agent or garage where we have been served by an inexperienced and obviously new member of staff – who is unfamiliar with our account history and appears to have limited knowledge of the products that he/she is trying to sell. We find it much more satisfactory to be served by an experienced member of staff who knows his/her customers and products.

Yet, a deterioration in the standard of staff being employed (as evidenced by the indicators listed above under quality of staff experience) would not impact greatly on current period ROCE. A focus on current ROCE might actually induce a business to make greater use of poorly-paid, junior staff in order to minimise operating costs. The impact of this on the business might be felt only in the long term.

As with any performance indicator, an NFPI has to be viewed in some context in order to be most meaningful. A good control report will express indicators in terms of a deviation from plan, relative to an industry benchmark or as part of a trend analysis covering comparable earlier periods.

Further, it is best to consider performance indicators as part of a package giving a multi-dimensional impression of how the organisation is performing.

Example

One example of the use of NFPIs frequently reported in management literature is that of BAA plc (formerly the British Airports Authority). This is the case of a service company that attempts to evaluate its own performance in terms of the quality it is able to offer to customers.

It has identified about 12 key success factors which include access, aesthetics, cleanliness, comfort, staff competence, staff courtesy, reliability, responsiveness and security. These take on board the factors that customers appreciate when using an airport – short distances to walk from point of arrival to point of departure, safety from attack or robbery, easy availability of luggage trolleys and wheel chairs, etc.

BAA carries out regular surveys involving interviews with customers, consultant reports, analysis of operational data, and monitoring customer feedback. Appropriate indicators for each factor are reported and studied through comparison between different airports and trend analysis over time. For example, if airport A persistently reports a higher level of theft from customers than other airports – then this might prompt the introduction of additional security measures at airport A. If complaints about staff courtesy at airport D have been on a persistent upward trend over time, then this might prompt enquiries into staff supervision at that site and/or additional staff training.

A customer survey might include a question as follows:

'Your impression of the service available in the cafeterias at Airport B is best described as:

(A) Most satisfactory,
(B) Satisfactory,
(C) Acceptable,
(D) Less than acceptable,
(E) Unsatisfactory'.

Answering this involves a qualitative judgement on the part of the customer, but the survey results can be reported and evaluated in quantitative terms. For example, if 80% of customers offered A or B answers to this question then the impression given is that the standard of service at Airport B cafeterias is not a problem – and it may even serve as a model of best practice for other airports.

This line of discussion leads us into the more modern models of performance evaluation which fall broadly under the 'Beyond Budgeting' heading encountered in Chapter 6.

7.7 Benchmarking

It is often found that performance is difficult to compare by a simple comparison of actual and budget profit. A variety of refinements have therefore been developed to assist in the establishment of business plans and in monitoring the achievement of those plans.

The term 'benchmarking' has become associated with a growing desire by companies to seek out the best available performance, internal or external, as a comparator ('benchmark') against which to measure their own performance. We have already encountered the term in Chapter 1 in the context of standard costing. The standard cost of a product or activity is a form of benchmark. However, it is conventionally arrived at through a work study exercise which is internal to the process being managed. Some argue that the standard cost concept offers a very limited form of benchmark and a wider view should be taken. The *Official Terminology* defines it as:

Benchmarking. The establishment, through data gathering, of targets and comparators, through whose use relative levels of performance (and particularly areas of underperformance) can be identified. By the adoption of identified best practices it is hoped that performance will improve.

The data-gathering exercise referred to in the definition is not necessarily an easy one: obtaining the information required in order to benchmark against competitors in non-financial areas can be problematic. Financial information is much more readily available than non-financial information. Obviously, non-financial information about competitors' products can be obtained by 'reverse engineering' them (i.e. buying a competitor's products and dismantling them, in order to understand their content and configuration), and from product literature, trade associations and press comment. However, the product is the end result of the *processes* that a business follows, and thus effective benchmarking required an understanding of the processes of other businesses. Getting information about their processes is much more difficult than getting information about their products. For example, how do competitors process customer orders, deal with customer enquiries, conduct their relationships with suppliers? The need to gain an understanding of business processes in other companies has given rise to two types of 'benchmarking': intra-group and inter-industry.

With intra-group benchmarking, groups of companies in the same industry agree that similar units within the co-operating companies will pool data on their processes. The processes are benchmarked against each other, and, at an operational level, 'improvement task forces' are established to identify and transfer 'best practice' to all members of the group. In inter-industry benchmarking, a non-competing business with similar processes is identified and asked to participate in a benchmarking exercise. For example, a distributor of personal computers may approach a distributor of hi-fi equipment to establish a benchmarking relationship. The two companies are not in direct competition, but there are obviously many similarities in the characteristics of their sources of supply, distribution channels and customers. There are benefits to both participants in such a scheme, as they are each able to benefit from the experience of the other, and establish 'best practice' in their common business processes.

Almost any aspect of a manufacturing or service operation can be benchmarked. For example, benchmarking is now quite widely used in the public sector. Local authorities may exchange data on matters such as cost per km of roadway maintained, cost per primary school pupil in education, cost per ton of refuse collected and so on. Benchmarking against non-local authorities may also be useful. An insurance company may provide a useful benchmark (cost per sq. metre of office space maintained, cost per customer enquiry processed) which a local authority may use to measure the performance of its office functions.

Benchmarking exercises may be undertaken as one-off projects in particular areas or on a continuing basis. Where an adverse discrepancy is identified between an own performance indicator and that of the benchmark reference then this may indicate an area for improvement. That said, it may simply indicate a difference of circumstances. For example 'cost per primary school pupil in education' will be higher than average for a local authority which has a high proportion of special needs pupils on its books. Similarly, lower than average 'cost per ton of sewage disposed of' does not reflect a more efficient operation if it is achieved simply by pumping raw sewage into the sea off a local beach. As with all forms of business control system, a degree of sensitivity is required in the manner in which benchmarks are selected and the manner in which the resultant comparisons are interpreted.

The motivation for collaborating with other companies in a benchmarking exercise is clear: it enables a company to improve its performance by learning from the experience of others. Obviously, there is a danger in intra-group benchmarking that competitors may gain more from the process than one's own firm, and this is an issue that will be of concern to management. However, this concern may be tempered by the knowledge that yet other competitors are outside the system. Nevertheless, the attraction of inter-industry benchmarking in providing less of a direct commercial threat is obvious.

7.8 The balanced scorecard

Actions that are taken to improve the economic performance of a business do not always lead to an improvement in short-term financial performance, and may actually lead to a deterioration in this performance. For example, increased spending on product development may lead to enhanced product innovation, but there will invariably be a time lag between the expenditure and the financial rewards expected to follow from it. Similarly, reducing the lead time from receipt of a customer order to the delivery of the product will have positive outcomes in terms of increased customer satisfaction and a likely reduction in the level of stocks held in the company. However, financial accounting requires stocks to be valued at full absorption cost; under this convention, a decline in stockholding is associated with a reduction in reported profit, which, in isolation, would be seen as a negative outcome. Such examples illustrate the importance of ensuring that information that is passed up the organisation from operating units contains sufficient non-financial information for management to assess the financial results of the subunits in the correct context. It is similarly important that the measures are such that employees are encouraged to take actions that are consistent with long-run profitability: the old maxim 'what gets measured gets attention' remains true.

The inclusion of non-financial information alongside financial information has become known as the 'balanced scorecard approach' associated with writings by Kaplan and Norton. The *Official Terminology* defines it as:

Balanced scorecard approach. An approach to the provision of information to management to assist strategic policy formulation and achievement. It emphasises the need to provide the user with a set of information which addresses all relevant areas of performance in an objective and unbiased fashion. . . .

The contents of a balanced scorecard will vary from business to business, but most include the following measures; *profitability* – the 'financial perspective'; *customer satisfaction* – the 'customer perspective'; *innovation* – the 'innovation and learning perspective'; and *internal efficiency* – the 'internal business perspective'. An example of the types of measures used to assess performance under the four 'perspectives' just listed is provided by *Kaplan and Norton*. The firm to which their measures relate is a semiconductor company, and they are reproduced in the form of Figure 7.1.

By providing all this information in a single report, management is able to assess the impact of particular actions on all perspectives of the company's activities.

Determining the specific items to include in a balanced scorecard requires a business to examine its operation carefully, in order to address the following three questions:

1. What are the critical success factors?
2. What performance measures can be used to monitor attainment against the critical success factors?
3. What changes must be made to organisational processes in order to facilitate the improvement of performance against the critical success factors?

As changes take place in its market, so the critical success factors of a business may change. The questions listed above must thus be regularly revisited, illustrating yet again the dynamism of the modern business environment, and the importance of ensuring that information is provided that gives a clear indication of the actions that are required to deal with environmental turbulence.

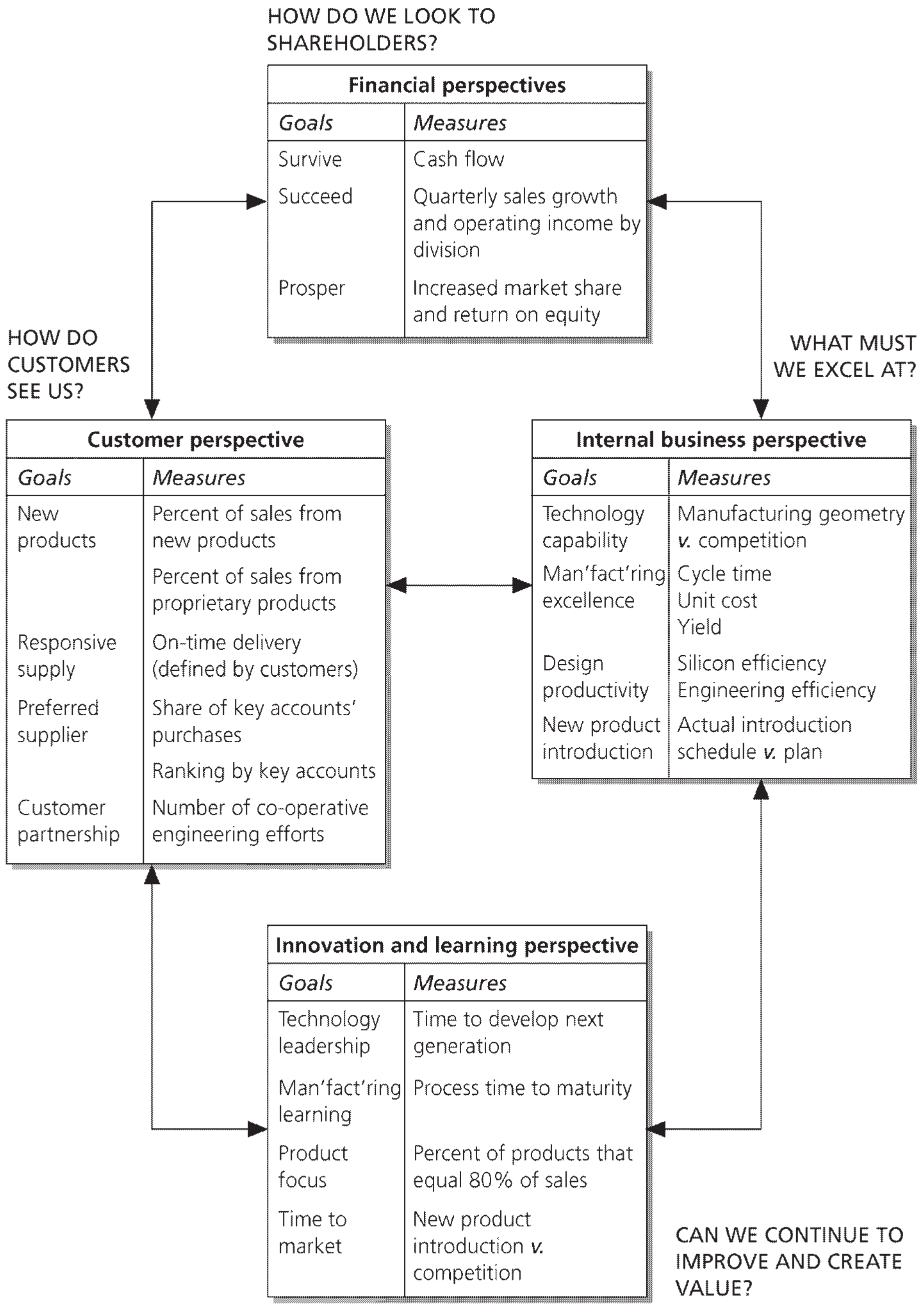


Figure 7.1 The balanced scorecard

7.9 Performance evaluation in the not-for-profit sector

The special characteristics of performance in the NFP sector were discussed in *'Efficiency and Effectiveness in the Not for Profit Sector'*, one of the Readings items in Chapter 5. The central issue is that an NFP organisation exists to achieve certain objectives and an evaluation of its performance in achieving those objectives must have regard to a combination of efficiency and effectiveness factors. The organisation should achieve the maximum output from the resources at its disposal (efficiency) and at the same time it should organise those resources in a manner that achieves a given result by the cheapest route (effectiveness).

Many of the performance indicators considered above can be applied to NFPs. For example, in evaluating the performance of a local authority one might consider:

cost per km of road maintained,
cost per child in school,
cost per square metre of grass verge mown,
cost per tonne of sewage disposed of.

These are all quantitative measures and care should be taken in their interpretation. For example, town A' s sewage disposal cost might be half that of town B. Does that mean that A is more efficient than B? Not necessarily, because A might be pumping raw sewage direct into the sea whereas B treats sewage and transports it for disposal. If A is a resort town then its 'efficiency' in disposing of sewage might have a variety of adverse knock-on effects. In considering performance one has to consider qualitative factors. A variety of qualitative indicators might also be considered in tandem with the quantitative ones listed above:

number of claims made by motorists arising from pot holed roads,
number of local children obtaining 2 A level GCEs or equivalent,
rating of local road system by the Automobile Association,
number of complaints from visitors concerning smell/taste of sea water.

Benchmarking is probably the most important recent innovation in performance evaluation in the NFP sector. The standard benchmarking practice can be used:

study processes in the organisation and select which are to be benchmarked,
secure suitable benchmark partners,
compare appropriate figures and indicators with partners,
adopt and implement 'best practices'.

A benchmark partner for one local authority need not necessarily be another local authority. For example, if the activity being benchmarked is 'office costs' then one could benchmark against an insurance company or a mail order company. However, while such benchmark partners might give a local authority an idea about its efficiency in certain areas, they would offer little guidance on effectiveness. If the authority is seeking guidance on the appropriate combination of spend on police, social services, housing etc in order to provide a certain level of welfare for elderly residents, (a quest for effectiveness) then the appropriate benchmark partners would have to be other authorities providing a similar service.

In the UK, benchmarking and its associated concept of 'best practice' are now widely used in public sector performance evaluation. The Department of the Environment rates all local authorities on the basis of periodic reviews. The use of appropriate performance indicators are a central element in these reviews. Such indicators have regard to both quantitative and qualitative factors.

As with all performance evaluation exercises, it must be appreciated that the calculation of a particular indicator will probably mean little unless it is set in some sort of context. Calculating the value of a particular indicator at 7.2 means little until it is compared with a budget, set in a trend or set against a best practice benchmark.

One final comment in this area should be made. You are reminded of the Peter principle – '*What gets measured gets done*'. If a performance evaluation is based on an incorrect or incomplete range of metrics, then the system can induce the wrong things to get done. For example, in the late 90s the performance of hospitals was judged on the length of their waiting lists. Specifically, the average time taken for a referred patient to have a first consultation was adopted as a key performance indicator. It is claimed that this induced hospitals to concentrate on patients with minor illnesses since they could be treated quickly and cleared off the list. The small number of patients requiring major treatments often had to wait longer than was the case before the performance indicator was adopted.

Hospital waiting lists were reduced, but not in a wholly neutral manner. Some people gained and some lost as a result of the system. That was never the intention.

7.10 Summary

In this chapter we have considered various aspects of performance evaluation and have seen the limitations of the more traditional methods linked to simple financial metrics and budget compliance. Much of material covered in the previous chapter is also relevant in this regard.

We have then proceeded to consider the more modern models of performance evaluation associated with Benchmarking and the Balance Scorecard. These techniques coupled with NFPIs are associated with the Beyond Budgeting concept. It is suggested that these ideas are better attuned to the modern economic environment than the more traditional approaches.

In this and the preceding two chapters we have explored the nature of budgeting and its role in business planning, business control and performance evaluation. We have seen how the general idea works and what its limitations are.

This Page Intentionally Left Blank

Reading 7

There is a substantial body of writing on general budgeting and performance management topics. The following extract gives a flavour of this.

Applying the balanced scorecard to small companies (extract)

Management Accounting **(USA), August 1997**

Reproduced by permission of the Institute of Management Accountants, Montvale, NJ, www.imanet.org

What is the balanced scorecard?

Essentially, the Balanced Scorecard is a set of financial and nonfinancial measures relating to a company's critical success factors. What is innovative about that concept is that the components of the scorecard are designed in an integraive fashion such that they reinforce each other in indicating both the current and future prospects of the company. More than others, Kaplan and Norton probably deserve much of the credit for elucidating and increasing the awareness of this concept.[1]

When Kaplan and Norton introduced the concept of the Balanced Scorecard they were looking for ways to concentrate corporate focus on performance measurement innovation. This focus was considered necessary because traditional management reporting systems have been found to be not much help in measuring performance in the new manufacturing environment. While these backward-looking 'task' or 'cost object' oriented measurement systems generated financial results for numerous organisational units including results by entity, line of business, cost centres, and profit centres, they failed to supply the information necessary to pull strong future performance out of the organisation.

Today's managers know that yesterday's accounting results tell little about what actually can help grow market share and profits – things like employee development and turnover, innovative services that enhance customer values, the quality of vendor services, and benefits from advancements in research and development. A key advantage of the Balanced Scorecard is that it puts strategy, structure, and vision at the centre of management's focus.

Another advantage is that because the Balanced Scorecard emphasises an integrated combination of traditional and nontraditional performance measures, it keeps management focused on the entire business process and helps ensure that actual current operating performance is in line with long-term strategy and customer values. In so doing, the Balanced Scorecard helps maintain a balance between building long-range competitive abilities and recognising investors' attention to financial reports. To this extent the Balanced Scorecard does retain traditional financial measures. But these financial measures are viewed in the larger context of the company's competitive strategies for creating 'future value through investment in customers, suppliers, employees, processes, technology, and innovation'.[2]

Because of the way the Balanced Scorecard aids in successful restructuring by linking together all subunits and members in a concerted effort to enhance the overall goals and objectives of the organisation, many leading-edge companies have begun to adopt this new approach. For example, in late 1989, Bank of Montreal's 'corporate performance was heading downhill fast.' Chairman and Chief Executive Officer Mathew Barrett and his team, deciding that 'a successful turnaround strategy had to include a new approach to performance measurement,' used the Balanced Scorecard to help solve the company's problems. A partial list of other adopters includes KPMG Peat Marwick, Tenneco, Allstate, AT&T, and Elf Atochem.[3]

Major components of a balanced scorecard

A well-designed Balanced Scorecard combines financial measures of past performance with measures of the firm's drivers of future performance. The specific objectives and measures of an organisation's Balanced Scorecard are derived from the firm's vision and strategy. As such, the relevant perspectives and their relative importance can be expected to vary among firms. There is some agreement, however, that the framework for a Balanced Scorecard will include at least four major perspectives: financial, customer, internal business process, and learning and growth (Figure 1).

The financial perspective serves as the focus for the objectives and measures in the other scorecard perspectives. This perspective reflects the concern in for-profit enterprises that every action should be part of a network of cause-and-effect relationships that culminate in improving short- and long-run financial performance. In the process of identifying goals and measures, different financial metrics may be appropriate for different units within the organisation, linking that unit's financial objectives to the overall business unit strategy.

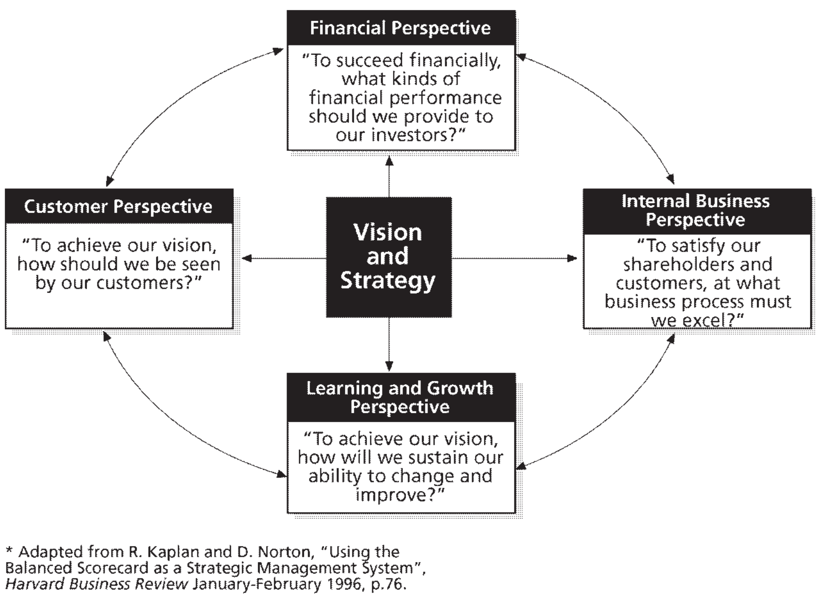


Figure 1 Translating strategy into operational terms

But how is a company to achieve its financial goals? Current wisdom is that every company needs to pay attention to the needs and desires of its customers because customers pay for the company's costs and provide for its profit. Companies need to identify the customer and market segments in which they choose to compete. This customer perspective allows companies to align their measures of customer values (i.e. satisfaction, loyalty, retention, acquisition, and profitability) with targeted customers and market segments.

Another component of the scorecard focuses on those internal business processes that will deliver the objectives that the financial and customer perspectives have established for customers and shareholders. This component expands the focus beyond improving existing operating processes to defining a complete internal process value chain that includes identifying current and future customer needs and developing solutions for those needs. This perspective will be unique to each company as it identifies the complete chain of processes that add to the value customers receive from its products and services.

Based on the objectives established in the financial, customer, and internal business process perspectives, a company needs to identify objectives and measures to drive continuous organisational learning and growth. The objectives in the learning and growth perspective should be the drivers of successful outcomes in the first three perspectives.

Because the Balanced Scorecard expands the company's set of objectives beyond traditional financial measures, managers will be able to measure how their business units create value for current and future customers. The Balanced Scorecard also helps to measure the need to enhance internal capabilities and the firm's investment in people, systems, and those procedures necessary to improve future performance. In other words, the Balanced Scorecard is an attempt to capture the essence of the organisation's critical value-creating activities. The Balanced Scorecard also aids in communicating the company's goals and rewarding those employees whose efforts enhance those goals. Because of the financial perspective, the Balanced Scorecard retains an interest in short-term performance but, at the same time, clearly reveals those drivers leading to long-term financial and competitive performance.

Fitting the balanced scorecard to the organisation

Developing a Balanced Scorecard involves a process of custom designing a strategic management measurement system for a specific organisation. The process is begun by making a preliminary assessment of the overall business strategy of the organisation. The focus is on integration of the entire business process but not overly emphasising the individual tasks. Once the overall business process is identified, along with its goals and objectives, it should be possible to identify and rank the measures believed to capture the essence of the organisation's progress toward those goals and objectives.

To date, reported applications of the Balanced Scorecard mostly have been confined to large, international companies. These companies tend to face more turbulent and competitive environments, have more dispersed and varied products and processes that they need to coordinate and monitor, and also have more resources for undertaking change initiatives. In comparison, small or local companies may have different needs such that what works for large companies may be ineffective or unnecessary for them. To gain some insights into the potential applicability of the Balanced Scorecard in small or local companies, we undertook a dialogue with four such companies operating in Southern California whose size ranged from 100 to 1,200 employees. This dialogue with a top level manager, either the CEO or a senior vice president from each company, was loosely structured in the form of a question and response survey asking to what extent the company had considered developing a

Table 1 Response from an electronics firm

Goals	Measures
Customer perspective	
Quality	Own quality relative to industry standards; number of defects; first pass yields; delivered product quality, number of visits to customers to calibrate quality; number of returns; number and quality of customers
Price	Own price relative to competitive market price; sales volume; customer willingness to pay
Delivery	Actual versus planned; number of ontime deliveries; number of days early/late; current backlog; aging of past due orders
Shipments	Sales growth; number of customers that make up 90% of shipments; % military sales; number of new-to-us part numbers shipped
New products	Number of new products to support new semiconductors; rate of technology improvements; % of sales from products introduced in last two years
Support	Response time; customer satisfaction surveys
Internal capabilities	
Efficiency of manufacturing process	Cycle time; lead time; manufacturing overhead cost/quarter; rate of increase in use of automation each quarter; days' sales in WIP; yield
New product introduction	Rate of new product introduction/quarter
New product success	New products quarterly sales; number of orders
Sales penetration	Actual sales versus plan; increases in number of $1 million customers each quarter
New businesses	Number of new businesses each year
Innovation	
Technology leadership	Product performance compared to competition; number of new products with patented technology in them; annual rate of increase in number of new products per engineer
Cost leadership	Manufacturing overhead per quarter as a percent of sales; rate of decrease in cost of quality per quarter
Market leadership	Market share in all major markets; number of systems developed to meet customer requests and requirements
Research and development	Number of new products; number of patents
Financial perspective	
Sales	Annual growth in sales and profits
Cost of sales	Extent it remains flat or decreases each year
Profitability	Return on total capital employed
Prosperity	Cash flows
Employees & community perspective	
Competitive salaries and benefits	Salaries compared to norm in local area
Opportunity	Individual contribution, personal satisfaction in job; opportunity to share in company financial success
Citizenship	Company contributions to community and the institutions that generate the environment; extent to which employees are encouraged to contribute to the community

Balanced Scorecard to fit its particular needs. Each company was asked to identify up to five major components, along with the goals and associated performance measures, that might form the basis for an effective Balanced Scorecard for it.

The electronics firm selected the customer perspective, emphasising the goals of quality, price, delivery, and development of new products as of primary importance. This selection probably is typical of the contemporary world view that customers and their values must come first if the company is going to maintain long-term financial stability and growth.

The second component selected is internal capabilities. But analysis of the goals and measures attached to this component indicates that customer values and market penetration are still on the minds of the company's management. There definitely is a linkage here that the management clearly recognises.

Third, the company values innovation which, again, clearly reflects the linkage with customer values and market penetration. In this area, we also see that they are very concerned with quality, the cost of quality, and its cause and effect on competitive market prices.

Fourth, the company indicates, but with little discussion, that there is a need to provide shareholders some relatively short-run traditional financial results. That the company places this component fourth is an indication that it sees customer values, product development and innovation, and market penetration as drivers of financial performance.

Finally, the company management's explicit identification of an employee perspective reflects its belief that a well-paid and satisfied workforce is key to attaining the company's overall goals and objectives.

References

1. Robert Kaplan and David Norton, 'The Balanced Scorecard – Measures That Drive Performance', *Harvard Business Review*, January–February 1992, pp. 71–79.
2. Robert S Kaplan and David P Norton, *Translating Strategy into Action: The Balanced Scorecard*, Harvard Business School Press, Boston, Mass, 1996, p. 7.
3. Bill Birchard, 'Making it Go', *CFO*, October 1995, pp. 49–51.

This Page Intentionally Left Blank

Revision Questions

7

Question 1

1.1 State three reasons why ROCE might be considered to be 'limited' as a performance indicator.

1.2 State why compliance with budget might not be an appropriate indicator for performance evaluation in 'the new economy'.

1.3 State why it might not be to the long-term advantage of a business to operate with the lowest possible stock days.

1.4 Distinguish between financial and non-financial performance indicators.

1.5 Distinguish between quantitative and qualitative performance indicators.

1.6 Suggest three performance indicators that might be used to measure 'responsiveness to customers'.

1.7 Distinguish between efficiency and effectiveness in an NFP organisation.

1.8 Explain why benchmarking is particularly appropriate for performance evaluation in local authorities.

1.9 Suggest five performance indicators that might be appropriate for benchmarking at a University, having particular regard to the value of the qualifications that the University awards.

1.10 Suggest three possible areas of criticism for benchmarking.

Question 2

CM Limited was formed ten years ago to provide business equipment solutions to local businesses. It has separate divisions for research, marketing, product design, technology and communication services, and now manufactures and supplies and wide range of business equipment (copiers, scanners, printers, fax machines and similar items).

To date it has evaluated its performance using monthly financial reports that analyse profitability by type of equipment.

The Managing Director of CM Limited has recently returned from a course on which it had been suggested that the 'Balanced Scorecard' could be a useful way of measuring performance.

Requirements

(a) Explain the 'Balanced Scorecard' and how it could be used by CM Limited to measure its performance. **(13 Marks)**

While on the course, the Managing Director of CM Limited overhead someone mention how the performance of their company had improved after they introduced 'Benchmarking'.

(b) Explain 'Benchmarking' and how it could be used to improve the performance of CM Limited. **(12 Marks)**

(Total Marks = 25)

Question 3

HJL provides consultancy services to companies considering improving their telephone and communication systems, including those operated using computer technology. HJL employs a number of consultants and measures its performance based on profitability and the number of chargeable hours. Performance measures make comparisons between actual and budget performance using budgets that are developed on an incremental approach which adds 5% to the budget of the previous year.

The Managing Director has returned from a management training conference which provided her with a basic understanding of the use of alternative performance measures. Two of these were The Balanced Scorecard and Benchmarking. She has asked you, as a management accountant, to prepare a report to be discussed at the next meeting of the Board of Directors. The report should explain these terms and how the performance of the company may improve if HJL were to introduce these new performance measures.

Requirements

Prepare a report, to be discussed at the next meeting of the Board of Directors, that:

(a) reviews the suitability of the existing performance measures used by HJL;

(b) explains 'The Balanced Scorecard' and recommends, with reasons, performance measures that could be used if it were introduced in HJL;

(c) explains 'Benchmarking' and the potential impact on operations within HJL if it were to be introduced.

Solutions to Revision Questions

7

Solution 1

1.1 It only reports what has happened in the previous short period.
It is based on subjective book values for assets and profit.
Concentration on current ROCE may induce 'short-termism' in managers.

1.2 Compliance with budget is the classic 'command and control' approach to management and performance evaluation. It may have been appropriate in an era when the business environment was very stable and predictable. It may then have been possible to produce meaningful plans that were capable of execution. However, the modern environment is much more fluid – where the market constantly changes and success is dependant on the ability to respond quickly to new developments and customer demand.

1.3 Stock is an asset which engages capital in the business. That capital has a cost so there is a temptation to minimise stock holding. But stock is also a valuable business asset which is needed to provide the maximum chance of satisfying customers and even out any irregularities in the flow of deliveries and production. It may be technically possible to operate with minimal stock but this is not always commercially advantageous.

1.4 A financial performance indicator a number drawn from money values, for example, profit margin, ROCE, debtor days etc. Typically those money values are taken from the financial reports of an organisation which are prepared on the basis of relevant accounting standards. A non-financial performance indicator is one which is not drawn primarily from accounting data. For example, the delivery lead time in days measures the time it takes from order to delivery for a customer purchase.

1.5 A quantitative indicator relates to some aspect of the operation that is amenable to being expressed as a number. For example, a 10 day delivery lead time is a quantitative indicator. 'A reputation for being a reliable supplier' is a qualitative indicator – although it may be possible to express it in quantitative terms (e.g. '75% of customers place us in the upper quartile of supplier reliability').

1.6 Delivery lead time (days),
Customer rating on willingness to customise products/services,

Number of customer orders/enquiries leading to completed sales,
Customer rating on standard of answers to technical enquiries.

1.7 Efficiency relates to securing the maximum output from a given set of inputs. For example, if we say that 95 standard hours work were performed during 100 available hours labour, the we might say we were operating at 95% efficiency. Effectiveness relates to finding the optimum combination of inputs to achieve a given objective. For example, we might say that the most effective means of containing youth crime is to spend £1m on police, £1.5m on school support services and £0.5 on sports clubs.

1.8 Local authorities are engaged in a complex operation intended to secure a variety of different public objectives. One often finds that it is difficult to measure efficiency by conventional means since outputs cannot be expressed in clear and unambiguous terms. Also, effectiveness is difficult to achieve since there are often various means available to achieve given objectives and one has to 'juggle' them. Benchmarking is therefore very suitable to local authorities since it allows them to compare like aspects of their activities and outputs. If 'best practice' can be identified then this acts as a guideline for all.

1.9 Employer rating of degrees and qualifications.
Government (UK and overseas) rating of degrees and qualifications.
Student/alumni rating of degrees and qualifications.
Number of alumni in employment within 12 months of graduating.
Average salary of alumni 5 years after graduation.
Number of alumni in management/professional employment 5 years after graduating.
Number of alumni judged to have achieved 'national fame' status inside 10 years after graduating.

1.10 Organisations and businesses differ in so many detailed respects that it may be difficult to find a benchmark partner that provides a genuine like-for-like comparison.
Potential benchmark partners may be reluctant to exchange commercially sensitive information.
Different approaches to the provision of activities may be possible, for example, using different combinations of labour and equipment to produce the same product. There may be no such thing as 'best practice'.
The whole culture of benchmarking is 'mimetic' – whereby organisations copy each other's practices in order to achieve some form of legitimacy. It may be better for all to adopt distinct practices in order to suit detailed differences in history and circumstances.

☑ Solution 2

(a) The balanced scorecard was developed and refined during the 1980s and 1990s. It has the aim of breaking the reliance of traditional performance measurement systems on financial performance measures, and widening the scope of performance measurement and therefore of managerial attention, to include both financial and non-financial information. By developing a wider focus of attention, the balanced scorecard encourages managers to look at the relationships between different aspects of performance, and highlights the links between improving operational performance and achieving improvements in financial performance.

The balanced scorecard contains three basic elements:

A customer perspective, where the focus is on measuring and improving customer satisfaction. CM Limited might measure the incidence of customer complaints, or of repeat purchases, as proxies for customer satisfaction.

The learning and growth perspective assesses the organisation's ability to satisfy, develop and motivate its employees. Key measures here assess employee retention, productivity and satisfaction. CM Limited would use questionnaires, surveys and/or interviews to gain information on these areas. It would seek to determine, for example, whether employees felt that they were supported in their work, and how satisfied they were with their working conditions.

The internal business process perspective assesses the efficiency of the value creating process, and gathers information on areas such as innovation, operations and after-sales service. CM Limited could gather information on the percentage of sales from new products, sales growth compared with competitors, and speed of response to customer service requests.

The effect of making improvements in these three areas is that profitability, cashflow and other measures in the financial perspective should improve. The balanced scorecard, however, explicitly links the operational perspectives to the financial perspective, so that a change in any of the former can be seen to have an influence on the latter. If a balanced scorecard approach were to be introduced, the focus of CM Limited's managerial attention would move from being on products to a more holistic model, in which the key performance measures, linked to the achievement of objectives, are identified and monitored. Thus, objectives are more likely to be achieved, since the key performance indicators have been identified.

(b) Benchmarking is used by many organisations as a way of achieving process improvements and cost reduction. The objective of benchmarking is to become 'best in class' in the chosen areas and to constantly compare your own performance with that of an appropriate comparator. Many business processes are not unique to businesses located in a single industry (which will be CM Limited's competitors), and therefore best in class performance might be found in a company which undertakes the same process, but in a quite different industry. By exchanging information concerning costs/times/resource requirements of the process, firms may learn from one another, and become aware of any areas of inefficiency which they may have, and thus gain an insight into where their cost reduction efforts should be targeted.

CM Limited sells business equipment, so it could investigate the possibility of benchmarking its order taking, delivery, stockholding and similar procedures against those of a similar firm located in a different geographical area. Or, it could perhaps benchmark against a local firm selling and repairing air conditioning units or electrical white goods.

Benchmarking improvements could impact upon the 'internal business process' of the balanced scorecard, causing efficiency improvements. Should employee training requirements be required, then 'learning and growth' changes would need to be made. In the short term, there might be a deterioration in the cash flow of CM Limited, but as the improvements begin to have an effect, the financial perspective will improve.

Solution 3

Report

To: Board of Directors
From: Management Accountant
Subject: Performance Measures
Date: 24 November 2004

Introduction

Further to your request, I consider in this report our existing performance measures and then set out explanations of the balanced scorecard and benchmarking approaches and how our performance could improve if we introduced these alternative performance measures.

(a) Existing performance measures

Our present performance measures focus attention on our profitability and our level of chargeable hours, the latter of course being a key factor in achieving our profitability targets.

These targets are set in the form of a budget which is based upon increasing our performance by 5% over that previously budgeted. This arbitrary increase does not necessarily reflect the change in the circumstances in which HJL operates. As a result, the budget may become dysfunctional. It also suggests that the organisation's sole performance indicator is one that focuses on financial aspects. There are many other aspects that contribute towards the company's performance which need to be monitored.

(b) The Balanced Scorecard

The balanced scorecard is an approach to the provision of information to management to assist strategic policy formulation and achievement. It emphasises the need to provide the user with a set of information which addresses all relevant areas of performance in an objective and unbiased fashion.

The balanced scorecard comprises four perspectives: financial perspective, customer perspective, internal business perspective, and innovation and learning perspective.

The financial perspective considers how we look to our shareholders and thus focuses on measures of short- and long-term profitability and growth. Our present performance measures of profitablility and number of chargeable hours is very much focused on these financial measures, but they should not be the only measures that are used.

The customer perspective considers how our customers see us. This is important because if our customers are pleased with the service they receive then we will continue to be their preferred supplier and hopefully they will recommend us to their business contact group so that we obtain more work. Measures that could be used include the number of customer referrals received, the proportion of quotations accepted by the customer, the extent to which our projects and recommendations are delivered on time to our customers.

The internal business perspective monitors what we must excel at if we are to succeed. This perspective looks at our ability to remain up to date and design new communications systems in an efficient manner. We need to compare our systems with those recommended by our competitors and measure the time taken to introduce new systems that take advantage of technological developments.

The innovation and learning perspective considers whether we can continue to improve and create value by the advice that we give to our customers. Measures that could be used in this area include our position in the industry in relation to introducing new systems compared to our competitors, and the amount of expenditure on training per employee.

The overall concept of the balanced scorecard is that all four types of performance measure are equally important to ensure the continuing success of a company.

(c) Benchmarking

There are two types of benchmarking: intra group and inter-industry.

Intra group benchmarking involves groups of companies in the same industry agreeing to pool data on their processes. Best practices are identified from this pooled data and as a result the performance of all of the group companies can improve.

Inter-industry benchmarking is used by non-competing businesses that have similar processes. HJL could consider using this type of benchmarking by working with other consultancy businesses who provide services other than those connected with communications, such as marketing consultants.

Benchmarking enables a company to improve its performance by learning best practice from other organisations. Benchmarking establishes targets and comparators and through their use relative levels of performance (particularly areas of underperformance) can be identified. By the adoption of identified best practices it is hoped that performance will improve.

Conclusion

I should be pleased to discuss these matters with you at our next meeting.

This Page Intentionally Left Blank

Developments in Management Accounting

8

LEARNING OUTCOMES

After completing study of this Chapter you should be able to :

- explain the role of MRP and ERP systems in supporting standard costing systems, calculating variances and facilitating the posting of ledger entries;
- evaluate the impact of just-in-time manufacturing methods on cost accounting and the use of 'backflush' accounting when work-in-progress stock is minimal;
- compare activity-based costing with traditional marginal and absorption costing methods and evaluate its potential as a system of cost accounting;
- explain the origins of throughput accounting as 'super variable costing' and its application as a variant of marginal or variable costing.

8.1 Introduction

In this chapter we will consider developments in the business environment over the last 25 years and the impact that these developments have had on the practice of management accounting. In particular, we will consider activity-based techniques (ABTs), throughput accounting and backflush accounting.

8.2 The modern economic environment

8.2.1 Traditional production processes

In manufacturing industry (and one can identify parallels in the service sector), there have traditionally been three main methods of organising production, each one representing the least-cost method of satisfying customer needs:

(i) *Jobbing production* – where customers require goods to be produced to their own particular specifications. In such an environment, each order is a one-off, manufactured to customer order. Typically, only low stocks are held and production is organised in a manner calculated to achieve flexibility. That is, machines and personnel are arranged in a manner that allows production to be shifted quickly from one job to another.

(ii) *Batch production* – where production takes place in the form of discrete production runs. Typically, production is not to specific customer order and some stock holding of both finished goods and components may be essential. Given that production facilities have to switch quickly from output of one product to another, a degree of flexibility has to be incorporated in the operation. Such flexibility in plant arrangement and machine design may be at the expense of unit cost.

(iii) *Mass production* – where a standard product is in continuous or near continuous production. This approach prioritises low unit cost at the expense of flexibility. If customer dispatches and supplier deliveries can be phased evenly (through use of JIT and SCM technique – discussed below), then it may be possible to operate with very low stock holdings.

The mass production model is typical of traditional industry. This approach is vulnerable to fluctuations in the market. A temporary down turn in customer demand may result in a build-up in stocks of finished goods and it may be difficult or expensive to suspend production when this happens. It may be very difficult to accommodate product features customised to the needs of individual customers. The weakness of the mass production model is that it lacks flexibility. It involves sacrificing a lot in exchange for low unit production cost.

8.2.2 The background to change

Cost is an important competitive weapon. Low-cost producers will have an advantage in the marketplace over those whose cost base is higher. However, cost is only one competitive weapon and it is one that has become of declining importance in recent years. Other dimensions of competition have become increasingly important: product reliability, product innovation, shortened time to market, and flexibility of response to customer demands – these last three being features of time-based competition.

It is obvious that a manufacturer would gain competitive advantage if he were able to produce the diversity of output seen in a jobbing system at a cost associated with mass production. In recent years, some manufacturers, most notably the Japanese, have been successful in moving towards this. Furthermore, the products of these manufacturers have an enviable reputation for reliability. These suppliers have clearly gained competitive advantage in the marketplace, forcing competitors to follow or exit the market. Consumers, given the opportunity to enjoy diversity and reliability at a mass-produced cost, have reacted not unexpectedly by requiring all manufacturers to offer these features. Further, a corollary of the requirement for greater diversity has been a shortening of product life cycles.

This fundamental shift in demand patterns dictates a need for companies to constantly review and redesign existing products, and to shorten the time to market of each new line in order to ensure satisfactory returns from it. Against this new background, companies will find it increasingly difficult to gain economic returns from an expensive, dedicated mass-production line operated in traditional way. Means must be found whereby manufacturing facilities cannot only accommodate the production of existing lines and their inevitable redesigned successors, but also facilitate the rapid introduction of new products at minimum cost. The challenge of the modern, globally competitive market is to offer an increased and increasing choice of high-quality products at a cost traditionally associated with mass production; to enjoy economies of scale, along with the economies of scope that result from the increased manufacturing flexibility. This challenge can be met by investment in new technology, and the adoption of alternative production management strategies. Those who successfully meet this challenge are the 'world-class manufacturers' that provide the benchmark against which other manufacturers are measured.

'Word class' organisations make products using the latest manufacturing technologies and techniques. Those products are typically sold around the world and are generally viewed as being first rate in terms of quality, design, performance and reliability. Companies such as Toyota, BMW and Boeing have been described at various times as being world-class manufacturers. The world-class manufacturer will probably invest heavily in research, product design, CAD/CAM technology. It will also make extensive use of modern management concepts such as TQM, flexible manufacturing systems and customer relationship management. These concepts variously known as advanced manufacturing technologies (AMTs) or the new manufacturing are discussed in detail below.

8.3 The new manufacturing

8.3.1 Computer-aided design

At the initial design stage of a product, the considerable space occupied by the drawing tables of a typical design office has been replaced by computer terminals, and the time taken to work through an initial engineering drawing – and, more importantly, rework the drawing – has shortened dramatically as a result of the softwares currently available. Computer-aided design (CAD) allows huge numbers of alternative configurations to be analysed both for cost and utility. CAD allows quality and cost reduction to be built in at the design stage of a product. The advanced graphics facilities of the typical CAD program enable the draughtsman not only to move parts around the design, and instantly appreciate the effect of these changes on the finished product, but also to manipulate the drawing, and view the design from any desired angle (and even, in the case of the latest generation of software, 'walk through' it). The use of a database to match, where possible, the requirements of the new design with existing product parts, will enable the company to minimise stockholdings by reducing the total number of product parts required.

8.3.2 Computer-aided manufacturing

The manufacturing process is carried out by a range of machinery that, together with its concomitant software, comes under the collective heading of computer-aided manufacturing (CAM). Significant elements of CAM are computer numerical control (CNC) and robotics. CNC machines are programmable machine tools that are capable of performing a number of machining tasks, such as cutting and grinding. A computer program stores all the existing manufacturing configurations and set-up instructions for a particular machine or bank of machines, facilitating a change in configuration in a matter of seconds via the keyboard; changes to existing configurations and new configurations are easily accommodated. CNC therefore offers great flexibility, and dramatically reduced set-up times. Furthermore, unlike human operators, who tire and are error prone, CNC machines are able to repeat the same operation continuously in an absolutely identical manner, to a completely consistent level of accuracy and machine tolerance. CNC also promotes flexibility through allowing machines to switch from output of one product to another very quickly.

Two brief examples will serve to illustrate the dramatic impact of CAM on manufacturing flexibility, and the time taken to develop a product and bring it to the market. Nissan, the car producer, found that the time taken to completely retool car body panel jigs in their intelligent body assembly system (IBAS) fell from 12 months to less than 3 months by reprogramming the process machinery by computer and using computerised jig robots. Similar advances have been made in the resetting of machines and in the exchange of dies. These changes have reduced the changeover time in moving from one process to another. Again it is a Japanese company, Toyota, that provides one of the best examples of the advances made in this area. As the speed of production changeover increases under CAM, the possibility of producing smaller and smaller batch sizes at an economic cost also increases, so that the production schedule can be driven more and more by customer requirements rather than the constraints of the traditional manufacturing process.

8.3.3 Computer-integrated manufacturing

The ultimate extension – and logical long-term direction – of AMT in the production environment is computer-integrated manufacturing (CIM), which brings together all the elements of automated manufacturing and quality control into one coherent system. The 'ideal' technological world of CIM – the fully automated production facility, controlled entirely by means of a computer network with no human interference – is not yet with us (and, indeed, with its overtones of 'ghost factories', would not necessarily be universally welcomed).

A somewhat watered-down version of CIM is already with us, however, in the form of a flexible manufacturing system (FMS) discussed below. The FMS cell is often referred to as an 'island of automation' in the context of a more traditionally organised facility.

8.3.4 Flexible manufacturing systems

FMS is 'an integrated production system which is computer controlled to produce a family of parts in a flexible manner . . . a bundle of machines that can be reprogrammed to switch from one production run to another'. It consists of a cluster of machine tools and a system of conveyor belts that shuttle the work piece from tool to tool in a similar fashion to the traditional transfer line used in mass (large-batch) production. Thus the benefits lie in being able to switch quickly from making one product to another.

The major strength of an FMS system is its ability to manufacture not just a family of parts, but a family of products. By using this system, General Electric has been able to produce a range of diesel engines that are of considerably different sizes on the same automated production line, without substantially retooling and time-consuming start-ups.

FMS normally incorporates CAD and CAM features. It is an approach to manufacturing that is well attuned to modern market economics, where products have short life-cycles, are produced in short discontinuous runs (see discussion of JIT below) and are often highly customised to the needs of individual customers.

One notable aspect of an FMS (or any AMT environment) is that efficiency is a product of product design and plant flexibility rather than a direct result of low unit production costs. A traditional standard costing and variance analysis system may not be very effective in this environment. For one thing, once one moves away from a traditional mass production

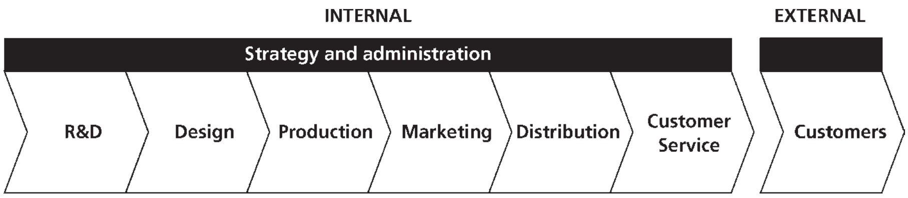


Figure 8.1 The value chain

operation, a high proportion of production costs are either designed into a product or are facility costs not directly specific to any one product. Running a cost system that places a focus on things like the 'direct material usage variance' may tell one almost nothing about how well or badly a production operation is performing.

8.4 The value chain

The driving force behind the adoption of AMTs is a thorough appreciation of the relationship between *all* the factors within the value chain – the sequence of business factors by which *value* is added to the organisation's products and services. The value chain is illustrated in Figure 8.1.

Research and development. The generation of, and experimentation with, ideas for new products, services or process.
Design. The detailed planning and engineering of products, services or process.
Production. The co-ordination and assembly of resources to produce a product or deliver a service.
Marketing. The process by which potential customers learn about and value the attributes of the organisation's products or services, and are persuaded to buy them.
Distribution. The mechanism by which the organisation's products or services are delivered to the customer.
Customer service. The support activities provided to customers.

Functions within the value chain are not necessarily sequential; the organisation can gain important competitive advantages by activating individual parts of the chain concurrently. The major consideration is their smooth *co-ordination* within the framework of the organisation as a whole.

8.5 Production operations systems and management strategies

8.5.1 Material requirements planning

The traditional way to determine material requirements is to monitor stocks constantly; whenever they fall to a predetermined level, a preset order is placed to replenish them. This approach involves the replenishment of any one stock item independently of all others. In reality, the demand for a particular stock item is a function of the assemblies and subassemblies of which it forms a part. This traditional approach (involving re-order level and economic order quantity calculations) originates in the pre-computer era.

Material requirements planning (MRP or MRP1) is a technique that aims to ensure that material resources – raw materials, bought-in components and in-house subassemblies – are made available just before they are needed by the next stage of production or despatch. It also seeks to ensure that these resources are delivered only when required, so that stocks are kept to an absolute minimum. The technique enables managers to track orders through the entire manufacturing process, and helps the purchasing and production control departments to move the precise amount of material at the right time to the correct production/distribution stage. MRP1 is only practical with the availability of a full computer model of the production and associated materials procurement requirement for the coming period. MRP1 appeared in the 1960s with the arrival of computers in management.

MRP is a computerised production planning system that begins with the setting of a master production schedule, and, working backwards, uses the information from this top-level schedule to determine the raw material, component and subassembly requirements at each of the earlier stages in the production process. Obviously, the ability of the system to deliver what is required in the correct place at the correct time will be dependant on the quality of the information that is put into the computer model.

The data in the system is analysed to produce a *material requirements* plan for purchasing and manufacturing. As the system is computerised, schedules can easily be reworked to accommodate changes to customer requirements. For example, if a customer requests that product X be delivered in the current month rather than product Y, which had previously been ordered, and that delivery of product Y be deferred until the following month, the MRP system can quickly reschedule all the activities that go to producing these requirements, in order to meet the new needs of the customer.

Prerequisites for the successful operation of an MRP system are as follows:

(i) *Strict schedule adherence*. The operation of informal expediting systems, or the informal alteration of production priorities, will quickly destroy the potential benefits of the system. Workers must be educated to understand the importance of schedule adherence, and controls should be in place to ensure this adherence. A further possible problem is that the system assumes unlimited capacity in all work centres, whereas in reality some work centres always behave as bottlenecks. This contradiction destroys the accuracy of MRP scheduling logic, and makes it ineffective for capacity planning and control.

(ii) *Accurate base data*. Data accuracy is vital to the system; if a plan is based on inaccurate data, it may be impossible to adhere to the schedule. For example, if the information in the inventory file is incorrect, perhaps stating that certain subassemblies are available when in fact they are not, the whole production schedule will be incapable of being completed in the manner envisaged. The difficulties encountered in keeping inventory records and 'bill of materials' (listing of materials and components required for products) up to date have been a major cause of failure in the implementation of MRP systems. Similarly, it is vital that the bill of materials file is accurate, and regularly updated to reflect any changes in product composition. An enormous effort is required in a typical company to bring the data inputs to a high enough level of accuracy to support an MRP system. However, without such accuracy, the MRP system will not bring about the expected benefits.

8.5.2 Manufacturing resources planning

When MRP is extended beyond the planning of raw materials, components and subassemblies to encompass other input resources, such as machine capacity and labour, so that the system provides a fully integrated planning approach to the management of all the company's manufacturing resources, it is known as manufacturing resources planning (MRP2). It is clear that the *caveats* mentioned above will only increase in importance when the system's database becomes larger and more complex.

Even if the data in an MRP system – either MRP1 or MRP2 – is accurate, and there is 100 per cent schedule adherence, this does not, of itself, mean that the company operating the system will be a world-class manufacturer. It has been argued that many western companies adopt an operations research focus in management, and this approach has been adopted in applying both MRP systems. An operations research approach takes input parameters as given. For example, production times, delivery times and design features are regarded as constants, and within this static framework the optimal production and purchasing plan is sought. This is the 'static optimisation' philosophy of performance management that is entirely consistent with the standard costing and budgeting models considered above.

This is not to argue that MRP systems are incompatible with world-class manufacturing or continuous improvement – indeed, Japanese companies such as Nissan use MRP2 – but simply to point out that applying MRP to an *existing* set of circumstances may improve the *efficiency* with which existing operations are carried out, but this efficiency may still lead to a level of cost that is *higher* than could be achieved if the parameters themselves were challenged. MRP2 appeared in the 1970s, very much as a straight line development from MRP1.

8.5.3 Optimised production technology (OPT)

Like MRP systems, OPT requires detailed information about inventory levels, product structures, routeings and set-up and operation timing for each and every procedure of each product. However, unlike MRP, the technique actively seeks to identify and remove – or optimise the use of – bottleneck resources within a manufacturing process, in order to avoid unnecessary build-ups of stock. A bottleneck resource is the thing in the production process that limits overall output. We have already encountered this idea in the context of critical path analysis, limiting factor analysis and the principal budget factor.

Drury (2000) gives an excellent and concise description of the OPT approach, which is worth reproducing in full:

> The OPT philosophy contends that the primary goal of manufacturing is to make money. Three important criteria are identified to evaluate progress towards achieving this goal. These are throughput, inventory and operating expenses. The goal is to maximise throughput while simultaneously maintaining or decreasing inventory and operating expenses.
>
> The OPT approach determines what prevents throughput from being higher by distinguishing between bottlenecks and removing them or, if this is not possible, ensures that they are fully utilised at all times. Non-bottleneck resources should be scheduled and operated based on constraints within the system, and should not be used to produce more than the bottlenecks can absorb. The OPT philosophy therefore advocates that non-bottleneck resources should not be utilised to 100 per cent of their capacity, since this would merely result in an increase in inventory. Thus idle time in non-bottleneck areas is not considered detrimental to the efficiency of the organisation. If it were utilised, it would result in increased inventory without a corresponding increase in throughput for the plant.
>
> With the OPT approach, it is vitally important to schedule all non-bottleneck resources within the manufacturing system based on the constraints of the system (i.e. the bottlenecks). For example, if only 70 per cent of the output of a non-bottleneck resource can be absorbed by the following bottleneck resources, then 30 per cent of the utilisation of the non-bottleneck is simply concerned with increasing inventory. It can therefore be argued that by operating at the 70 per cent level, the non-bottleneck resource is achieving 100 per cent efficiency.

The above description makes it clear that the objective of OPT is to maximise throughput of products, which necessitates the maximisation of output from bottlenecks. Everything else is subservient to this end, so, for example, buffer stocks might be held ahead of bottlenecks, and quality checked *before* product enters the bottleneck. Non-bottlenecks should be paced by the bottlenecks, and should not produce merely for stock.

It has been suggested that overheads should be changed to products on the basis of throughput time, defined as the time taken from initial input to the production line to removal from the line as a finished good. In using this as the allocation base, top management is flagging up to operating management that product costs can be reduced by cutting down throughput time.

8.5.4 ERP, CRM and SCM

MRP1, MRP2 and OPT are essentially business planning techniques, whereby the full resource requirements of a given plan of action can be identified and those requirements satisfied in the most cost-effective manner. The approach is entirely consistent with the budgeting model that we explored in earlier chapters.

However, things have not stopped there and the 1990s saw further developments along this line. During the 1990s, enterprise resource planning (ERP) systems tended to displace the old MRP systems. ERP involves the use of elaborate computer systems to provide plans for every aspect of the business – not just confining attention to material supplies and manufacturing. ERP system design and installation became one of the major products sold by firms of business consultants. ERP systems are frequently associated and integrated with budgeting systems.

Another parallel development was customer relationship management (CRM) systems. These contained all the information about customers and customer requirements. They are often integrated with ERP systems and involve websites and e-commerce facilities. A CRM system may allow receipt of a customer order to automatically prompt the scheduling of necessary production facilities and the ordering of components.

The ultimate development of this kind was supply chain management (SCM), which became very much the 'hot topic' in business management circles in the late 1990s. SCM systems go beyond individual companies and seek to integrate the flow of information between different companies on a supply chain. Thus, if a customer placed an order with company A, then an SCM system would automatically schedule the production and delivery of components form A's supplier, company B.

To be effective, SCM system have to be associated with a high degree if mutual confidence among the participating businesses. This may involve placing personnel from one business in the premises of another to ensure that appropriate manufacturing standards and specifications are met. It may also involve sharing information about product design and cost structures.

MRP, ERP and SCM represent a line of development associated with the use of computers and IT to undertake very detailed planning and resource scheduling exercises. However, many observers feel that this approach may be nearing the end of its life cycle. The elaborate, integrated ERP systems of the 1990s may be passing out of use. It is claimed that they involve unnecessary data collection, over-elaborate bills of materials and inefficient workflows. The current move is towards the alternative 'lean enterprise' and its associated information system requirements. The thrust of the lean enterprise concept is that production scheduling and resource acquisition should respond quickly and flexibly to customer demand rather than being the subject of an elaborate planning exercise. Once again, we encounter the idea that modern thinking in management places an emphasis flexibility and short response time rather than elaborate forward planning.

8.5.5 Just-in-time concept

There can be few students of business-related topics who have not heard of just-in-time (JIT) production methods. The CIMA *Official Terminology* defines JIT as:

JIT: A system whose objective is to produce or procure products or components as they are required by a customer or for use, rather than for stock. A just-in-time system is a 'pull' system, which responds to demand, in contrast to a 'push' system, in which stocks act as buffers between the different elements of the systems, such as purchasing, production and sales.

JIT production is defined as:

JIT production: A production system which is driven by demand for finished products whereby each component on a production line is produced only when needed for the next stage.

And JIT purchasing as:

JIT purchasing: A purchasing system in which material purchases are contracted so that the receipt and usage of material, to the maximum extent possible, coincide.

JIT is best described as a 'philosophy', or approach to management, as it encompasses a commitment to continuous improvement and the pursuit of excellence in the design and operation of the production management system. The logical thrust behind JIT is that production and resource acquisition should be 'pulled' by customer demand rather than being 'pushed' by a planning process. A JIT based production operation responds quickly to customer demand and resources are required and utilised only when needed. In order to be able to operate in this manner, an organisation must achieve excellence in all areas of management.

An attempt to gains from the adoption of JIT usually exposes problems that were previously hidden. An analogy with a boat sailing along a river is often used to explain this result, as seen in Figure 8.2.

The production process in a multi-product plant represents the boat, and the levels of stocks that a company holds are the determinants of the water level of the river. A high level of raw material and component stocks, work in progress and finished goods would indicate that the river is extremely deep. As these stock are reduced, the water level reduces. The bed of the river may contain rocks, the height and quantity being determined by the number of problems that a company faces in its production. The 'rocks' may be caused by poor production scheduling, machine breakdown, absenteeism, inefficient plant layout, excessive rework, schedule interruption through order expediting, etc. However, these rocks do not cause a problem to the boat on the surface, provided that the water depth – the level of inventory – is sufficient to cover them. As the water level – the inventory goes

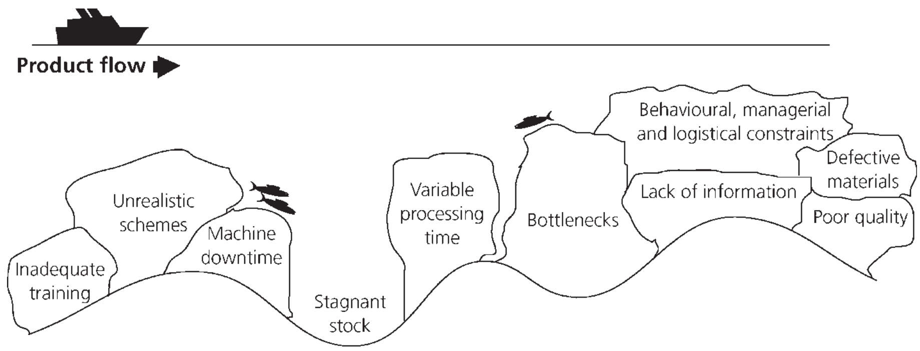


Figure 8.2 The just-in-time concept

down, the rocks – the problems within the company – will be exposed. The inevitable consequence of this is that the boat will crash into the rocks and be damaged.

This damage can be avoided in one of the two ways. The first, the traditional western way, is to keep the water level deep – maintain high levels of stocks. An alternative way, and the way consistent with the JIT philosophy, is to remove the rocks, so that the boat can sail quite safely in a much lower level of water. Operating on a JIT basis with low inventories requires a first class operation in all the areas of:

production scheduling
supplier relations
plant maintenance
information systems
quality controls
customer relations.

In a JIT environment, 'family groups' of products – products with similar production requirements – are manufactured in separate cells along production-line principles. That is, all the machines needed to carry out the manufacture of a particular product family are arranged in the form of a discrete 'mini' assembly line. The machines are grouped closely together in the sequential order required by processing, and products move from machine to machine in a constant flow, without 'queuing' by machines or returning to stores, thus minimising lead times and work in progress. The reader will recognise similar features and aims to those described earlier with an FMS.

The traditional manufacturing environment operates on a 'push-through' basis, in which one process supplies parts to the next process without regard to the latter's immediate ability to continue work on those parts. Work in progress in an unavoidable features of such a system. In contrast, the JIT system works on a 'pull' principle, whereby one workstation 'pulls' the part from the previous station; work will not begin in any workstation until the signal to part has been received from the next station in the process. The bin, or container, that is passed to the previous workstation to give the 'pull' signal, is known in Japanese as the 'kanban', hence the use of this word to describe JIT systems. As production only commences once the 'pull' signal has been received, this has the obvious consequence of keeping work in progress at a low level. One consequence of the 'pull' system, however, is that problems in any part of the system will immediately halt the production line, as earlier workstations will not receive the 'pull' signal and later stations will not have their own 'pull' signals answered. As noted above, this would have the powerful effect of concentrating all minds on finding a long-term solution to the problem.

The analogy of the boat and the river emphasised the role of buffer stocks in protecting the traditional manufacturing system against shortages caused by innate problems such a poor-quality production or machine breakdowns. JIT operates with minimal stock levels; its approach is to 'get it right first time', and the aim is 'zero defects'. In the absence of the attainment of this 'ideal' situation, JIT is still able to cut scrap and rework. If transfer batches are small, product is quickly manufactured and quality checked – any problems are quickly found and only a small amount of work in progress will need to be reworked.

The JIT manufacturer plays an active and constructive part in ensuring that cost savings are made by suppliers. Cost teams from the manufacturer regularly visit suppliers' plants, perform audits on the information supplied to them, and suggest ways in which the suppliers' operations might be carried out more efficiently and achieve greater synchronisation and harmony with the manufacturer's own specifications. This co-operation with a limited number of suppliers provides the manufacturer with a high degree of control of the upstream activities in the value chain, even though the supplier has legal ownership of these parts of the chain. There is an element of commonality with SCM (discussed above) in this.

8.6 Total quality management (TQM)

TQM may be defined as the continuous improvement in quality, productivity and effectiveness obtained by establishing responsibility for process as well as output. In this, every process has an identified process owner within the organisation and every person in an organisation operates within a process and contributes to its improvement. The idea is that quality is the key strategic variable in achieving strategic advantage. When a customer considers buying a product he is influenced in his choice of supplier by factors other than the technical specification of the product – such as speed of delivery, customisation, reliability, ease of placing an order and attractiveness of design. All these are quality-related factors. The TQM movement argues that ability to deliver these quality-related factors is a function of process, that is, it is a function of how the organisation works.

The role that quality plays in ensuring an efficient and effective operation has already been encountered within the context of JIT. Operating on a demand-pull basis with minimal stocks requires a high level of quality at all levels in the manufacturing operation.

There are two recurring themes that run through much of the literature on TQM. These are 'terms' and 'empowerment'. Employee empowerment is considered to liberate talents and facilitate the deployment of skills. Teams are considered to improve the co-ordination of functions and skills within the organisation. The co-operative ethic lies at the heart of what TQM is all about.

TQM is a philosophy and a movement rather than a body of techniques. There are many alternative definitions and models of TQM. However, the central idea is that quality is the key strategic variable in business and it is a variable that is amenable to organisational culture. The idea is that quality should be a feature that is rooted in the structure of the organisation. Quality should impact on the way that the organisation is run and on the way that staff are recruited, assessed, promoted and rewarded. The view that quality is something imposed on staff by inspectors is anathema to the TQM movement. W. Edwards Deming, widely accepted as the founder of the TQM movement, argued that mass inspection of goods ties up resources and does not improve quality. Quality has to come from within the process rather than being imposed on it from without.

The main features of a TQM-oriented organisation include:

- Top priority is given to satisfying customers and the organisation is structured in a way that ensures interest convergence of owners, employees, suppliers and management in achieving this. Managers should act as facilitators rather than controllers.
- People are considered to be the key internal guarantors of success. Decision-making processes are participative. Management is both visible and accessible.
- Constant change is considered a way of life and the organisation is structured in a manner that readily embraces change. The organisation structure is flat, requiring employees to use initiative and communicate directly with customers and suppliers.
- The organisation pursues continuous improvement and not static optimisation. The concept of 'an optimum defects level' rooted in traditional cost accounting is entirely alien to TQM. Performance is measured against an external benchmark and not against an internal standard, in order to emphasise the possibility of improvement.
- The emphasis is on prevention of problems and faults rather than detection. Employees have a wide span of activity but a short span of control.

Achieving and improving quality is the central theme that runs through all of these features. This is particularly relevant in the era of flexible manufacturing when products are highly customised and product life cycles are short. Customer service and product innovation have become major elements in the quality of products that are being offered.

One feature of traditional management accounting is that it may not report the cost of quality failure and quality assurance. Poor-quality work results in costs, but those costs may be 'buried' at several points in the management accounting system and thus not be specifically reported. For example, the costs of quality failure may include:

- internally rejected and test-failed units;
- compensation/replacement for units rejected and returned by customers;
- rectification costs;
- compensation for units failed in service with customers;
- loss of customer goodwill and market reputation.

It is notable that some of these things are opportunity costs that have no immediate impact on accounting costs and are not reported through a conventional management accounting system.

The adoption of a TQM approach is likely to require the provision of comprehensive cost of quality reports that are supplied on a frequent basis to all levels in the organisation. This involves identifying the costs of quality control, quality failure and quality assurance – and collecting them together for management information and reporting purposes. It is only when the costs of quality are known that the measures needed to achieve and maintain high quality can be justified.

The role of design in determining product costs has already been encountered. Quality is engineered into products at the design stage. In the modern era, 90% of product costs may be determined at the design stage – and a traditional costing system reporting costs and variances in discrete one month periods may be of limited relevance in evaluating performance. Reporting product costs on a life-cycle basis ('life cycle costing') therefore allows a much fuller understanding of the costs and benefits of quality.

TQM is a cultural thing and over the years it has attracted critics as well as followers. The debate between the two groups is explored in the article titled 'Quality streak' in the Readings section of this chapter.

8.7 Synchronous manufacturing

The title 'synchronous manufacturing' was coined in 1984, when leading exponents of OPT felt that the focus of the latter, as evidenced by its nomenclature, had become too narrow. The change in name allowed the newly emerging procedures and concepts of JIT and TQM to be integrated with the basic principles of OPT. It is interesting to note, however, that the guiding force behind both OPT and synchronous manufacturing is the identification and management of 'bottleneck resources' – Eli Goldratt prefers to use the term 'theory of constraints'.

Synchronous manufacturing has been defined as:

Synchronous manufacturing: . . . an all-encompassing manufacturing management philosophy that includes a consistent set of principles, procedures, and techniques where every action is evaluated in terms of the common global goal of the organisation.

Note the use of the word 'philosophy' in the definition: this is the key to distinguishing it from its narrower, technique-based predecessor, OPT. The word 'optimised' in the latter implied that an 'optimum' position was possible, which runs counter to a belief in continuous improvement; and the words 'production' and 'technology' failed to capture the richness of the range of constraints and challenges faced by the firm in achieving its objectives – market constraints, and logistical, managerial and behavioural constraints need to be added to the physical constraints of production capacity.

A set of seven 'principles' are associated with synchronous manufacturing:

1. Do not focus on balancing capacities, focus on synchronising the flow.
2. The marginal value of time at a bottleneck resource is equal to the throughput rate of the products processed by the bottleneck.
3. The marginal value of time at a non-bottleneck resource is negligible.
4. The level of utilisation of a non-bottleneck resource is controlled by other constraints within the system.
5. Resources must be utilised, not simply activated.
6. A transfer batch may not, and many times should not, be equal to the process batch.
7. A process batch should be variable both along its route and over time.

Principle 5 requires a brief explanation: as we saw with OPT, it is possible to *activate* resource, particularly a non-bottleneck resource, beyond what is useful or productive for the system; however, that resource will only be *utilised* if the activation contributes positively to company performance. In other words, activating a resource without utilising it is both wasteful and costly.

An alleged weakness of the conventional JIT philosophy is its approach of improving the process everywhere in the system. According to synchronous manufacturing principles 2 and 3, the return on improvements at a *bottleneck* resource is enormous. But the return on improvement made at *non-bottlenecks* is marginal at best, and often of no consequence at all.

In other words, whether *across-the-board* improvement activities have any impact on the organisational goal of making money is not known. The synchronous manufacturing philosophy, on the other hand, required managers to focus on those areas of operations that offer the greatest potential for *global* improvements. This process of *focused* improvement becomes a vital part of its own particular approach to continuous improvement throughout the entire organisation.

Another criticism of the basic JIT model is that it is unable to pre-plan the production schedule for any resource in the process except final assembly, and thus the schedule does not consider the resulting loads at the bottleneck work stations. Consequently, it may not effectively utilise the bottleneck resources and, since bottlenecks determine the throughput for the entire system, the resulting throughput may be less than optimum.

8.8 The emphasis on continuous improvement

What emerges from all the previous discussion is that a world-class business achieves its objectives by pursuing a policy of continuous improvement in those factors that have been shown to be important to customers in today's market place. These are:

(i) Innovation in design;
(ii) Flexibility in process;
(iii) Short product lead times;
(iv) High quality at all levels in the operation;
(v) Low cost engineered into product and process.

It has been seen that the benefits from these features will not be realised through the slavish application of technologies and techniques. Similarly, a management accounting system which emphasises a compliance with standard costs over given short periods is not likely to be helpful. Long-term benefits will only be achieved by a commitment on the part of all employees to the philosophy of continuous improvement. The search for continuous improvement must become a personal as well as a corporate goal, or the full benefits of technologies and techniques – either individually or in combination – will not accrue to the firm, to the detriment of its competitive position.

Management accounting must assist a search for continuous improvement by supplying relevant information, that is, information that helps management to choose the actions necessary to achieve the desired organisational goals, and information that measures the movement of the firm towards those goals. The onus is very much on the management accountant to develop new costing systems and performance measures that will support world-class manufacturing and world-class management.

8.9 Activity-based costing

8.9.1 Traditional versus activity-based cost

We have seen earlier in this text that the modern business environment is one which is much more dynamic than that in which traditional management accounting practices were developed. This applies also to the manner in which we determine the costs of individual products and services.

Traditional cost accounting involves attributing indirect costs to individual products on the basis of an overhead absorption base related to some proxy such as direct labour hours or machine hours ('volume related measures'). One can apply this approach with varying degrees of sophistication but it is unlikely to give an unambiguous result in modern circumstances.

In the 'new manufacturing' environment a high proportion of costs are indirect and the only meaningful way to attribute such costs to individual products is through a study of the activities that give rise to them. One is seeking an approach to product costing that reflects the manner in which costs are actually incurred and the question is whether or not traditional absorption costing offers such an approach for both decision making and performance evaluation purposes. This last question can be split into three strands:

(a) Are production overheads significant relative to total full absorption cost?
(b) Is there any causal link between the incurrence of these production overhead costs and production volume, and hence products?
(c) Are there causal links between the incurrence of production overhead and particular product that are not volume-related?

Part (a) is important in the context of materiality. If production overhead costs represent only 1 per cent of total production costs, the argument as to how that 1 per cent should be spread among products would not have the same significance as one relating to the spreading of an amount representing, say, 50 per cent of total production costs. In fact, overhead costs have become an increasing proportion of production costs during this century, and in many industries now represent the single largest element of product costs. This change in the make-up of production costs has two main causes: the nature of the production process itself, and the nature of competition faced by firms.

In terms of production processes, it would be hard to think of a single industry in which there has not been a significant shift from the use of human labour to the use of machinery. The effect has been a reduction in the cost of direct labour and an increase in long-term variable production overhead (fixed costs) through increased depreciation charges. Furthermore, modern manufacturing machinery tends to be much more accurate than manual labour, so wastage of material has also declined over time, leading to a further fall in the proportion of direct costs in the total mix.

In the early part of this century, much competition was on the basis or price. While price remains an important competitive weapon in many industries, there are also other factors that determine a firm's success. As we saw in an earlier chapter, businesses now compete on time, quality, innovation, etc. This had led many producers to offer a great variety of products, and necessitated very complex production schedules. This complexity and diversity has also been responsible for some of the increase in production overheads in recent decades.

It will readily be appreciated that, as overheads have become an increasing proportion of total production cost, any arbitrariness in the method in which they are charged to products assumes increasing significance in a decision-making context.

Part (b) asked whether there was any causal link between the incurrence of production overhead costs and production volume, and hence products. As noted above, some short-term variable overheads are observed to change in response to a volume-related measure, such as direct labour or machine hours worked – that is, there is a causal link between production volume and the level of production overhead cost incurred. We gave the example of the volume-related activity of running a machine, which results in the variable overhead cost of power being incurred. However, other production overhead expenditure, such as the cost of material procurement, clearly has no direct relationship with the number of direct labour hours worked or the number of hours machines are operating. Nevertheless, the production volume-related basis that appears to drive some short-term variable overheads is usually used to absorb all overheads. It can be argued that this is the only sensible way to operate: by definition, the long-term variable production overheads are fixed in the short term; in the short term, therefore, there can be no causal link between any particular volume-related activity and the particular overheads incurred. Any absorption of cost must be arbitrary, but an absorption must be made nevertheless in order to meet financial accounting requirements. However, it follows that the information is unlikely to be useful for decision-making purposes.

Part (c) asked whether there were causal links between the incurrence of production overhead and particular product that were not volume-related. In many companies, overhead continues to be absorbed by products on the same basis year after year, with little thought being given to the appropriateness for decision-making of this basis in a situation in which overhead is increasing relative to direct cost. However, the activity-based costing approach is based on the premise that there may be a causal link between these overheads and individual activities, particularly when a perspective of more than one year is taken.

We must conclude that traditionally calculated product costs are not useful for decision-making, as they are unable to provide satisfactory explanations for the behaviour of costs. This does not mean, however, that ABC costs, without modification, are decision-relevant.

8.10 Transaction analysis and cost drivers

As noted above, overhead in traditional systems is absorbed by products using volume-related measures. The activity-based approach, where appropriate, seeks explanations other than volume for the level of overhead. In this context, it is recognised that overhead costs are incurred in carrying out a number of different types of transactions. These have been summarised as follows:

(i) logistical transactions, that is, those activities that relate to the organisation of the flow of materials and other resources throughout the production process;
(ii) balancing transactions, that is, those that relate to ensuring that the supply of resources is matched with the demand for them;
(iii) quality transactions, that is, those concerned with ensuring output conforms to requirements;
(iv) change transactions, that is, those concerned with meeting customers' requirements for altered specifications, product designs, delivery dates, etc.

The important point about the transactions identified by Miller and Vollman is that the primary driver behind them is usually not production volume. For example, logistical and balancing transactions are likely to be driven by the number of batches produced, rather than the total number of individual units. Similarly, change transactions might be related to the number of customers and number of different product types, rather than the volume of production. By identifying non-volume-related drivers, a better understanding of the behaviour of costs in the long term is provided. Such an analysis also facilitates the aggregation of cost by cost object, such as distribution channel, which again provides a better understanding for the management of the business than traditional approaches are able to produce.

The resources necessary to carry out the above transactions will tend to be variable in the short term only in an upward sense. As the number of customers increases, the potential for change transactions, for example, also increases. If the number or mix of customers were to change in the short term, in such a way that the overall workload is reduced, it is unlikely that any of the personnel employed to carry out the change transactions would be dismissed. Similarly, a short-term increase in the workload might be absorbed by existing staff, and overtime may be worked, which may or may not increase costs, depending on individual contracts. However, if the increased workload persists, more staff will eventually be hired. As the volume of these change transactions increases, the total overhead cost of the business will increase. In a traditional costing system (Figure 8.3), the increased cost of these transactions is automatically transferred to particular products by the use of a volume-related absorption rate. However, as noted above, such costs are not primarily volume-driven. It is conceivable that, for example, small batches of highly customised products could give rise to costs in terms of all four types of transactions listed above. Through the operation of a traditional costing system, the increased costs associated with carrying out these small-batch transactions will be spread among all the products on an inappropriate volume-related basis, such as direct labour hours or machine hours. It is this sort of anomaly that has led to the criticism of traditional costing as being arbitrary in its cost absorption, and thus providing information that is not useful for decision-making.

Activity-based costing (ABC) identifies the activities that cause cost to be incurred, and searches for the fundamental cost drivers of these activities. Once the activities and their drivers have been identified, this information can be used to attach overhead to those cost objects (e.g. products) that have actually caused the cost to be incurred. In comparing the activity-based costing approach with the traditional approach, the obvious starting point is a comparison of the costs of individual products as determined under a traditional costing system with those same costs under an ABC system (Figure 8.4). However, this would be a pointless exercise if it simply stopped there: for a given sales revenue and a given level of total costs, the overall company profit will be precisely the same whatever method of allocation is used to allocate the total cost between individual product lines.

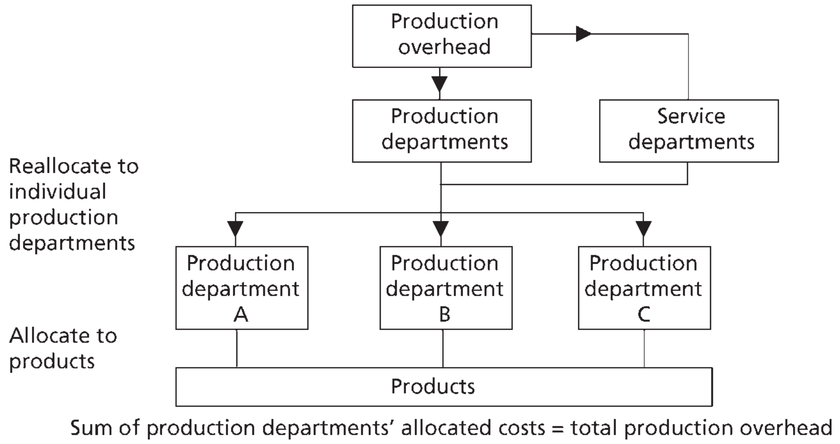


Figure 8.3 Traditional product costing system

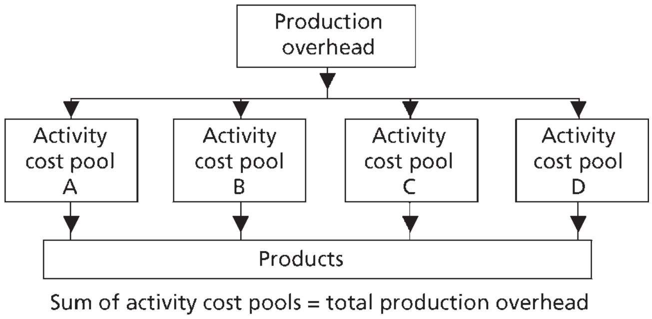


Figure 8.4 Activity-based costing system

8.11 Favourable conditions for ABC

The purpose of moving from a traditional costing system to an ABC system must therefore be based on the premise that the new information provided will lead to action that will increase the overall profitability of the business. This is most likely to occur when the analysis provided under the ABC system differs significantly from that which was provided under the traditional system, which is most likely to occur under the following conditions:

(i) When production overheads are high relative to direct costs, particularly direct labour.
(ii) Where there is great diversity in the product range.
(iii) Where there is considerable diversity of overhead resource input to products.
(iv) When consumption of overhead resources is not driven primarily by volume.

Information from an ABC analysis may indicate opportunities to increase profitability in a variety of ways, many of which are long term. For example, an activity-based analysis often reveals that small-batch items are relatively expensive to produce, and are therefore unprofitable at current prices. A number of responses to this information could be adopted. The first response might be to consider stopping production of such items, and concentrate on the apparently more profitable high-volume lines. Another approach would be to investigate how the production process could be organised in such a way as to bring the cost of producing small-batch items closer to that of producing high-volume goods. By identifying the cost of carrying out particular activities, the new approach provides opportunities for directing attention to matters of cost control. It can therefore be viewed as a much longer-term technique then the word 'costing' in the title suggests. The establishment of an ABC product cost may thus be considered to be merely the beginning of a process, rather than an end in itself. The recent use of the term activity-based management suggests this forward-looking orientation, which is assuming increasing importance. Activity-based management is discussed briefly in a later section.

8.12 Establishing an activity-based product cost

8.12.1 Comparison with traditional costing

Figures 8.4 and 8.5 illustrate the differences between a traditional product costing system and an ABC system.

A simplified description of the various steps associated with the operation of the basic ABC approach, and a comparison with the traditional coasting costing approach, is given below. An example is set out in Section 8.12.40.

Step 1 – Identify the main production-related activities of the organisation. In a traditional cost system, these will often be related to the department, for example, machining, assembly, ordering, receiving, packing, despatching, etc. Note that, for ABC, 'activities' can apply to services as well as to products.

Step 2 – Identify the cost (cost pool) of each of the activities identified in Step 1. This analysis would include the direct costs of the activities, and might include some apportioned costs, such as recent and rates, but it would exclude costs that would have been allocated to departments under a traditional system. For example, under the latter, a production department would be charged an allocation to cover the cost of the receiving department, but in an activity-based system, the receiving department either becomes an activity cost pool in itself, or is part of a greater activity cost pool and is not reallocated to production departments.

Step 3 – Determine the cost driver for each activity identified in Step 1. The cost driver is the thing that best explains why resources are consumed by a particular activity, and therefore why the activity incurs cost, that is, it provides an explanation of the size of the cost pool. For example, although the resources consumed by the order processing activity can be explained by the number of orders processed, a more precise explanation might be the number of items processed therein, that is, an order for one item will usually take less processing than an order for ten items, but ten single-item orders will require more processing than an order for ten items. A decision must be made as to what constitutes the most appropriate driver.

Step 3a – Select the activity cost pools and cost drivers that will be used within the system. This step reflects the need for some compromise within an activity-based costing system. As we have just seen, in order processing, the driver could be the number of orders processed, or the number of items per order. The outcome of the process will clearly be dependent on the particular decision made. The diagram above does not show step 3a separately, but makes the implicit assumption that a driver can be identified.

Step 4 – Calculate a cost driver rate for each activity cost pool in the same way as an overhead rate is calculated in a traditional system.

$$\text{Cost driver rate} = \frac{\text{Activity cost pool}}{\text{Activity driver}}$$

Step 5 – Apply the activity cost driver rates to products (cost units) to arrive at an activity-based product cost.

8.12.2 Analysis of activities

The original impetus for the adoption of activity-based costing is often the desire to provide a more accurate unit product cost. Indeed, the first referene to ABC, which appeared in the Official Terminology as late as 1991, is consistent with this objective. ABC was defines as: 'Cost attribution to cost units on the basis of benefit received from indirect activities, e.g. ordering, setting up, and assuring quality.' However, any unit cost, no matter how it is derived, can be misinterpreted. There is temptation to adopt a simplistic approach, which would say, for example, that if it cost £1,000 to produce ten units, it will cost £10,000 to produce 100 units. As we know, this in incorrect in the short term, owing to the existence of short-term fixed costs. The ABC approach does not eliminate this problem any more than the traditional approach. The alternative to presenting full absorption costing information in a traditional costing system has been to provide the user with a statement which distinguishes clearly between the variable cost of production and the fixed cost of production. This carries an implication for the decision-maker that if the variable cost of production is £50 for ten units, the additional cost of producing a further 40 units will be 40 × £5 = £200. Activity-based costing, on the other hand, can provide the user with a more sophisticated breakdown of cost. This breakdown relates cost to the level of activities undertaken. The structure of reporting will vary from company to company, but Cooper (1992) has suggested that four levels of activity, which he terms a hierarchy of cost, will commonly be found in practice. These are shown below:

(i) *Unit-level activities*. These are activities where the consumption of resources is very strongly correlated with the number of units produced. Costs traditionally defined as direct costs would fall into this category, for example, direct material and direct labour.

(ii) *Batch-level activities*. Some activities – for example, machine set-up, materials handling and batch inspection – consume resources in proportion to the number of batches produced, rather than in proportion to the number of units produced. By identifying the consumption of resources at a batch rather than a unit level, it is easier than in a traditional costing system for a user to visualise the changing cost that will come about in the long term by changing a product mix or production schedule.

(iii) *Product-level activities*. Consumption of resources by, for example, administration, product specification or purchasing, may be related to the existence of particular products. If the activity is performed to sustain the existence of a particular product line, it is a product-level activity.

(iv) *Facility-level activities*. Even within an ABC system, it is accepted that there are some costs that relate simply to being in business and that therefore cannot be related in any way to the production of any particular product line. Grounds maintenance, plant security and property taxes would be examples of this type of cost.

Consideration of (i)–(iv) shows that the difference between traditional costing and ABC costing will be dependent on the proportion of overhead cost that falls into each of the four categories. If this overhead is made up primarily of (i) and (iv), it is obvious that the traditional approach and the ABC approach will lead to very similar product costs. However, if the bulk of overhead cost falls into category (ii) and/or category (iii), there will be a very significant difference between the two.

Exercise

A company produced three products, the standard costs of which are shown below:

	P	*R*	*S*
	£	£	£
Direct material	50	40	30
Direct labour (@ £10/hour)	30	40	50
Production overhead*	30	40	50
	110	120	130

*Absorbed on basis of direct labour hours

Quantity produced/sold (units)	10,000	20,000	30,000

The company wishes to introduce ABC, and has identified two major cost pools for production overhead and their associated cost drivers.

Information on these activity cost pools and their drivers is given below:

Activity cost pool	*Cost driver*	*Cost associated with activity cost pool*
Receiving/inspecting quality assurance	Purchase requisitions	£1,400,000
Production scheduling/machine set-ups	Number of batches	£1,200,000

Further relevant information on the three products is also given below:

	P	*R*	*S*
Number of purchase requisitions	1,200	1,800	2,000
Number of set-ups	240	260	300

From the information given, calculate the activity-based production cost of products, *P*, *R* and *S*. Also, comment on the differences between the original standard costs and the activity-based costs you calculate.

Solution

We are in a position to move straight to Step 4, that is, the calculation of the cost-driver rates.

Cost-driver rate for receiving/inspecting quality assurance per purchase requisition $= \dfrac{£1{,}400{,}000}{5{,}000} = £280$

Cost-driver rate for production schedling/machine set-ups per set-up $= \dfrac{£1{,}200{,}000}{800} = £1{,}500$

Therefore ABC production costs of these products are:

	P	*R*	*S*
	£	£	£
Direct material	50.00	40.00	30.00
Direct labour	30.00	40.00	50.00
Production overhead:			
Receiving/inspecting/quality assurance			
£280 × 1,200/10,000	33.60		
£280 × 1,800/20,000		25.20	
£280 × 2,000/30,000			18.66
Production scheduling/machine set-ups			
£1,500 × 240/10,000	36.00		
£1,500 × 260/20,000		19.50	
£1,500 × 300/10,000			15.00
	149.60	124.70	113.66

Comparison of the ABC cost with the original traditionally calculated cost reveals that product *S* was significantly overcosted by the traditional system relative to the ABC system, while product *P* was seriously undercosted. Product *S* is high-volume product with a high direct labour content, while product *P* is a low-volume product with a low direct labour content; this result is therefore to be expected. The activities in this simple example are both batch-related, not unit-related. ABC reflects this reality in its allocation of production overhead costs to the product. The traditional approach allocated all production overhead costs to products as if the overheads were driven by unit-level activities, that is, the number of direct labour hours worked – with the inevitable costing consequence seen above.

You should note that this example, with only two activity cost pools, will almost certainly have necessitated some arbitrary cost allocations. All that is being claimed is that the resulting

ABC costings give a better insight into the cost of producing the products than traditional costs.

The debate as to whether ABC is actually a new technique, or whether it simply encourages a more accurate tracing of costs to products in a manner that is perfectly consistent with the traditional aproach, is interesting but sterile – and misses the point of ABC, as is demonstrated in the rest of this chapter. Nevertheless, it is worth pointing out that ABC product costs are full absorption costs and, as such, suffer from the same type of deficiencies in a decision-making context as do traditional full absorption costs – they are historical, based on current methods of organisation and operation and, at the level of the product, contain allocations of joint/common costs, a point which is illustrated in the comprehensive example of ABC appearing later in this chapter. However, it can be strongly argued that ABC has an important 'attention-directing' role to play in both cost management and dicision-making. Indeed, the cost management, or monitoring, role of ABC is explicity acknowledged in the definition which appears in the latest CIMA Official Terminology:

ABC: An approach to the costing and monitoring of activities which involves tracing resource consumption and costing final outputs. Resources are assigned to activities and activities to cost objects based on consumption estimates. The latter utilise cost drivers to attach activity costs to outputs.

This particular role is discussed below.

In decision-making, it is arguable that activity-based costs are much more helpful than traditional costs in determining the costs relevant for decision-making and, more particularly, in drawing attention to the likely impact on long-run variable costs of short-term decisions. This point is discussed further later in the chapter.

Exercise – activity-based costing

(a) Distinguish between:
   (i) short-run variable costs and long-run variable costs, and give an example of each;
   (ii) the marginal cost and the average cost of production, and describe the conditions likely to cause such costs to vary.

(b) Explain how long-run variable production costs are allocated to cost units in traditional costing methods. In what ways are modern manufacturing methods making this approach less relevant?

8.12.3 Cost management and ABC

ABTs have a wide range of applications in the areas of business planning and decision-making. The application of an awareness of operational activities in the management of a business is known as 'Activity-Based Management'. You will encounter the approaches which fall under the ABM heading as part of your studies for CIMA's Paper P2, Management Accounting – Decision Making.

8.12.4 A comprehensive example of ABC

Exercise section I: traditional analysis

A company manufactures three products – *X*, *Y* and *Z*, whose direct costs are given below:

	X	*Y*	*Z*
	£	£	£
Direct material	67.92	63.27	56.79
Direct labour (@ £3/hour):			
Machining	13.08	14.73	17.01
Assembly	24.00	27.00	31.20
	105.00	105.00	105.00

The data below was used in calculating the direct labour costs above, and will be used to determine the production overhead charged to each product under the 'traditional' costing method.

	X	*Y*	*Z*	*Total*
Machine time (hours)	11.00	9.00	8.00	
Direct labour (hours)				
Machining	4.36	4.91	5.67	
Assembly	8.00	9.00	10.40	
Production (units)	50,000	30,000	16,250	
Total machine hours	500,000	270,000	130,000	900,000
Total labour hours				
Machining	218,000	147,300	92,137	457,437
Assembly	400,000	270,000	169,000	839,000
				1,296,437

Information on the company's overheads is as follows:

Production overhead	*£000*	*£000*
Indirect labour		
Machinery	900	
Assembly	600	
Purchasing/order processing	600	
Factory management	100	
		2,200
Power		
Machining	400	
Assembly	100	
		500
Indirect materials		
Machining	200	
Assembly	200	
Purchasing	100	
Factory management	100	
		600
Depreciation		
Machining	600	
Assembly	300	
Purchasing	200	
Building	400	
		1,500
Security		100
Grounds maintenance		100
Total production overhead		5,000

Prepare a traditional overhead analysis and calculate product costs for the three products. Assume that the machining department uses a machine hour absorption rate and the assembly department a labour hour rate.

✓ Solution

Step 1 – Assign production overhead to cost centres

	£000	£000
Machining		
Indirect labour	900	
Power	400	
Indirect materials	200	
Depreciation	600	
		2,100
Assembly		
Indirect labour	600	
Power	100	
Indirect materials	200	
Depreciation	300	
		1,200
Purchasing/order processing		
Indirect labour	600	
Indirect materials	100	
Depreciation	200	
		900
Factory management		
Indirect labour	100	
Indirect materials	100	
Depreciation	400	
Security	100	
Ground maintenance	100	
		800
Total production overhead		5,000

Step 2 – Reallocate services department costs to production departments on a suitable basis

	£000	£000
Machining		
Indirect costs (from step 1)	2,100	
Reallocation of service centre costs	600	
		2,700
Assembly		
Indirect costs (from step 1)	1,200	
Reallocation of service centre costs	1,100	
		2,300
Purchasing/order processing		
Indirect costs (from step 1)	900	
Reallocate on basis of direct labour cost	(900)	
		–
Factory management		
Indirect costs (from step 1)	800	
Reallocate on basis of direct labour cost	(800)	
		–
Total production overhead		5,000

Step 3 – Calculate absorption rate
Machining: based on total machine hours

$$\frac{\text{Total overhead costs}}{\text{Total machine hours}} = \frac{£2{,}700{,}000}{900{,}000} = £3 \text{ per machine hour}$$

Assembly: based on total assembly labour hours

$$\frac{\text{Total overhead costs}}{\text{Total labour hours}} = \frac{£2{,}300{,}000}{839{,}000} = £2.74 \text{ per machine hour}$$

Step 4 – Calculate full product cost

	X	*Y*	*Z*
	£	£	£
Direct cost (as before)	105.00	105.00	105.00
Production overhead:			
Machining	30.00	27.00	24.00
Assembly	21.92	24.66	28.50
	156.92	156.66	157.50

Exercise section II: ABC analysis – allocating all costs to products

The information and data in the following tables will be used to determine cost drivers and calculate overheads.

Product X	*Product Y*	*Product Z*
High volume	Medium volume	Low volume
Large batches	Medium batches	Small batches
Few purchase orders placed	Medium purchase orders placed	Many purchase orders placed
	Medium components	Many components
Few customer orders placed	Medium customer orders placed	Many customer orders placed

	Product X	*Product Y*	*Product Z*	*Total*
Typical batch size	2,000	600	325	
No. of production runs	25	50	50	125
No. of inspections	25	50	50	125
Purchase orders placed	25	100	200	325
Customer orders received	10	100	200	310

Prepare an ABC analysis and calculate product costs.

Solution

Step 1 – Identify production-related activities

	£000	£000
Analysis of indirect labour		
Machining		
Supervision	100	
Set-up	400	
Quality control	400	
		900
Assembly		
Supervision	200	
Quality control	400	
		600
Purchasing/order processing		
Resource procurement	300	
Customer liaison/expediting	300	
		600
Factory management		
General administration		100
		2,200

Activities

1. Machining
2. Machine set-up
3. Machining quality control
4. Assembly
5. Assembly quality control
6. Resource procurement
7. Customer liaison/expediting
8. Factory management

The table below shows the specific details of:

Step 2 – identify the cost of activities;
Step 3 – identify cost driver;
Step 4 – reallocate factory management costs pro rata to other costs

STEP 2	*£000*	*Total £000*	*STEP 3*	*STEP 4 £000*	*Total £000*
1. Machining					
Supervision	100				
Power	400				
Indirect materials	100				
Depreciation	600				
		1,200	Machine running time	230	1,430
2. Machine set-up					
Indirect labour	400				
Indirect materials	50				
		450	No. of set-ups (batch size)	85	535
3. Machining quality control					
Indirect labour	400				
Indirect materials	50				
		450	No. of inspections (batch size)	85	535
4. Assembly					
Supervision	200				
Power	100				
Indirect meterials	100				
Depreciation	300				
		700	Direct labour hours worked	135	835
5. Assembly quality control					
Indirect labour	400				
Indirect materials	100				
		500	No. of inspections (batch size)	95	595
6. Resource procurement					
Indirect labour	300				
Indirect materials	50				
Depreciation	100				
		450	No. of orders placed (product batch size)	85	535
7. Customer liaison/expediting					
Indirect labour	300				
Indirect materials	50				
Depreciation	100				
		450	No. of orders rec'd (product)	85	535
8. Factory management (see note)					
Indirect labour	100				
Indirect materials	100				
Depreciation	400				
Security	100				
Grounds maintenance	100				
		800	No obvious (size of business?)	(800)	0
		5,000		0	5,000

There is no obvious driver for the common costs collected under the heading 'factory management' so they have been reallocated to other activity cost pools on the basis of their total costs.

Step 5 – Calculate overhead from cost drivers

Rate per machine hour

$$\frac{\text{Total overhead costs}}{\text{Total machine hours}} = \frac{£1{,}430{,}000}{900{,}000} = £1.59 \text{ per machine hour}$$

Rate per set-up

$$\frac{\text{Total overhead costs}}{\text{Total set-ups}} = \frac{£535{,}000}{125} = £4{,}280 \text{ per batch}$$

Rate per machining inspection

$$\frac{\text{Total overhead costs}}{\text{Total inspections}} = \frac{\pounds 535{,}000}{125} = \pounds 4{,}280 \text{ per batch}$$

Assembly rate per direct labour hour

$$\frac{\text{Total overhead costs}}{\text{Total assembly hours}} = \frac{\pounds 835{,}000}{839{,}000} = \pounds 1.00 \text{ per labour hour}$$

Rate per assembly inspection

$$\frac{\text{Total overhead costs}}{\text{Total inspections}} = \frac{\pounds 595{,}000}{125} = \pounds 4{,}760 \text{ per batch}$$

Rate per order placed

$$\frac{\text{Total overhead costs}}{\text{Total orders placed}} = \frac{\pounds 535{,}000}{325} = \pounds 1{,}646 \text{ per order}$$

Rate per order received

$$\frac{\text{Total overhead costs}}{\text{Total orders received}} = \frac{\pounds 535{,}000}{310} = \pounds 1{,}726 \text{ per order}$$

Step 6 – Calculate full product cost

	X	*Y*	*Z*
	£	£	£
Direct costs (as before)	105.00	105.00	105.00
Overhead			
Per machine hour	15.90	14.31	12.72
Per set-up			
£4,280/2,000	2.14		
£4,280/600		7.13	
£4,280/325			13.17
Per machine inspection			
£4,280/2,000	2.14		
£4,280/600		7.13	
£4,280/325			13.17
Assembly rate @ £1 per DLH	8.00	9.00	10.40
Per assembly inspection			
£4,760/2,000	2.38		
£4,760/600		7.93	
£4,760/325			14.65
Per order placed			
£1,646 × 25/50,000	0.82		
£1,646 × 100/30,000		5.49	
£1,646 × 200/16,250			20.26
Per order received			
£1,726 × 10/50,000	0.35		
£1,726 × 100/30,000		5.75	
£1,726 × 200/16,250			21.24
Overhead subtotal	31.73	56.74	105.61
Direct costs + overheads	136.73	161.74	210.61

Rationalisation of overhead charged

Product	*Overhead (£)*	*production*	*Total (rounded)*
	£		*£000*
X	31.73	50,000	1,580
Y	56.74	30,000	1,700
Z	105.61	16,250	1,720
			5,000

Comparison of product costs under each method

	X	*Y*	*Z*
'Traditional'	156.92	156.66	157.50
Activity-based costing	136.73	161.74	210.61

Product *Z* – with a low total production volume, many purchase and customer orders, and frequent small production runs – has a significantly higher cost under ABC than under the 'traditional' method. The opposite is the case with product *X*, which has a high total production volume, relatively few orders and large production runs.

Exercise section III: ABC analysis – excluding facility-level costs

In the calculation in section II the ABC costs, like traditional costs, contain an allocation of the factory management costs within each cost driver – or absorption – rate. Factory management costs were allocated to other activities simply because of the lack of an identifiable driver with which to associate them with products. Factory management is a 'facility-level' activity and, as such, cannot be identified directly with another activity, and certainly not with a particular product.

Despite the lack of an identifiable driver, it can be argued that this cost should not be identified arbitrarily with the other activities, but should be left within its own cost pool.

If this is done, Step 4 in the ABC analysis above would be omitted, and the calculation would proceed as follows:

ABC analysis when factory management costs are not reallocated to other activities
This shows the detail for:

Step 2 – Identify the cost of activities
Step 3 – Identify cost drivers

STEP 2	*£000*	*STEP3*
1. Machining	1,200	Machine running time
2. Machine set-up	450	No. of set-ups (batch size)
3. Machining quality control	450	No. of inspections (batch size)
4. Assembly	700	Direct labour hours worked
5. Assembly quality control	500	No. of inspections (batch size)
6. Resource procurement	450	No. of orders placed (product/batch size)
7. Customer liaison/expediting	450	No. of orders received (product)
8. Factory management	800	No obvious driver (size of business)
	5,000	

Step 4 – Omitted
Step 5 – Calculate overhead from cost drivers

Rate per machine hour

$$\frac{\text{Total overhead costs}}{\text{Total machine hours}} = \frac{£1{,}200{,}000}{900{,}000} = £1.33 \text{ per machine hour}$$

Rate per set-up

$$\frac{\text{Total overhead costs}}{\text{Total set-ups}} = \frac{£450{,}000}{125} = £3{,}6000 \text{ per batch}$$

Rate per machining inspection

$$\frac{\text{Total overhead costs}}{\text{Total inspections}} = \frac{£450{,}000}{125} = £3{,}600 \text{ per batch}$$

Assembly rate per direct labour hour

$$\frac{\text{Total overhead costs}}{\text{Total assembly hours}} = \frac{£700{,}000}{839{,}000} = £0.83 \text{ per labour hour}$$

Rate per assembly inspection

$$\frac{\text{Total overhead costs}}{\text{Total inspections}} = \frac{£500{,}000}{125} = £4{,}000 \text{ per batch}$$

Rate per order Placed

$$\frac{\text{Total overhead costs}}{\text{Total orders placed}} = \frac{£450{,}000}{325} = £1{,}385 \text{ per order}$$

Rate per order received

$$\frac{\text{Total overhead costs}}{\text{Total orders received}} = \frac{£450{,}000}{310} = £1{,}452 \text{ per order}$$

Factory management costs of £800,000 have no obvious driver, and are not included in the costs above.

Step 6 – Calculate full product cost

	X	*Y*	*Z*
	£	£	£
Direct costs (as before)	105.00	105.00	105.00
Overhead			
Per machine hour	13.33	12.00	10.67
Per set-up			
£3,600/2,000	1.80		
£3,600/600		6.00	
£3,600/325			11.08
Per machine inspection			
£3,600/2,000	1.80		
£3,600/600		6.00	
£3,600/325			11.08
Assembly rate @ £0.83 per DLH	6.67	7.51	8.67
Per assembly inspection			
£4,000/2,000	2.00		
£4,000/600		6.67	
£4,000/325			12.31
Per order placed			
£1,385 × 25/50,000	0.69		
£1,385 × 100/30,000		4.62	
£1,385 × 200/16,250			17.05
Per order received			
£1,452 × 10/50,000	0.29		
£1,452 × 100/30,000		4.84	
£1,452 × 200/16,250			17.87
Overhead subtotal	26.58	47.64	88.73
Direct costs + overheads	131.58	152.64	193.73

Rationalisation of overhead charged

Product	*Overhead*	*Production*	*Total*
	£		*£000*
X	26.58	50,000	1,329
Y	47.64	30,000	1,429
Z	88.73	16,250	1,442
			4,200

In this second approach, the £800,000 factory management costs have been left unallocated. Obviously, for stock valuation purposes, it would be necessary to allocate them to products, albeit on an arbitrary basis. They could be allocated to products in proportion to the allocation of other overhead costs, as shown below:

Product	*Total Overhead (1)*	*Factory management cost (2)*	*Total production overhead allocated (1) + (2)*
	£000	*£000*	*£000*
X	1,329	253	1,582
Y	1,429	272	1,701
Z	1,442	275	1,717
	4,200	800	5,000

Apart from minor rounding differences, the total allocation as shown in the final column above is identical to that in the same column in section II, and thus the total overhead charged to the three products is identical under both approaches. However, the second approach may be much more helpful to management by directing attention to the resource implications of manufacturing particular products. For example, the table below shows product Y's comparative costs.

	Factory management costs allocated to other activities	*Factory management treated as a separate activity*	
ABC COST OF PRODUCT *Y*	*£*	*£*	
Direct costs (as before)	105.00	105.00	
Overhead			
Unit-level activity cost			
Per machine hour	14.31	12.00	
Assembly rate	9.00	7.51	
Batch-level activity cost			
Per set-up	7.13	6.00	
Per machine inspection	7.13	6.00	
Per assembly inspection	7.93	6.67	
Per order placed	5.49	4.62	
Product-level activity cost			
Per order received	5.75	4.84	
Overhead subtotal	56.74	47.64	
Facility-level activity cost			
Factory management costs:		9.10	(£272,000 ÷ 30,000)
Total production overhead	56.74	56.74	
Direct costs + overheads	161.74	161.74	

In the first analysis, the cost-driver rates do not give an accurate reflection of the resource consumption implications of performing particular activities, as they contain an arbitrary allocation of factory management costs. The second analysis provides cost-driver rates that do reflect truly the long-run costs of performing particular activities. This information may be useful to management in identifying cost-reduction opportunities, as well as for product costing purposes.

In addition to identifying 'factory management' as a separate cost pool, the table above has also grouped costs in accordance with the hierarchy outlined above. This provides management with a clear view of the resource consumption that will result in the long run, if production of *Y* is maintained at 30,000 units and the organisation of production remains the same. If the volume of production of *Y* were to change, both ABC analyses draw management's attention to the fact that the change in overhead resource consumption brought about by the change in volume would not be proportionate to the change in the number of units produced. In the first analysis, even the resource consumption of unit-level activities would not change proportionately to the change in production volume, as there is no reason to expect the facility-level costs of factory management, included therein via the allocation process, to change proportionately with change in volume. In the second analysis, where there are no arbitrary cost allocations, the resource consumption of unit-level activities would change proportionately with the change in volume. However, the change in consumption of the other overhead resources would depend on precisely how the change in volume was achieved – for example, were there more batcher? For example, volume could be expanded by increasing the sized of each batch of *Y*, in which case the consumption of batch-level resources would remain constant, despite the rise in volume. ABC analyses thus provide a clearer insight into the way in which resource consumption, and ultimately cost, will change as a result of the specific changes in activities that accompany a particular change in volume.

8.12.5 Variance analysis and ABC

An ABC approach to the analysis of overhead costs is possible. This follows the ABC logic that all overheads are variable if one understands what they vary with. Let us illustrate the approach with a simple example.

Example

ABC Ltd produces the Unit and all overheads are associated with the delivery of Units to its customers. Budget details for the period include £8,000 overheads, 4,000 Units output and 40 customer deliveries. Actual results for the period are £7,800 overheads, 4,200 units output and 38 customer deliveries.

The overhead cost variance for the period is :

Actual cost	£	7,800
Standard cost		8,400 (4,200 Units at £2 per Unit standard cost)
Cost variance		600 Fav

Applying the traditional fixed overhead cost variance analysis gives the following result :

Volume variance	£	400 Fav (£8,400 standard cost – £8,000 budget cost)
Expenditure variance		200 Fav (£8,000 budget cost – £7,800 actual)
Cost variance		600 Fav

Adopting an ABC approach gives the following result :

Activity variance	£	800 Fav ((42 standard – 38 actual deliveries) × £200)
Expenditure variance		200 Adv ((38 deliveries x £200) - £7,800)
Cost variance		600 Fav

The ABC approach is based on an assumption that the overheads are essentially variable (but variable with the delivery numbers and not the Units output). The ABC cost variances are based on a standard delivery size of 100 Units and a standard cost per delivery of £200. Both of these figures are derived from the budget. The activity variance reports the cost impact of undertaking more or less activities than standard and the expenditure variance reports the cost impact of paying more or less than standard for the actual activities undertaken.

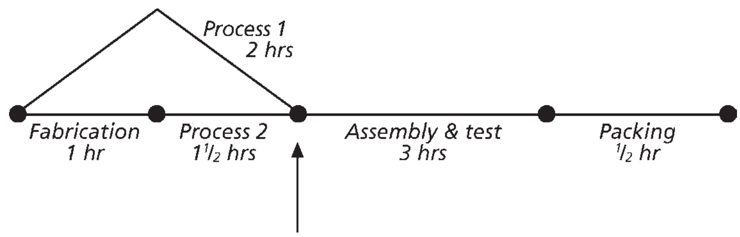


Figure 8.5 Network chart of a manufacturing process

8.13 Throughput accounting

In this chapter we are discussing the development of synchronous manufacturing, and the identification of bottleneck resources. In this context we will now go on to learn about throughput accounting, a new type of management accounting system that has been developed to provide management information that is more suited to the new manufacturing philosophy.

8.13.1 The theory of constraints

The concept behind the throughput accounting system was first formulated and developed by Goldratt and Cox (1986) in the USA in a book called *The Goal*. Godlratt (1990) developed the concept and eventually gave it the name the theory of constraints (TOC) by which name it is known today in the USA. The theory was picked up and turned into an accounting system in UK, where it has become known as throughput accounting (TA). Goldratt and Cox developed the technique to help managers improve the overall profitability of the firm. The theory focuses attention on constraints or bottlenecks within the organisation which hinder speedy production. This main concept is to maximise the rate of manufacturing output, that is, the throughput of the organisation. The idea being TOC is that raw materials should be turned into products that are immediately shipped to customers at the greatest possible speed, in a similar way to JIT system.

The important concept behind TOC is that the production rate of the entire factory is set at the pace of the bottleneck – the constraining resource. Hence, in order to achieve the best results TOC emphasises the importance of removing bottlenecks or, as they are called in the USA, binding constraints from the production process. If they cannot be removed they must be coped with in the best possible way so that they do not hinder production unduly. In order to do this, network diagrams need to be drawn to identify the bottlenecks or binding constraints. Figure 8.5 illustrates a simple network chart where the assembly and test process is the bottleneck.

In Figure 8.5 it can be seen that the assembly and test process is the bottleneck and that in order to maximise throughput, a buffer stock is needed prior to the assembly and test process so that its employees never have to wait for components from prior processes.

TOC identifies three types of cost.

Throughput contribution = sales revenue – completely variable costs this is usually = sales revenue – direct material cost.
(Labour costs tend to be partially fixed and are excluded normally. Direct material cost includes purchased components and material handling costs.)
Conversion costs. These are all operating costs, excluding completely variable costs, which are incurred in order to produce the product, that is, labour and overhead, including rent, utilities and relevant depreciation.
Investments which include all stock, raw material, work-in-progress, finished goods, research and development costs, costs of equipment and buildings, etc.

The aim is to increase throughput contribution while decreasing conversion costs and investment costs. TOC is a short-term profit maximising technique that is very similar in approach to marginal costing. The only real difference is that the contribution may be more realistic in that all conversion costs are assumed to be fixed costs. Bottleneck decisions are in reality linear programming decisions as TOC attempts to do the following:

Maximise throughput contribution (sales revenue – direct materials)
Subject to:
Production capacity (supply constraints)
Production demand (demand constraints)

TOC is quite widely used in USA by companies such as Ford Electronics, General Motors and Avery Dennison, some of which claim that it has revolutionised their business. It is also used by a number of UK companies, sometimes in the form of throughput accounting, discussed next.

8.13.2 Throughput accounting

In the UK Galloway and Waldron (1988/89) developed TA from the theory of constraints. It is very similar in concept to TOC but it is an accounting-based technique whereas TOC is not. Eli Goldratt has always stressed the differences between the two systems. This may have been because he is not over-found of cost accountants or their methods and at one time one of his sayings was that 'cost accounting is the number 1 enemy of productivity'. TA is an extreme version of variable costing as, like TOC, it treats only direct material as variable and all labour and overhead costs as fixed. It operates through a series of ratios and differs from all other management accounting systems because it emphasises throughput first, stock minimisation second and cost control third.

Throughput accounting's primary concern is the rate at which a business can generate profits. In order to monitor this it focuses on the return on the throughput through the bottleneck resource.

Its key measure is:

$$\text{Return per time period} = \frac{\text{sales revenue} - \text{material costs}}{\text{time period}}$$

[Assuming materials are the only totally variable costs, Balderstone & Keef (1999)]

This ratio measure the value added by the organisation during a specific period of time, normally one hour. As time plays a crucial part in the ratio, managers' attention is automatically drawn to removing bottlenecks that might cause delay in the production process.

If one machine holds up production, because it is inefficient or has inadequate capacity, it is of little use to work the other machines at 100 per cent efficiency as the parts produced will be destined for stock until such time as the bottleneck machine can process them. Eventually when parts are spilling from the storeroom or piled all over the factory floor the efficient machines will have to stop altogether for a time, in order to allow the bottleneck machine to catch up. Therefore, there is nothing to be gained by measuring and encouraging the efficiency of machines that do not govern the overall flow of work. The same applies to the efficiency of production staff working in the non-bottleneck processes. In fact bonuses that are paid to encourage fast working are at best simply wasted and at worst result in increased storage costs. Furthermore, if workers are encouraged to work too quickly they are likely to produce more faulty goods and to waste materials. If the goods are destined for the storeroom, this increase in waste serves no purpose except to increase the average cost per unit.

A minor use of the return per time period ratio is to optimise production in the short term. Product return per time period ratio can be used in the same way as limiting factor ratios are used in order to plan how many units of each product should be made in order to maximise profit. The limiting factor is the first factor that prevents a manufacturing company expanding production towards infinity, and the ratio is contribution/limiting factor. The products are ranked according to this ratio; that is according to their use of the limiting factor, the one with the highest contribution per key or limiting factor being the best financially. In TA the key or limiting factor is the bottleneck. The return per time period ratio can be modified and used in a similar way to the P/V ratio. The amended ratio for ranking products is:

$$\text{Product return per minute} = \frac{\text{sales price} - \text{material costs}}{\text{Minutes on key/bottleneck resource}}$$

This is illustrated in detail in the following example.

Exercise – contrasting TA with the limiting factor approach

A company produces two products, A and B, the production costs of which are shown below:

	A	*B*
	£	£
Direct material cost	10	10
Direct labour cost	5	9
Variable overhead	5	9
Fixed overhead	5	9
Total product cost	25	37

Fixed overhead is absorbed on the basis direct labour cost.

The products pass through two processes, Y and Z, with associated labour cost of £10 per direct labour hour in each. The direct labour associated with the two products for these processes is shown below:

Process	*Time taken*	
	Product A	*Product B*
Y	10 min	39 min
Z	20 min	15 min

Selling prices are set by the market. The current market price for A is £65 and that for B, £52. At these prices, the market will absorb as many units of A and B as the company can produce. The ability of the company to produce A and B is limited by the capacity to process the products through Y and Z. The company operates a two-shift system, giving 16 working hours per day. Process Z is a single-process line and two hours in each shift will be downtime. Process Y can process two units simultaneously, although this doubles the requirement for direct labour. Process Y can operate for the full 16 working hours each day.

Requirement

What production plan should the company follow in order to maximise profits?

☑ Solution

In order to find the profit maximising solution in any problem, the constraints which prevent the profit from being infinite must be identified; the greater the number of constraints, the more difficult the problem is to solve. In the simplest case, where there is only one binding constraint, the profit maximising solution is found by maximising the contribution per unit of the scarce resource, that is, binding constraint. Linear programming may be used solve the problem where more than one constraint is binding for some, but not all, feasible solutions. Where the number of products is limited to two, and such constraints are relatively few in number, the problem can easily be expressed graphically to reveal the profit maximising solution, and/or the problem can be expressed in the form of a set of simultaneous equations. As the number of potentially binding constraints increases, the use of a computer becomes the only feasible way to solve the necessary number of simultaneous equations.

In this question, the only constraint is the company's ability to process the product. The total daily processing time for processes Y and Z are:

Maximum process time Y $= 2 \times 6$ hours $\times$ 60 mins $=$ 1,920 minutes
Maximum process time Z $=$ 12 hours $\times$ 60 mins $=$ 720 minutes

So the maximum number that could be produced of each of the two products is:

	Product A	*Product B*
	Maximum units	*Maximum units*
Y	$\frac{1{,}920}{10} = 192$	$\frac{1{,}920}{39} = 49.23$
Z	$\frac{720}{20} = 36$	$\frac{720}{15} = 48$

In the case of both products, the maximum number of units which can be produced in process Y exceeds the number that can be produced in process Z, and thus the capacity of process Y is not a binding constraint. The problem therefore becomes one of deciding how to allocate the scarce production capacity of process Z in such a way as to maximise profit.

Traditional approach – maximising the contribution per minute in process Z

Contribution of A = £65 (selling price) − £20 (variable cost) = £45
Contribution of B = £52 (selling price) − £28 (variable cost) = £24
Contribution of A per minute in process Z = £45 − 20 = £2.25
Contribution of B per minute in process Z = £24 − 15 = £1.60

The profit maximising solution is therefore to produce the maximum possible number of units of A, 36, giving a contribution of £45 × 36 = £1,620.

Throughput approach – maximising throughput per minute in bottleneck resource Z

Throughput of A = £65 (selling price) ÷ £10 (materical cost) = £55
Throughput of B = £52 (selling price) ÷ £10 (selling price) = £42

Contribution of A per minute in process Z = £55 ÷ 20 = £2.75
Contribution of B per minute in process Z = £42 ÷ 15 = £2.80

The profit maximising solution is therefore to produce the maximum number of units of B, 48, giving a throughput of £42 × 48 = £2,016.

It is clear that, given the different solutions, the two approaches cannot both lead to profit maximisation. Which technique is correct depends on the variability or otherwise of labour and variable overheads, which in turn depends on the time horizon of the decision. This type of profit maximisation technique is a short-term one and in today's world labour is likely to be fixed in the short term and so it can be argued that TA provides the more correct solution. Variable overheads would need to be analysed to assess their variability.

Marginal costing rose to popularity in the 1930s when labour costs were usually variable as the workforce was usually paid on a piece-rate basis. Since then textbooks, at least, have always assumed that labour is a variable cost in the short term. All that has happened with TA is that it tends to recognise the present reality, which is that most cost excluding materials are now fixed in the short term.

The marginal costing approach should of course be modified to accommodate this, as it requires only variable costs to be used to calculate contribution. If only material costs are variable then only those costs should be used in the calculation of contribution. Thus there should be no difference between the two systems in this respect.

8.13.3 Throughput cost control and effectiveness measures

Although the measure of return per period is a valuable measure for speeding up the flow of work and eliminating bottlenecks it ignores the costs involved in running the factory. There is little to be gained if throughput and, therefore, revenue are increased marginally but in order to achieve this labour and overhead costs increase considerably. The throughput accounting ratio measures this:

$$\text{TA ratio} = \frac{\text{Value added per time period}}{\text{Conversion cost per time period}} \text{ i.e. } \frac{\text{sales} - \text{materials}}{\text{labour} + \text{overhead}}$$

This ratio will obviously be greater than one for a profitable company and the aim will be to increase it to an acceptably high level. If a product has a ratio of less than one the organisation loses money every time it is produced.

Traditional efficiency measures such as standard costing variances and labour ratios can no longer be used with TA because traditional efficiency cannot be encouraged. (The labour force must not be encouraged to work to produce for stock.) A process efficiency ratio of throughput/cost can still be used.

Effectiveness is, however, the more important measure:

$$\text{Current effectiveness ratio} = \frac{\text{Standard minutes of throughput achieved}}{\text{Minutes available}}$$

This measures effectiveness and compares it to a current standard.

Traditional variances can also be misleading in a throughput environment. For example, if overtime was worked at the bottleneck to increase throughput an adverse labour rate variance would arise. Generally adverse variances are considered bad. However, in throughput environment this would be good and would increase profits as long as the extra labour cost was less than the increase in value added.

TA's aim like JIT, must always be to minimise production time taken and so all non-value added elements in the production lead time need to be eliminated or minimised so that process time approaches the lead time.

$$\text{Lead time} = \text{set-up time} + \text{waiting time} + \text{process time} + \text{inspection time} + \text{move time}$$

8.13.4 Summary of throughput accounting

Table 8.1 highlights the difference between TA and traditional product costing.

So far TA has only been considered in relation to manufacturing organisations but it has been used very successfully in service industries as well. For example, it has been used to speed up and reduce costs in checking customers' creditworthiness. In one company this process took a long time, often longer than a week, and held up further activities. Before TA was used, over-qualified people were used to make basic credit decisions and this caused the delays in deciding on creditworthiness. Afterwards ordinary members of staff were allowed to make decisions in the majority of cases and only difficult ones were referred to

Table 8.1 Difference between throughput accounting and traditional product cost systems

Throughput accounting	Traditional product costing
Value is added when an item is sold	Value is added when an item is produced
Schedule adherence and meeting delivery dates are the key to work effectively	Full utilisation of labour and machine time is the key to working efficiently
Variance analysis only investigates why the scheduled mix was not produced	Variance analysis investigates whether standards were achieved
Labour and traditionally defined variable overheads are not normally treated as variable costs	Labour and traditionally defined variable overheads are treated as variable costs
Stock is valued in the P&L and balance sheet at material cost only (i.e. variable cost)	Stock is valued in the P&L and balance sheet at total production cost

experts. This meant that decisions were made much faster, normally within 24 hours, and the cost of the function was reduced.

TA has been criticised for being unduly short term because all costs apart from material costs tend to be treated as fixed. It could be argued that the use of traditional marginal costing is not always correct because those that use it tend to treat direct labour as a variable cost, which is not realistic. It could be argued, and has been by some that labour is more fixed than an item of machinery and its associated costs, as that can be removed and sold within a few weeks. Staff cannot be made redundant as quickly and the cost may be greater. Having said that, in the long term all costs are variable and all options possible but TA only considers the current situation and way of improving it.

Marginal costing and throughput accounting rely on the calculation of contribution (sales–variable cost) and as such there is no difference between them. Because direct labour was paid on a piece-rate, it was largely a truly variable cost when marginal costing was developed early this century. Today, textbooks tend to use the same definition of variable costs for marginal costing purpose even though it is usually no longer relevant. Once this problem has been overcome the two systems are seen to be the same in principle, marginal costing dealing with short-term one-off decisions and throughput accounting providing a planning and control system.

Make or buy decisions should nearly always be made from a strategic viewpoint and not from a short-term marginal cost point of view. But assume for a moment that a short-term decision is needed and marginal costing is used, and that it suggests that the product under consideration should be made rather than bought in. If this product uses valuable capacity on the machine before the bottleneck machine, then the holding of buffer stock could be jeopardised under certain circumstances. This was a real scenario at Allied Signal Ltd. Because throughput accounting was used, management declined the opportunity to make the product under consideration (Darlington 1995). Again conflict occurred between the two systems, but the consequence of using spare capacity should have been considered in any system; throughput accounting simply drew attention to it.

It is also argued that by concentration on the relationship between sales and materials TA neglects other costs. This is not a valid criticism as the TA ratio incorporates conversion costs per time period. However, the purpose of throughput accounting, and especially TOC, is not so much to control costs as to demonstrate ways of improving profit by increasing production flow. It is an attention-directing system. The criticisms can be countered but nevertheless throughput accounting is not a technique that will suit all organisations.

8.14 Backflush accounting

Traditional cost accounting systems track the sequence of raw materials and components moving through the production systems, and as a consequence are called 'sequential tracking systems'. As JIT is an entirely different system it requires its own cost accounting system. The absence of stocks makes choices about stock valuation systems unnecessary and the rapid conversion of direct material into cost of goods sold simplifies the cost accounting system. The approach is known as backflush accounting.

Backflush accounting delays the delays the recording of costs until after the events have taken place, then standard costs are used to work backwards to 'flush' out the manufacturing costs. There are two events that trigger the records kept in most backflush accounting systems:

The first is the purchase of raw materials, In a true JIT system where absolutely no raw material stock is held, even this trigger is not relevant and raw materials are 'flushed' when the second trigger is activated.
The second trigger is either the transfer of goods to finished goods stock or, in a true JIT system, the sale of goods. Two examples of possible backflush accounting systems are given in Tables 8.2 and 8.3.

Table 8.2 System 1. A small stock of raw material is held but no finished goods stock

	Dr £	Cr £
1. Raw materials are purchased – £3,200		
Stock control	3,200	
Creditors control		3,200
2. Conversion costs are incurred – £3,000		
Conversion cost control	3,000	
Individual a/cs		3,000
3. Goods sold – £6,000 worth at standard cost		
Cost of goods sold	6,000	
Stock control		2,900
Conversion costs allocated		3,100
4. Under- or over-allocation of conversion costs		
Conversion costs allocated	3,100	
Cost of goods sold		100
Conversion costs control		3,000

Table 8.3 System 2. No raw material stock is held but same finished goods stock is held

	Dr £	Cr £
1. Raw materials are purchased – no entry		
2. Conversion costs are incurred – £3,000		
Conversion cost control	3,000	
Individual a/cs		3,000
3. Finished goods units produced £6,000		
Finsihed goods control	6,000	
Creditors control		2,900
Conversion costs allocated		3,100
4. Finished goods sold – £5,900		
Cost of goods sold	5,900	
Finished goods control		5,900
5. Under- or over-allocation of conversion costs		
Conversion costs allocated	3,100	
Cost of goods sold		100
Conversion costs control		3,000

The figures are the same as for system 1, but the transfer to finished goods is assumed to be £6,000 and the cost of goods sold is £5,900 leaving a finished goods stock of £100.

This is the system used by Toyota in its UK factory. In true Japanese style it manipulates employees to behave in a certain way. First employees must concentrate on achieving sales because cost of sales is the trigger – nothing gets recorded until the sale is made. Second there is no benefit in producing goods for stock. In traditional systems which have a finished goods stock managers can increase profit by producing more goods than are sold in a period because an increase in finished goods stock reduces the cost of sales in traditional financial account. (Figure 8.6)

The model just described may be altered to cope with work-in-progress in the system by using a raw and in progress account (RIP) in place of the stock control account. All other entries remain the same (Figure 8.7).

The backflush accounting model cannot be used by all organisations. It can only be used where a JIT-type system is in operation. Where it is used it does have advantages. The traditional system is time consuming and expensive to operate, as it requires a considerable amount of documentation, such as material requisitions and time sheets to support it in order to maintain the WIP records and job cards. If a company operates with low stock levels the benefits of operating the traditional costing system are few. By introducing a blackflush system a considerable amount of clerical time is saved.

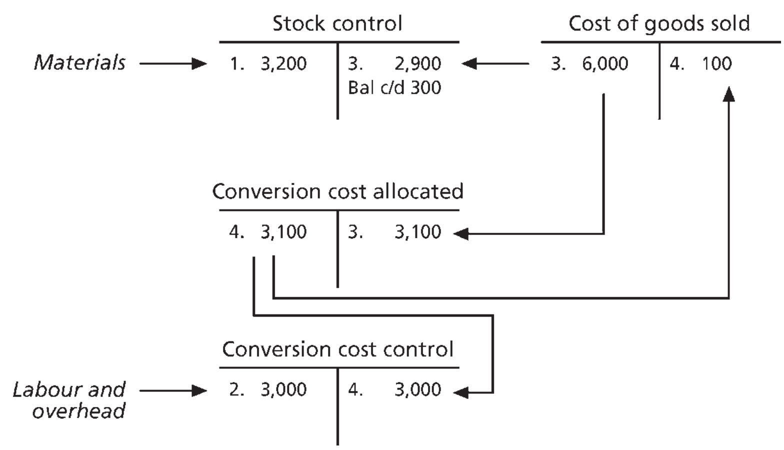


Figure 8.6 Ledger accounts for system 1

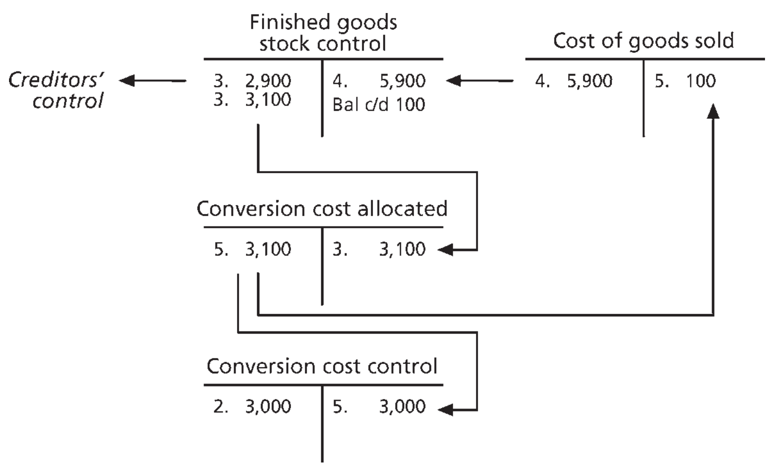


Figure 8.7 Ledger accounts for system 2

From the backflush accounting examples it can be seen that JIT eliminates direct labour as a cost category. Instead labour is treated as an indirect cost and is included in conversion cost with the overheads. This is because production is only required when demand requires it and so production labour will be paid regardless of activity. All indirect costs are treated as a fixed period expense. With JIT, failed or rework must be almost eliminated if the system is to work and so no accounts for this will exist in blakflush accounting whereas they are required in traditional systems.

The backflush accounting model does not conform to the accepted financial accounting proceducers for external reporting in the UK. This is because work-in-progress is treated as an asset in the financial accounts and in backflush accounting it is not shown to exist although in practice a small amount does. This can be countered by claiming, quite rightly, immateriality. If only one-tenth of one day's production is held in work-in-progress then it is immaterial. It can also be claimed that it is immaterial if the work-in-progress does not change from one period to the next as opening and closing stock will cancel each other out.

Backflush accounting can be criticised because of the lack of information that it provides. Some argue, quite rightly, that in reality it is impossible to eliminate all stock as a truck arriving with raw material creates stock until it is moved to and used in production. If backflush accounting is used in a system where a substantial amount of stock is held, a physical stock-take will be needed, because the system does not record the quantity of stock. Instead it is derived on paper by the difference between the standard cost of material in the goods sold and the amount of materials purchased. This must be checked by a physical stock-take from time to time.

8.15 Summary

In this chapter, we have considered modern developments in the manufacturing, business and economic environment. We have explored the manner in which these developments have resulted in the adoption of new management philosophies such as TQM, JIT and TOC. Further, we have reviewed the new management accounting techniques such as ABC, throughput accounting and backflush accounting that have appeared in response to the modern environment.

Readings

8

There is a large body of literature in the area of modern developments in Management Accounting. This body includes articles appearing in academic publications, professional journals and newspapers. The items below are a selection of material published during the last 10 years.

Quality Streak

Bob Scarlett, *CIMA Insider*, 9 September 2001, (pp. 22–23)

The cost of total quality

Over the last 20 years, total quality management (TQM) has become a ubiquitous organisational phenomenon. It is encountered in sectors ranging from manufacturing to health care and education. The total quality 'movement' has captured the imagination of business managers, writers, consultants and academics. The design and operation of total quality programmes has generated a minor business consulting industry in its own right.

Background

The idea that quality is a key success factor in business is an old one. Producing products may be far easier than producing products which give acceptable value to the customer. The value that a customer derives from a product depends heavily on its quality as well as its technical specification. If a customer is considering buying a product (which can be a component, a service or a finished good) then he will be influenced in his decision by how quickly it can be delivered, how far it can be customised to meet his precise requirements, how reliable it will be in service and how pleasing its appearance is. All these last issues pertain to quality.

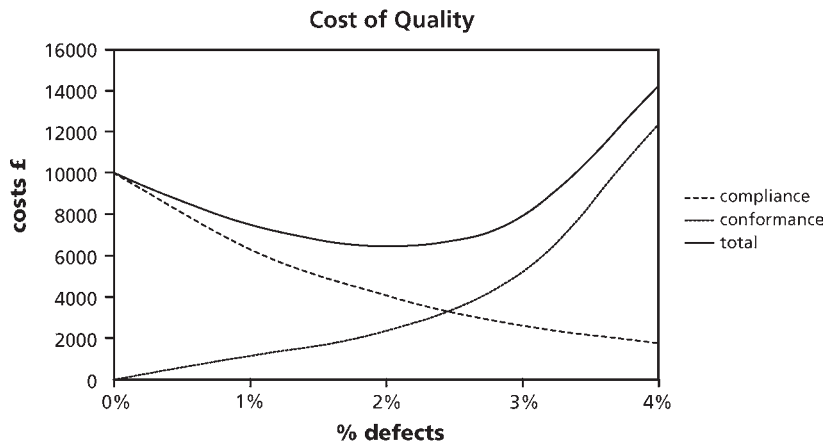
The traditional cost accounting view of quality is that it has a cost. That cost is composed of two main elements:

Compliance costs – the organisational costs of ensuring that quality is achieved. These include quality inspection, quality training and product sampling.

Conformance costs – the costs of failing to achieve perfect quality. These include reworking costs, replacement costs and customer rejection costs.

There is a trade-off between the two. This trade-off may be illustrated by the diagram above.

This diagram illustrates the quality cost structure of a manufacturing operation. In order to achieve 0 per cent defects, compliance costs must be high (£10,000) but these can be reduced as higher levels of defects are accepted. At 0 per cent defects, conformance costs are nil but these rise as higher levels of defects are accepted. In theory, there is an optimum level of acceptable defects – which in this case is at 2 per cent. This occurs at the point where total quality costs (compliance and conformance) are minimised.



The main thinking that arises from this traditional view is that quality costs are important and may be the subject of management decisions. They should be specifically identified and reported on by the management accounting system. Quality costs are not always easy to identify and may be dispersed through the costing system of the whole operation. Their total may not be apparent. Furthermore, the long-term implications of poor quality on terms of customer response may not be immediately quantifiable.

One modern innovation is the Cost of Quality Report. This seeks to identify all the costs associated with maintaining quality and the costs of failing to maintain quality. These costs can be matched against targets and benchmarks to provide performance measure. Measures taken to maintain quality may extend to locating technical specialists at the factory site of suppliers.

The TQM concept

The TQM concept came to the fore in the 1980s although it is generally considered to originate in the post-war reconstruction of Japanese industry. The TQM name itself was a brand name used by PA Consultants.

It is a philosophy and a movement that attracts followers. It is not just a body of techniques. There are many alternative definitions of TQM. However, the central concept is that quality is the key strategic variable in business and it is a variable that is amenable to organisational culture. The idea is that quality should be a feature that is rooted in the structure of the organisation. Quality should impact on the way that the organisation is run and on the way that staff are recruited, assessed, promoted and rewarded. The view that quality is something imposed on staff by inspectors is anathema to the TQ movement.

A recent management seminar was given in Newcastle by a firm of consultants promoting a TQM model called 'Six Sigma'. The presenter was asked how TQM related to the Cost of Quality diagram shown above. He replied that TQM does not recognise the idea of compliance costs. The activities that those costs relate to should be immersed in the normal functioning of the organisation. Hence it is only conformance costs that need be considered – resulting in 0 per cent defects being optimum.

One advocate of TQM described it as follows:

> TQM focuses on customer delight, error removal, training and involvement of all employees, visible leadership and the continuous improvement process
>
> David Luther, V-P Corning Industries, 1992

The main features of a TQM oriented organisation include:

Top priority is given to satisfying customers and the organisation is structured in a way that ensures interest convergence of owner, employees, suppliers and management in achieving this. Managers should act as facilitators rather than controllers.

People are considered to be the key internal guarantors of success. Decision-making processes are participative. Management is both visible and accessible.

Constant change is considered a way of life and the organisation is structured in a manner that readily embraces change. The organisation structure is flat, requiring employees to use initiative and communicate directly with consumers and suppliers.

The organisation pursues continuous improvement and not static optimisation. The concept of 'an optimum defects level' illustrated above is entirely alien to TQM. Performance is measured against an external benchmark and not against an internal standard.

The emphasis is on prevention of problems and faults rather than detection. Employees have a wide span of activity but a short of control.

Achieving and improving quality is the central theme that runs through all of these features. This is particularly relevant in the era of flexible manufacturing when products are highly customised and product life cycles are short. Customers service and product innovation have become major elements in the quality of products that are being offered.

TQM is far more than just a body of quality control techniques. It cuts right across the more traditional aspects of management rooted in Taylorism and Scientific Management. It has found wide acceptance throughout all sectors of industry and there are many organisations that claim to have derived substantial benefits from it.

When Japanese companies came to the UK in the 1980s they brought TQM with them. At the Nissan plant in Sunderland, staff at all levels wore the same company uniform and shared the same dining facilities. Almost all administrative and management staff shared an open plan office. Many of the British workers, coming from traditional engineering companies, found the approachability of Japanese managers to be refreshing. This made a profound impact on local people and businesses at the time.

The problems with TQM

There are two recurring themes that run through much of the literature on TQM. These are 'teams' and 'empowerment'. Employee empowerment is considered to liberate talents and facilitate the deployment of skills. Teams are considered to improve the co-ordination of functions and skills within the organisation. The co-operative ethic lies at the heart of what TQM is all about.

However, 20 years' experience of TQM has raised awkward questions.

Do employees and management really find 'empowerment' to be liberating? Empirical studies suggest that 'empowerment' often amounts to the delegation of additional duties to employees. Limits have to be placed on what employees can do, so empowerment is often associated with rules, bureaucracy and form-filing. That apart, many employees find most satisfaction from outside work activities and are quite happy to confine themselves to doing what they are told while at work. The proponents of TQM are often very work-centred people themselves and tend to judge others by their own standards.

Do teams contribute to organisational effectiveness? Just calling a group of people who work in the same office 'a team' does not make it a team. A team requires a high level of co-operation and consensus. Many competitive and motivated people find working in a team environment to be uncongenial. It means that every time you want to do anything you have to communicate with and seek approval from fellow team members. In practice, this is likely to involve bureaucracy and form filling.

Is quality really a function of system? TQM tends to proceed from the assumption that variations in quality can be explained by features in the organisational system. The idea is that by changing the system you can improve quality. However, it can be argued that TQM merely moves empowerment from management to employees. It has been argued that the latter cannot be expected to succeed where the former have failed.

Experience with TQM

Management literature offers many examples of the success of TQM and the benefits that some organisations have obtained from it.

However, experience is not all good. Many organisations that have attempted TQM have found that it involves a great deal of additional bureaucracy. When the attempt is anything less than fully committed, then the results can be unfortunate. Some organisations have found themselves with two parallel structures. A new TQM structure is set up complete with committees and teams – but the old hierarchical structure remains in existence which actually amounts to 'the real organisation'.

One UK study (A.T. Kearney) reported found that only 20 per cent of organisations who had tried TQM reported positive results from it. A US study (Arthur D. Little) put the figure somewhat higher at 30 per cent. Celebrated failures include:

> Florida Power and Light Company discontinued its TQ programme after extensive employee complains concerning excessive paperwork. This decision was taken in spite of the company having won Japan's 'Deming Prise' for quality management in 1989.
>
> British Telecom launched a TQ programme in the late 1980s but was reported (*The Economist*, 18 April 1992) to have abandoned most of it after three years. It was claimed that BT became bogged down in TQ related bureaucracy and took some time to recover from it.

Conclusion

In appraising TQM one has to appreciate that it is not a well-defined technique that can offer a 'quick fix' solution to specific perceived problems. Rather, it is an organisational philosophy that embraces a wide variety of different techniques and ideas. For example, JIT and benchmarking are closely associated with TQM.

The general theme of TQM is the need to move away from a traditional hierarchic organisation structure in order to respond to the demands of an increasingly customer service oriented business environment where quality is the key strategic variable. Those organisations which have made a success of TQM are ones which understand its limitations and are prepared to take the long view.

Standard costing and its role in today's manufacturing environment

Mike Lucas, *Management Accounting*, April 1997. Reproduced by permission of the Institute of Management Accountants, Monteuale, NJ. www.imanet.org

In recent years, writers such as Kaplan and Johnson, Ferrara and Modern and Lee have argued that standard costing variance analysis should not be used for cost-control and performance-evaluation purposes in today's manufacturing world. Its use, they argue, is likely to induce behaviour which is inconsistent with the strategic manufacturing objectives that companies need to achieve in order to survive and prosper in today's intensely competitive international economic environment.

The case against standard costing

Drury, for example, has described how the scientific management principles of F.W. Taylor provided the impetus for the development of standard costing systems. The scientific management engineers divided the production system into a number of simple repetitive tasks in order to obtain the advantages of specialisation and to eliminate the time wasted by workers changing from one task to another.

Once individual tasks and methods have been clearly defined it is a relatively simple matter to set standards of performance using work study and time and motion study. These standards of performance then serve as the basis for financial control: monetary values are assigned to both standards and deviations from standard, that is, variances. These variances are then attributed to particular operations/responsibility centers.

Companies operating in today's manufacturing environment, however, are likely to have strategies based on objectives such as improving quality, increasing flexibility to meet customer's individual requirements, reducing manufacturing lead times and delivery times, reducing inventories and unit costs. To help achieve these objectives, manufacturing strategies such as just-in-time (JIT), advanced manufacturing technology (AMT) and continuous improvement are often applied. Kaplan *et al.* argue that standard costing is counter-productive in such an environment. The major criticisms levelled at standard costing variance analysis are as follows:

1. *In a JIT environment, measuring standard costing variances for performance evaluation may encourage dysfunctional behaviour*
   The primary purpose of the JIT production system is to increase profits by decreasing costs. It does this by eliminating excessive inventory and/or workforce. Items will be produced only at the time they are needed and in the precise amounts in which they are needed – thus removing the necessity for inventories. Running the business without inventories requires the ability to produce small batch sizes economically. In order to do so, set-up times must be reduced. Performance measures should therefore be such as to motivate managers and workforce to work towards reducing set-up times in order to achieve the sub-goal of economic small batch size as a prerequisite for achieving the lower inventories. Performance measures that benefit from large batch sizes or from producing for inventory should therefore be avoided; standard costing variances are just such measures!

2. *In an AMT environment, the major costs are those related to the production facility rather than production volume-related costs such as materials and labour which standard costing is essentially designed to plan and control*

   Standard costing is concerned with comparing actual cost per unit with standard cost per unit. Fixed costs imputed to the product unit level are only notionally 'unit' costs. Any difference between the actual and standard fixed cost per unit is not therefore meaningful for controlling operations, as it does not necessarily reflect under- or overspending – it may simply reflect differences in production volume. What matters is the total fixed overhead expenditure rather than the fixed overhead cost per unit.

   Therefore, in an AMT environment, standard costing variances have at best a minor role to play and at worst they may be counter-productive in so far as they force managers to focus on the wrong issues. An activity-based cost management (ABCM) system may be more appropriate, focusing on activities that drive the cost in service and support departments which form the bulk of controllable costs.

3. *In a JIT/AMT/continuous-improvement environment, the workforce is usually organised into empowered, multi-skilled teams controlling operations autonomously*

   The feedback they require is real time and in physical terms. Periodic financial variance reports are neither meaningful nor timely enough to facilitate appropriate control action.

4. *In a total quality management (TQM) environment, standard costing variance measurement places an emphasis on cost control to the likely detriment of quality*

   TQM requires a total managerial and worker ethos of improving and maintaining quality, and of resolving problems relating to this. The emphasis of standard costing is on cost control; variance analysis is likely to pull managerial and worker interest away from perhaps critical quality issues. Thus cost control may be achieved at the expense of quality and competitive advantage.

5. *A continuous improvement environment requires a continual effort to do things better, not achieve an arbitrary standard based on prescribed or assumed conditions*

   Ferrara has suggested that standard costing based on engineering standards – which in turn are predicted on the notion of a 'one best way' – is only appropriate in the static, bygone world of cost-plus pricing (the world in which the Scientific Management School lived?). In such a world, a standard cost is established specifying what a product should cost and to this is added the required profit mark-up to arrive at the selling price. Cost management then consists of ensuring that standards are adhered to.

   In today's intensely competitive environment (the argument goes), we no longer look to the total unit cost in order to determine selling price; instead, we use the selling price to help determine the cost the market will allow. This allowable or target cost per unit is a market-driven cost that has to be achieved if desired profits are to be achieved. In a highly competitive, dynamic world there is likely to be considerable downward pressure on this allowable cost. Cost management must therefore consist of both cost maintenance and continuous cost improvement.

   In such a competitive improvement-seeking environment, of what value is standard costing based on predetermined engineering standards which create a mind-set of achieving the standard rather than of continuous cost reduction?

6. *In a largely automated production system, it argued, the processes are so stable that variances simply disappear*

   Gagne and Discenza, for example, contend that 'with the use of statistical quality control and automation, the production processes are very consistent and reliable. Variances often cease to exist.' If this is true, emphasis should be switched to the product design stage as most costs are effectively committed during this phase. A target cost that is achievable through the designer's efforts can be established and the designer then controls the design activities of a new product using the target cost as an economic guideline.

The case for standard costing

Although the foregoing criticisms appear persuasive, surely the basic principle of standard costing variance analysis remains sound, that is, specifying in advance what should be achieved and than measuring the extent to which it is being achieved? The unit cost of a product has profound implications for the firm's competitive position and is thus worthy of such control.

Clearly, however, the criticisms must be addressed. The following deals with the criticisms one by one and suggests modifications, where appropriate, that will enable standard costing to continue to have a major role in cost control and performance evaluation.

1. *In a JIT environment, measuring standard costing variances may give rise to dysfunctional behaviour*
   There is no reason why standard costing should not be valuable in a JIT environment. There may be some truth in the suggestion that a measure which compares the total cost of time (set-up and operating) to the number of units produced might encourage production in large batches in order to reduce the proportion of time spent on machine set-ups. If this is seen as a risk, alternative means of countering it might be:

   to exclude set-up times from the labour input side of the equation and/or
   to adopt a counter-balancing performance indicator which penalises/discourages long runs, e.g. inventory level or average batch size.

   The tendency of measuring a materials price variance to encourage purchasing managers to buy in bulk and hence add to inventory can be obviated by the attitude of senior management to the interpretation of variances. As long as adverse variances are not used as a stick to beat managers with, but rather as part of a learning process with a view to improvement, their avoidance through dysfunctional behaviour need not be a major problem. Any such tendencies towards dysfunctional behaviour may also be checked by measuring other indicators, e.g. inventory level.

2. *In an AMT environment most costs are non-volume-related*
   Advocates of ABCM have, quite reasonably, argued that fixed costs should not be imputed to the product unit level. By implication, therefore, they cannot be controlled via a standard costing system. Critics, however, often go further, arguing that since in a JIT/AMT environment most cost are not volume-related, standard costing variance analysis does not have a significant role to play in cost management. This charge is not borne out by the empirical evidence! Fechner, for example, cites surveys by Drury and Tayles (1994), Joyce and Blaney (1990) and Dean (1991), which have found that many manufacturing industries, in different countries, have overhead costs of no more than 30 per cent of total cost (and some of this will be volume-related!). The 70 per cent constituted by direct cost will, usually, be volume-related.

3. *In a JIT/AMT/continuous-improvement, work teams need real-time, quantitative (as opposed to financial) feedback*
   In addition to quantitative feedback, periodic financial information also has a role to play in informing work teams of the financial implications of their activities. For example, a

work team may be aware of problem with materials yields. To improve yields, they may change the way they operate. This may result, however, in increased labour–hour consumption which more that offsets the savings in materials costs. If real-time feedback is required, integrated computerised manufacturing and accounting systems can now provide financial variance information in real time.

4. *Over-emphasis on cost control can be detrimental to quality*
   This is a danger which management should be aware of. This does not justify the abandonment of cost control, however! It simply reinforces the need to measure performance through a range of indicators – cost, quality, lead times, inventory levels and so forth.

5. *Engineering standards are incompatible with continuous improvement*
   While, historically, engineering standards have been the norm, this does not have to be so! Take, for example, Japanese 'Kaizen costing' as used in Toyota plants. The essential principle of controlling unit product cost embodied in standard costing is preserved, the only difference being that Kaizen uses the actual production cost of the previous year as the basis for comparison (rather than a predetermined engineering standard) and a target reduction rate is applied to this. This variance calculation is thus: (cost base – target reduction) – actual cost this period.

6. *In a largely automated production system, most costs are committed at the product design stage*
   While many costs are, indeed, committed at the product design stage, there is usually considerable scope for cost variability at the production stage. This is exemplified by the manner in which Kaizen is intended to complement target costing. Target costing is applied in managing costs at the product design stage via value engineering. Kaizen is then used to encourage continuous improvement, that is cost reduction. It does this by targeting reductions to current unit costs and then comparing actual reductions against these targets.

Conclusion

The basic principle of accounting control embodied in standard costing remains sound. The constituents of the standard, the variances calculated and the way they are interpreted may need to change. A fruitful area for future research is the way in which organisations are retaining the cost control methodology inherent in standard costing but are adapting their systems to take account of the changing production environment.

There has been criticism of variance analysis because it may inhibit the development of 'modern' techniques such as TQM and JIT. However, there is a strong rationale for the calculation of variances because this is the obvious way to check whether a process or activity has been carried out as planned. In principle, variances need to be identified as a preliminary to taking corrective action (or, in the case of favourable variances, finding out 'what went right' so as to learn lessons for the future). There is a second, more technical, reason for the extensive use of variance analysis in practice. Many companies employ costing systems which value stock at standard cost, and such systems are simpler than those which value stock on a first-in-first-out or average-cost basis. However, valuing stock at standard cost implies that any difference between actual cost and standard cost has been identified (as a variance) and 'removed' ('removing variances' in practice means writing them off to profit and loss account as they arise). There are, therefore, important reasons for studying variance analysis.

The calculation of variances can appear to be quite complex because high-level variances can be broken down into sub-variances – with the intention of pinpointing precise *responsibility* for each individual sub-variance. Thus a materials cost variance might be divided into a materials price variance (purchasing responsibility) and a materials usage variance (production responsibility). However, care must be exercised in assigning responsibility because often variances are interrelated.

Learning to love ABC

Gary Cokins, *Journal of Accountancy*, August 1999

Hard as it is to believe, activity-based costing (ABC) works best with a minimum amount of detail and estimated cost figures. By training and inclination accountants are detail oriented, abhorring lack of precision and vagueness. Unfortunately, these qualities that accountants excel in are incompatible with ABC. As a result, when CPAs undertake an ABC project, they typically become overwhelmed with data.

It's ironic. Because ABC is designed to provide useful financial insights into a company's operations, it's a process that should be well within accountants' sphere of expertise. Yet the fact remains: CPAs and ABC don't mix.

What's behind this incompatibility? Those who have successfully implemented ABC say that, when gathering the underlying data for ABC, close enough is not only good enough, it's often key to its success. But, typically, when accountants try to apply ABC, they strive for a level of exactness that is both difficult to attain and time-consuming – and that eventually becomes the project's kiss of death.

The goal of this article is not to make accountants scapegoats for failed ABC projects. Quite the contrary: it's to get CPAs to see that activity-based costing is not that hard to implement, and it truly can enhance their roles as business partner and consultant.

The power of ABC

To illustrate the potential of ABC, consider the following two financial reports of a department's expenses. One is taken from a general ledger and the other from an ABC analysis:

Chart of accounts view		*ABC view*	
	$		$
Salaries	621,400	Key/scan claims	32,000
Equipment	161,200	Analyse claims	121,000
Travel expenses	58,000	Suspend claims	32,500
Supplies	43,900	Receive provider inquiries	101,500
Use and occupancy	30,000	Resolve member problems	83,400
Total	914,500	Process batches	45,000
		Determine eligibility	119,000
		Make copies	145,000
		Write correspondence	77,100
		Attend training	158,000
		Total	914,500

How much financial insight is a manager likely to get from the chart of accounts report? Although it provides the same total as the ABC report, the ABC report provides information that can be applied to cost management. The ledger information, although accurate, fails to report the business-process costs that run cross-functionally – that is, across an organisation's departmental boundaries. It fails to show the true total cost of fulfilling a customer order that passes through many hands. And that's understandable: after all, the general ledger is structured to collect transactions by departments – not to provide insights into work-related costs. As a result, the general ledger is effective for bookkeeping, but it's structurally deficient for assisting in decision-making.

ABC is not a replacement for traditional general ledger accounting. Rather, it's way to translate general ledger data into a format that helps managers make decisions.

ABC corrects for the limitations of traditional costing by identifying all the work activities – and their costs – that go into manufacturing a product, delivering a service or performing a process. When the individual costs are added up, a clear picture of the total cost of a process comes into view. ABC can even distinguish the cost of servicing different customers. The traditional cost management approach – in which cost allocation is based on labour hours, gallons, pounds or other units of output – rarely reflects the true cause-and-effect relationship between indirect and overhead costs and individual products, services, channels or customers. ABC was developed as a practical solution for problems associated with traditional cost management – a technique that usually fails to allocate costs correctly because:

Too many of the costs are lumped together in some categories.
The average rates selected for many costs tend to be excessively broad.
Often irrelevant factors are used to allocate indirect costs. For example, should product-inspection costs be spread among all products or only those products being inspected?

Turning loss into profit

Why is it important to know the true cost of a process, product or or service? Because companies that use traditional indirect-cost allocations may actually lose money on certain products, orders and customers, even though their accounting systems report them as profitable. Because pricing and quotation practices usually rely on the same flawed cost data, the errors are perpetuated.

Once ABC is set up to determine true costs, cost estimating is a natural next step. It begins with forecasts of a product's output; then, by adding the various cost driver rates for that activity, the total projected cost can be determined. For that reason, what-if analysis and predictive planning are popular ABC applications.

Offsetting errors

How can it be that less detail and estimated figures produces an accurate costing picture?

Although the notion is counterintuitive, consider this: with ABC, the assigned costs that result from an estimating error (that is, estimating percentage of labour time per work activity) don't necessarily compound. When a potential error in ABC's activity costs combines with a potential error in the activity driver rates and assignments, the total error can actually become smaller when the errors offset each other. Cost allocating is a zero-sum error game. If an indirect cost allocation is incorrect, then some cost objects will be set too high while the remainder will be set too low, and the net sum error is zero.

However, when each of the activity costs are reaggregated into their specific products or services to customers the probability is slim to none that an individual product will receive activity costs from only the activities that were set too high.

Allied Signal and Coca-Cola, which have developed world-class ABC modeling teams, learned this lesson by putting their ABC systems through several redesigns. They found that simpler designs generally produced higher levels of accuracy.

Critics of ABC argue that the costing process is just another way to spin financial data. But as many companies have discovered, ABC puts the 'management' back into management reporting, and the accounting profession can be instrumental in this move – but only if accountants ease up on their heavy appetite for precision and place greater emphasis on relevance. Using ABC data can achieve relevant cost estimates as a basis for sound management decisions.

The rise of ABC

For years, activity-based costing (ABC) was considered an expensive management project that only large organisations with extensive resources could undertake. But today, with the proliferation of computers for data gathering and computing plus the recognition that most data for decision-making need not be accurate to several decimal places, any organisation can implement ABC.

In the early 1980s many companies began to realise their traditional accounting systems were generating inaccurate costing information. While calculating costs using direct-labour-based (or volume-based) allocations may have provided accurate enough results in the past, these simplistic allocation methods became outdated as most organisations' cost structures began to change in the '80s.

As organisations became more complicated, indirect and overhead costs grew at a faster rate than sales or services and displaced the costs of the front-line worker. In addition, the diversity of products and service lines expanded; similarly the diversity of customer and channels increased, too. As a result, no single volume-based allocation method could fairly trace indirect costs into the rich variation of products, service lines and customers. ABC resolves this.

The sharp rise of competition also contributed to the failure of the old costing methods. No longer could a company continue to carry unprofitable products and unprofitable customers by hoping the profitable ones would make up the difference. Price quotations, capital-investment decisions, product mix, technology choices, outsourcing and make-vs. -buy decisions today all require a sharper pencil.

Many managers understood intuitively that their accounting system was distorting the assignment of costs, so they sometimes made information adjustments. But over time, even those adjustments failed.

Two economic factors contributed to ABC's growing success. As the power of the personal computer grew and prices fell, it processed and stored more accounting data; as a result, the necessary data, in essentially the correct format, became more available to the ABC system and its users. Second, increasing competition has forced all organisations to focus not just on their top line – sales or budget funding. Now they must also understand their middle line – their costs.

Executive summary

Activity-based costing (ABC) was developed as practical solution for problems associated with traditional cost management.

The CPA-ABC incompatibility problem probably has its roots in accountants' instincts and training, which aim for precision. But with ABC, close enough is not only good enough, it's often key to its effectiveness.

ABC is not a replacement for traditional general ledger accounting. Rather, it translates general ledger data into costing information.

It's important to know the true cost of a process, products or service because companies that use traditional indirect-cost allocations may actually lose money on certain products, orders and customers, even though their accounting system reports them as profitable.

Once ABC is set up to determine true costs, cost estimating is a natural next step.

When an ABC project fails, the most likely reason is that its managers designed the ABC system to be too large require too much detail.

Activity Based Techniques

Bob Scarlett, *CIMA Insider*, May 2002

For the last fifteen years, activity based techniques (ABTs) have been at the forefront of developments in management accounting. The advent of ABTs has been associated with changes in production technology and organisational practices.

The origins of ABC

In the early 1980s, many organisations became aware that their traditional cost accounting systems were generating information that was either misleading or irrelevant. Organisations and manufacturing processes were becoming increasingly complex, products were becoming more highly customised and product life cycles were shortening. It was found that calculating product costs using traditional volume-based absorption methods (such as direct labour hours or machine hours) no longer produced meaningful results.

For example, let us say that a business manufactures many products including the X and the Y. Production of the two takes place at a rate of 10 units per hour and total production is 500 units of each in the period. Overheads in the period are £100,000 and a total of 20,000 direct labour hours are worked on all products. If the business uses a traditional overhead absorption rate of £5 per labour hour then the overhead cost of both the X and the Y will be £0.50 per unit.

Enquiry reveals that X manufacture is organised in the form of 2 production runs per period and Y manufacture is organised in the form of 10 production runs per period. Enquiry also reveals that overhead costs mainly related to 'batch level activities' associated with machine set-ups and materials handling for production runs. If there are a total of 1,000 production runs in the period then overheads may be attributed to products at a rate of £100 per run. On that basis the overheads cost of X will be £0.40 (2 runs × £100/500 units) and the overhead cost of the Y will be £2.00 (10 runs × £100/500 units).

The reported unit costs of £0.40 (X) and £2.00 (Y) are activity based, recognising that overhead costs are incurred through batch level activities. It is likely that this statements offers a more meaningful version of product costs than the traditional unit-volume-based version of £0.50 for both the X and the Y. ABC gives more meaningful results because it attributes costs to products in a more sensitive manner that recognises the way in which overhead costs are actually incurred.

In the case described, production of the Y is a more complex operation than production of the X. The need to organise Y production in frequent small batches (perhaps because it is perishable) means that it requires greater resource usage than production of the X – something that ABC recognises but traditional product costing does not.

This is particularly critical in the modern manufacturing environment. Continuous mass production of simple, homogenous products is becoming increasingly rare. Production now typically takes place in short, discontinuous runs and a high proportion of product costs are determined at the design phase. Hence, an increasing proportion of overhead costs are incurred at batch level or product level.

ABC is capable of providing a statement of product costs which may be used with confidence for both performance management and decision making in the modern world.

The activity based budget (ABB)

ABB has been developed to provide useful financial insights into the operations of an organisation. Traditional accounting tended to place an emphasis on the nature of the costs being incurred (that is, the input side) and budgeting has tended to adopt the same pattern, whereas ABB places an emphasis on the activities that are being achieved (that is, the output side).

The power of ABB may be seen from the following two alternative statements of a local authority department's budget:

(1) Chart of Accounts view

Wages	£140,000
Materials	28,000
Vehicle hire	35,000
Equipment hire	18,000
Total	221,000

(2) ABB view

	£	*Activities*	*£ Per activity*
Street sweeping	84,000	4,000	21
School cleaning	68,000	800	85
Park cleaning	39,000	130	300
Graffiti removal	30,000	150	200
Total	221,000		

The ABB view provides a clear framework for understanding the like between costs and the level of activity. No such framework exists under the Chart of Accounts view where many costs are often considered as irrelevant for decision-making purpose because they are 'fixed'.

In fact, few costs really are fixed in the long run and/or over a significantly wide span of activity levels. The problem is merely to appreciate how costs vary with the level and structure of output. The ABB view gives a clear impression of what it costs to produce certain outputs. For example, if the possibility of increasing the street cleaning frequency by 25 per cent is being considered then the ABB view provides a very clear indication of what the cost impact of that might be.

One critical thing to note is that both ABC and ABB are not replacements for traditional general ledger accounting. Rather, they translate information from the ledger into a format that assists management.

That said, information presented in activity based format may be less satisfactory for some of the more traditional cost control and audit functions. If an auditor is reconciling payroll costs with payments to employees then an ABC report may be of little use to him. In this case, the auditor is more concerned with the inputs rather that what those inputs achieved.

Activity based management (ABM)

The terms ABC and ABM are sometimes used interchangeably. This is inappropriate since ABC refers only to the actual technique used to determine the cost of activities and the cost of the outputs that those activities achieve. The aim of ABC is to provide improved cost data for use in managing the activities of a business.

ABM is a broader concept. It refers to the fundamental management philosophy that focuses on the planning, execution and measurement of activities as the key to competitive advantage. ABC and ABB are likely to be elements in the practice of ABM. A business that uses ABC and ABB is likely to have a good appreciation of its own cost structures and is therefore able to apply that appreciation for a variety of management purposes ranging from product design to departmental efficiency measurement.

It is often found that the adoption of ABC and ABB yields only disappointing results in terms of profitability and performance. A recent American study by the Institute of Management Accountants disclosed that 80 per cent of ABC users reported that ABC had not yet resulted in any profit increase. Why should this be so?

One problem identifies by researchers is that the information generated by ABC and ABB systems has to be used effectively in order to achieve the expected results:

> An ABC implementation failure could be defined as the inability of a company to move from simply generating ABC information towards actually using the information.
>
> Roberts & Silvester, 'Why ABC failed and why it may yet succeed', JCM 1996

The writers quoted above suggest that organisations sometimes contain structural barriers to change that make it difficult to progress from ABC to ABM. The design and installation of sophisticated accounting systems is pointless if the information from those systems is not used.

Exercise

Some observers have claimed that activity-based techniques (ABTs) represent the most important development in management accounting in recent years. They argue that these techniques are an intelligent approach to the accounting treatment of costs that satisfies the information requirements of the modern manufacturing environment.

However, other observers consider that there is nothing fundamentally new about ABTs. They argue that activity-based costing is merely an alternative method of overhead absorption. It may give different results to a traditional system, but not necessarily better ones. ABTs may only be a marketing tool for the services of business systems consultants.

Evaluate these two alternative views in light of your general knowledge of business.

Revision Questions 8

Question 1

1.1 What is a flexible manufacturing system and how does it relate to changes in the economy?

1.2 Explain materials requirements planning and contrast it with more traditional approaches to stock management.

1.3 Explain the Just-in-Time concept.

1.4 Explain the characteristics of a backflush accounting system.

1.5 Explain the features that make ABC more relevant to the modern manufacturing environment than traditional product costing technique.

1.6 Explain 'throughput accounting'.

1.7 Explain the 'total quality management' philosophy and its relevance to the modern economic environment.

1.8 Explain the meaning of the term 'the New Economy' and its relevance to the practice of management accounting.

Question 2

'Japanese companies that have used just-in-time (JIT) for five or more years are reporting close to a 30 per cent increase in labour productivity, a 60 per cent reduction in inventories, a 90 per cent reduction in quality rejection rates, and a 15 per cent reduction in necessary plant space. However, implementing a just-in-time system does not occur overnight. It took Toyota over twenty years to develop its system and realise significant benefits from it.'

Source: Sumer C. Aggrawal, *Harvard Business Review*

Requirements

(a) Explain how the benefits claimed for JIT in the above quotation are achieved and why it takes so long to achieve those benefits. **(15 marks)**

(b) Explain how management information systems in general (and management accounting systems in particular) should be developed in order to facilitate and make best use of JIT. **(10 marks)**

(Total marks = 25)

The following two questions draw both on the issues explored in this chapter and on a wider range of management accounting and business management topics. In preparing answers to these questions you should consider your earlier studies of management accounting and general knowledge of business.

Question 3

ST plc produces three types of processed foods for a leading food retailer. The company has three processing departments (Preparation, Cooking and Packaging). After recognising that the overheads incurred in these departments varied in relation to the activities performed, the company switched from a traditional absorption costing system to a budgetary control system that is based on activity based costing.

The foods are processed in batches. The budgeted output for April was as follows:

	Output
Food A	100 batches
Food B	30 batches
Food C	200 batches

The number of activities and processing hours budgeted to process a batch of foods in each of the departments are as follows:

	Food A Activities per batch	*Food B Activities per batch*	*Food C Activities per batch*
Preparation	5	9	12
Cooking	2	1	4
Packaging	15	2	6
Processing time	10 hours	375 hours	80 hours

The budgeted departmental overhead costs for April were:

	Overheads *$*
Preparation	100,000
Cooking	350,000
Packaging	50,000

Requirements

(a) For food A ONLY, calculate the budgeted overhead cost per batch:
 (i) using traditional absorption costing, based on a factory-wide absorption rate per processing hour;
 (ii) using activity based costing.

(b) Comment briefly on the advantages of using an activity based costing approach to determining the cost of each type of processed food compared to traditional absorption costing approaches. You should make reference to your answers to requirement (a) where appropriate.

(c) The actual output for April was:

	Output
Food A	120 batches
Food B	45 batches
Food C	167 batches

Prepare a flexed budget for April using an activity based costing approach. Your statement must show the total budgeted overhead for each department and the total budgeted overhead absorbed by each food.

(d) Discuss the advantages that ST plc should see from the activity based control system compared to the traditional absorption costing that it used previously.

? Question 4

As part of a total quality management (TQM) programme in a large manufacturing company, quality costing has been introduced and is regarded as useful by senior managers. They are now planning to extend the TQM programme, and quality costing, from manufacturing to the whole of the company. You have been asked to devise a TQM programme, including appropriate quality measures and calculations of quality cost in the management accounting section of the finance department.

Requirements

(a) Briefly explain each of the four categories of quality cost (prevention cost, appraisal cost, internal failure cost, and external failure cost). Give examples of each category appropriate to a manufacturing environment, and examples relevant to management accounting. **(8 marks)**

(b) Explain how this cost categorisation mentioned in (a) above can be used to help to develop performance measures within management accounting. Explain and justify a set of performance measures that can be used by the finance director in assessing the management accounting service. **(12 marks)**

(Total Marks = 20)

? Question 5

(a) 'It may be argued that in a total quality environment, variance analysis from a standard costing system is redundant.'

Discuss the validity of this statement. **(8 marks)**

(b) Using labour cost as the focus, discuss the differences in the measurement of labour efficiency/effectiveness where (i) total quality management techniques and (ii) standard cost variance analysis are in use. **(7 marks)**

(Total marks = 15)

? Question 6

ABC Ltd produces a large number of products including the A and the B. The A is a complex product of which 1,000 are made and sold in each period. The B is a simple product of which 25,000 are made and sold in each period. The A requires one direct labour hour to produce and the B requires 0.6 direct labour hours to produce.

ABC Ltd employs 12 salaried support staff and a direct labour force that works 400,000 direct labour hours per period. Overhead costs are £500,000 per period.

The support staff are engaged in three activities – six staff engaged in receiving 25,000 consignments of components per period, three staff engaged in receiving 10,000 consignments of raw materials per period and three staff engaged in disbursing kits of components and materials for 5,000 production runs per period.

Product A requires 200 component consignments, 50 raw material consignments and 10 production runs per period. Product B requires 100 component consignments, eight raw material consignments and five production runs per period.

Requirements

(a) Calculate the overhead cost of the A and the B using a traditional system of overhead absorption based on direct labour hours. **(10 marks)**

(b) Identity appropriate cost drivers and calculate the overhead cost of the A and the B using an activity-based costing system. **(10 marks)**

(c) Compare your answers to (a) and (b) and explain which gives the most meaningful impression of product costs. **(5 marks)**

(Total marks = 25)

? Question 7

It has been suggested that much of the training of management accountants is concerned with *cost control* whereas the major emphasis should be on *cost reduction*.

Requirements

(a) Distinguish between cost control and cost reduction. **(10 marks)**

(b) Give three examples each of the techniques and principles used for
  (i) cost control and
  (ii) cost reduction. **(10 marks)**

(c) Discuss the proposition contained in the statement. **(5 marks)**

(Total marks = 25)

Scenario for questions 8–10

During the last twenty years, KL's manufacturing operation has become increasingly automated, with computer-controlled robots replacing operatives. KL currently manufactures over 100 products of varying levels of design complexity. A single, plant-wide overhead absorption rate (OAR), based on direct labour hours, is used to absorb overhead costs.

In the quarter ended March 20X9, KL's manufacturing overhead costs were:

	£000
Equipment operation expenses	125
Equipment maintenance expenses	25
Wages paid to technicians	85
Wages paid to storemen	35
Wages paid to dispatch staff	40
	310

During the quarter, Rapier Management Consultants were engaged to conduct a review of KL's cost accounting systems. Rapier's report includes the following statement:

In KL's circumstances, absorbing overhead costs in individual products on a labour-hour absorption basis is meaningless. Overhead costs should be attributed to products using an activity-based costing (ABC) system.

We have identified the followings as being the most significant activities:

1. receiving component consignments from suppliers;
2. setting up equipment for production runs;
3. quality inspections;
4. dispatching goods orders to customers.

Our research has indicated that, in the short term, KL's overheads are 40 per cent fixed and 60 per cent variable. Approximately half the variable overheads vary in relation to direct labour hours worked and half vary in relation to the number of quality inspections. This model applies only to relatively small changes in the level of output during a period of two years or less.

Equipment operation and maintenance expenses are apportionable as follows: component stores (15 per cent), manufacturing (70 per cent) and goods dispatch (15 per cent).

Technician wages are apportionable as follows: equipment maintenance (30 per cent), setting up equipment for production runs (40 per cent) and quality inspections (30 per cent).

During the quarter:

a total of 2,000 direct labour hours were worked (paid at £12 per hour);
980 component consignments were received from suppliers;
1,020 production runs were set up;
640 quality inspections were carried out; and
420 goods orders were dispatched to customers.

? Question 8 (see scenario)

KL's production during the quarter included components *r, s* and *t*. The following information is available:

	Component r	*Component s*	*Component t*
Direct labour hours worked	25	480	50
Direct material costs	£1,200	£2,900	£1,800
Component consignments received	42	24	28
Production runs	16	18	12
Quality inspections	10	8	18
Goods orders dispatched	22	85	46
Quantity produced	560	12,800	2,400

In April 20X9 a potential customer asked KL to quote for the supply of a new component *(z)* to a given specification. 1,000 units of *z* are to be supplied each quarter for a two-year period. They will be paid for in equal instalments on the last day of each quarter. The job will involve an initial design cost of £40,000 and production will involve 80 direct labour hours £2,000 materials, 20 component consignments, 15 production runs, 30 quality inspections and 4 goods dispatches per quarter.

KL's sales director comments:

Now we have a modern ABC system, we can quote selling prices with confidence. The quarterly charge we quote should be the forecast ABC production cost of the units plus the design cost of the *z* depreciated on a straight-line basis over the two years of the job – to which we should add a 25 per cent mark-up for profit. We can base our forecast on costs experienced in the quarter ended March 20X9.

Requirements

(a) Calculate the unit cost of components *r, s* and *t*, using KL's existing cost accounting system (single-factory, labour-hour OAR). **(5 marks)**

(b) Explain how an ABC system would be developed using the information given. Calculate the unit cost of components *r, s* and *t*, using this ABC system. **(11 marks)**

(c) Calculate the charge per quarter that should be quoted for supply of component *z* in a manner consistent with the sales director's comments. Advise KL's management on the merits of this selling price, having regard to factors you consider relevant.
Note: KL's cost of capital is 3 per cent per quarter. **(9 marks)**

(Total marks = 25)

? Question 9 (see scenario)

It is often claimed that ABC provides better information concerning product costs than traditional management accounting techniques. It is also sometimes claimed that ABC provides better information as a guide to decision-marking. However, one should treat these claims with caution. ABC may give a different impression of product costs but it is not necessarily a better impression. It may be wiser to try to improve the use of traditional techniques before moving to ABC.

Comment by KL's management accountant on the Rapier report

Requirements

(a) Explain the ideas concerning cost behaviour that underpin ABC. Explain why ABC may be better attuned to the modern manufacturing environment than traditional techniques. Explain why KL might or might not obtain a more meaningful impression of product costs through the use of ABC. **(10 marks)**

(b) Explain how the traditional cost accounting system being used by KL might be improved to provide more meaningful product costs. **(6 marks)**

(c) Critically appraise the reported claim that ABC gives better information as a guide to decision making than do traditional product costing techniques. **(9 marks)**

(Total marks = 25)

? Question 10 (see scenario)

The lean enterprise [characterised by 'just in time' (JIT) total quality management (TQM) and supportive supplier relations] is widely considered a better approach to manufacturing. Some have suggested, however, that ABC hinders the spread of the lean enterprise by making apparent the cost of small batch sizes.

Comment by an academic accountant

Requirements

(a) Explain the roles that JIT, TQM and supportive supplier relations play in modern manufacturing management. How might the adoption of such practices improve KL's performance? **(10 marks)**

(b) Explain what the writer of the above statement means by 'the cost of small batch sizes'. Critically appraise the manner in which this cost is treated by KL's existing (single OAR-based) cost accounting system. Explain the benefits that KL might obtain through a full knowledge and understanding of this cost. **(10 marks)**

(c) Explain and discuss the extent to which academic research in the area of management accounting is likely to influence the practice of management accounting. **(5 marks)**

(Total marks = 25)

Solutions to Revision Questions 8

Solution 1

1.1 An FMS is a manufacturing facility designed, organised and operated in a manner to facilitate swift changes in production. It is likely to be very different from a traditional production line which is organised for continuous production of a single product. FMS facilities typically consist of clusters of equipment which can be reprogrammed quickly as required. Such flexibility has a cost and makes demands on personnel. However, FMS facilities are adapted to the needs of a swiftly changing market and JIT production systems.

1.2 Traditional materials planning in the pre-computer era involved constantly monitoring stock levels and re-ordering whenever they fell below certain specified levels. This was an inherently passive approach. MRP involves preparing detailed procurement plans based on projected output and placing orders in order to ensure that materials are delivered as and when they are needed. The ability of a large, complex operation to operate with MRP (and its later variants – MRP2 and ERP) depends very much on the availability of reliable computer systems.

1.3 JIT is an approach to production that involves obtaining materials, components and use of facilities as and when they are needed. It also involves arranging to supply customers with goods only as and when they are required. It is therefore characterised by small but frequent deliveries, low stock levels and short, discontinuous batch production. Operating in this manner makes considerable demands on staff, facilities and the production planning operation.

1.4 Backflush accounting is an approach that avoids the cost-tracking approach that is characteristic of traditional accounting. The latter usually involves maintaining detailed records of costs incurred in order to determine the cost of products on a cumulative basis. Backflush costing and its variants work the other way. When production costs are incurred they are charged to a conversion cost account. When production is completed then the standard cost of the units concerned is credited to the conversion cost account. The balance outstanding on the latter at any time will therefore be the stock of raw materials and work in progress – sometimes described as the 'RIP' account. It is an approach considered well adapted to a JIT environment (where stocks are low and cost variances are few), but it is not new. It is similar in character to low-cost practice commonly used in the pre-computer era to prepare monthly management accounts.

1.5 ABC is an approach to cost determination which involves careful study of the activities that give rise to costs and the manner in which those activities vary with the level and structure of output. It seeks to attribute costs to products through the identification and use of appropriate 'cost drivers'. This contrasts with more traditional practice which involved the use of volume related, and often arbitrary, overhead absorption bases. ABC is more demanding than traditional practice but it is better attuned to the modern environment. A modern manufacturing operation typically involves a far more complex range of activities than was the case 30 years ago and a higher proportion of costs are likely to be indirect. A more sensitive approach to cost determination is therefore appropriate.

1.6 Throughput accounting is the term used to describe an approach to accounting which places an emphasis on production volumes, production times and contribution. In the practice of TA, the assumption is frequently made that the only truly variable cost in an operation is that of the materials used. The key TA performance indicator for any period is:

(Sales Revenue – Material Cost)/Production Time (hours).

By considering this indicator for 'the bottleneck facility' management may be guided in optimising the use of production facilities. Throughput accounting is therefore closely associated with the 'theory of constraints'.

1.7 TQM is a management philosophy which involves use of a range of advanced management techniques. Its central concept is that 'quality' is the key strategic variable in a business and that it is a variable that is amenable to organisational culture. The key concepts associated with the provision of quality in an organisation are 'empowerment' and 'teams'. TQM is very much the antithesis of the traditional 'command and control' concept associated with budgeting that we encountered earlier in this text. TQM involves the devolution of authority to multi-skilled, empowered teams in the organisation. It is claimed the TQM provides the organisational flexibility needed to cope with an environment where product life cycles are short, products are highly customised and products have a high service element. The empowerment and motivation of individual staff to deal directly with customers is therefore critical to success.

1.8 The 'New Economy' is a buzz word which became popular in management literature in the late 1990s. Essentially, it referred to a business environment in which it was expected that 'lean' and 'virtual' businesses would emerge as the dominant species. Traditional businesses with factories and offices would be replaced by loosely organised alliances which would obtain the use of facilities and resources only as and when needed. The goods being produced were expected to have an increasingly high service content (e.g. the software and associated system support in a PC costing more than the equipment). The key to success in this environment would be 'flexibility'. It was also claimed that new metrics (other than profit or return on investment) would be needed in order to evaluate the performance of such businesses. The spectacular collapse of many high profile New Economy businesses (Enron and World.com being examples) during the recession of the early 2000s has brought the term into some disfavour lately.

✓ Solution 2

In answering this question it is important to appreciate that JIT is not merely a stock management technique. Rather, it is a management philosophy.

(a) The benefits of JIT, as described by Aggrawal, are gained by a revolutionary change in work practices, company culture and external relationships. JIT is not just about running a production facility with less inventory, it is a way of working that reduces traditional practices which do not add value to the product. Such 'non-value adding' practices include warehousing and stock movement within the factory, testing for quality control, running machinery merely to accumulate large stocks of WIP at a bottleneck down the line and setting-up machinery to run a batch of different specification or product.

The new company culture gives workers the power to manage the production process by moving to where they are needed on the production line or by solving their own problems (quality circles). This requires co-operation between workers and a new approach to management. Furthermore, the workers self-test their work (to ensure quality assurance and must feel free to halt production if there is a problem. Workers need to be multi-skilled, that is, there can be no demarcation across traditional skill boundaries, so that set-up times and maintenance down-time may be minimised. These new working practices coupled with new technology reduce inefficiencies in the production process and result in new working patterns.

New external relationships must be developed, especially with suppliers of materials and components. The supplies must be defect-free, on time and delivered more frequently in smaller lots. There should be no inspection of goods received. Therefore, new standards need to be established with tighter tolerances, warranties and changed packing requirements. In return, the supplier will become the sole supplier, but will take on board the responsibility for R&D for the items supplied.

All of the above changes are quite radical and involve everyone concerned with the production process. The JIT philosophy will work only when workers are empowered, that is, free to make decisions and own up to mistakes; this cultural change for both workers and management requires much training and much practice. Thus, the benefits of JIT do not appear overnight.

(b) The introduction of a JIT production process will result in smaller batch sizes, that is, smaller production runs and more changeovers, lower inventory levels and more frequent deliveries, fewer direct labour and machine hours, but more indirect labour for quality assurance, software development, R&D, etc.

Thus, we see a need for faster gathering, grouping and analysis of performance for control purposes. Fortunately, computer-controlled processes capture much of the information required, such as what was done, when it was done, how long it took and what was produced. This enables traceable costs to be collected and monitored for each cost centre. This process must start at the component level, and for every stage in the production process the number of set-ups, orders, inspections, labour and machine time, etc., must be built into the product cost-control exercise.

Electronic data interchange will enable the system to match the pace of frequent deliveries on to the shop floor, and as a Kanban system will be used the day-to-day variation in inventory will be small. A complete production scheduling system will be required such as MRP2. This will allow for management accounting exercises such as capacity utilisation to be carried out.

The empowered workers will not require variance analysis, but motivational control will be more important and will use physical performance indicators, such as average set-up time or number of defects. Standard costing will still be required, but mainly as a foundation in preparing the financial accounting reports. To control the rising indirect costs, budget control will become more important. Cost planning will need to cater for blueprints for new products or production methods and for cost reduction as an ongoing process.

Thus, the development in management information systems is more of evolution and change in emphasis, as opposed to the revolution on the shop floor when JIT is introduced.

☑ Solution 3

Requirement (a)

Budgeted processing hours $= (10 \times 100) + (375 \times 30) + (800 \times 200)$
$= 1{,}000 + 11{,}250 + 16{,}000$
$= 28{,}250$

Budgeted cost $= \$500{,}000$

$$\text{Budgeted absorption rate per processing hour} = \frac{\$500{,}000}{28{,}250} = \$17.70$$

Budgeted overhead cost per unit of A $= 0.1 \times \$17.70 = \$1.77$

Activity	*Budgeted cost $000*	*Number of activities*	*Cost driver rate*
Preparation	100	3,170	31.546
Cooking	350	1,030	339.806
Packaging	50	2,760	18.116

Budgeted overhead cost per unit of A $= [(31.546 \times 5) + (339.806 \times 2) + (18.116 \times 15)]/100 = \$11.09$

Requirement (b)

The use of an activity based approach to attributing overhead costs to product units, rather than the traditional absorption costing basis is that by using an activity based approach a fairer recognition of the costs of producing an item is obtained.

In part (a), it can be seen that the unit overhead cost of product A is significantly higher under an ABC approach. This is caused, at least in part, by the smaller batch size compared to most of the other products and the fact that the incidence of the overhead costs occurs in respect of batches of production rather than individual units.

Requirement (c)

Flexible budget

Activity	*A*	*B*	*C*	*Total*
	$	*$*	*$*	*$*
Preparation	18,928	12,776	63,218	94,922
Cooking	81,553	15,291	226,990	323,834
Packaging	32,609	1,630	18,152	52,391

Workings

Preparation	31.546 × [(120 × 5) + (45 × 9) + (167 × 12)]	95,827
Cooking	339.806 × [(120 × 2) + (45 × 1) + (167 × 4)]	323,834
Packaging	18.116 × [(120 × 15) + (45 × 2) + (167 × 6)]	52,391

Requirement (d)

A budgetary control system based on activity based costing provides more meaningful variances than traditional absorption costing, because the amount that should be expended is measured in relation to the cause of each of the costs, rather than simply one single assumed cause such as number of machine hours.

As a consequence, the manager responsible can more clearly identify how the cost may be controlled and thereby seek to control the cost and reduce variances.

Furthermore, the use of an ABC system requires a manager to investigate the cause of costs prior to setting their budget. As a consequence, they have a better understanding of the cause of the costs and thus how they may be controlled.

☑ Solution 4

This question requires candidates to demonstrate their understanding of quality cost by providing examples, and to apply the approach to developing an appropriate set of performance measures for the management accounting function.

(a) *Prevention costs*

These are investments made in machinery, technology and educational programmes with the intention of reducing the number of defective items. Examples are:

Manufacturing: Automated production processes such as robotics: the use of quality circles for process improvements.

Management accounting: Replacing manual operations with computers; the use of regular staff training programmes.

Appraisal costs

These are the costs of monitoring and inspection compared with predetermined standards of performance, before release to customers. Examples are:

Manufacturing: Product and process testing for quality by quality control staff; the costs of test equipment.

Management accounting: The use of computer audits to check the reliability of computer software; the use of batch input controls to confirm the validity of data processing.

Internal failure costs

These refer to failure costs discovered before delivery to customers. Examples are:

Manufacturing: The cost of scrapped production; the costs of rework and corrections.

Management accounting: The costs of reprocessing input errors; the costs of producing replacement reports.

External failure costs

These refer to failure costs discovered after delivery to customers. Examples are:

Manufacturing: The cost of meeting warranty claims from customers; the loss of repeat orders from customers.

Management accounting: The costs associated with poor decision-making arising from inaccurate or untimely information to management; the costs associated with resolving external audit queries.

(b) How cost categorisation can help develop performance measures

The breaking down of costs into the four categories identified in (a) provides a useful structure of data collection. Also, defining these cost categories helps to clarify an understanding of the issues involved in developing the objectives of management accounting within the organisation.

Rather than looking at the totality of quality costs within management accounting, a VFM approach can usefully be attempted in each quality cost area. For example, some of these quality cost areas are likely to be more critical than others, such as the provision of cost information for pricing purposes.

In this way, quality cost categorisation focuses attention on areas of both high expenditure and high importance, and may provide a basis for benchmarking the management accounting function against that of comparable organisations.

Appropriate quality and performance measures

It needs to be recognised that management accounting has internal customers, that is, other departments in the organisation and senior management. Their opinions on the service they receive are critical. Indeed many organisations are currently considering outsourcing their accounting functions.

Appropriate performance objectives should address issues such as:

the usefulness of management accounting information – in other words, relevance to user needs;
the timeliness of reports and cost exercises;
the flexibility in response to user requests;
the availability of accounting personnel to resolve queries;
value for money.

Specific performance measures could then be, for example:

the number of computer downtime hours in a period;
the number of reports issued on time;
ratings from internal customer satisfaction surveys;
benchmarking management accounting costs and activities against those of comparable organisations.

✓ Solution 5

(a) Standard costing involves the setting of standards at agreed levels of price and performance and the measurement of actual events against such standards in order to monitor performance. The variance analysis will measure changes in performance and price for sales, material, labour and overhead. A basic assumption is that the standards will apply over a time period during which they provide a suitable base against which to measure actual events.

A total quality environment adopts a different philosophy:

it aims towards an environment of zero defects at minimum cost. This conflicts with the idea of standard costs, which, for example, accept that a planned level of yield loss has been built into material standards.

it aims towards the elimination of waste, where waste is defined as anything other than the minimum essential amount of equipment, materials, space and worker time. Standard costs may be set at currently attainable levels of performance that built in an accepted allowance for 'waste'.

it aims at continuous improvement. The focus is on performance measures that illustrate a continuous trend of improvement rather than 'steady-state' standard performance that is accepted for a specific period.

it is an overall philosophy requiring awareness by all personnel of the quality requirements in providing the customer with products of agreed design specification. Standard costing tends to place control of each variance type with specific members of management and work-force. This view may cause conflicting decisions as to the best strategy for improvement.

(b) Standard costing will measure labour efficiency in terms of the ratio of output achieved: standard input. This measure focuses on quantity and does not address other issues of effectiveness. Effectiveness is a broader concept that incorporates the idea of trying to find the cheapest method of achieving a given result. Effectiveness in a total quality context implies high quality with a focus on value-added activities and essential support activities. Efficiency (in terms of output) may be achieved at a cost. In a total quality context, such costs may be measured as internal or external failure costs that will not be identified in the standard cost variance measure.

In a standard cost system, individual labour task situations are used as a basis for efficiency measurement. In a total quality environment it is more likely that labour will be viewed in multitask teams who are responsible for the completion of a part of the production cycle. The team effectiveness is viewed in terms of measures other than output, including incidence of rework, defect levels at a subsequent stage in production, and defects reported by the customer.

✓ Solution 6

This is a basic product costing question that invites students to demonstrate their understanding of the principles of ABC.

(a) Overhead costs of £500,000 and direct labour hours of 400,000 give an overhead absorption rate of £1.25 per hour.

Applied to the two products this OAR gives overhead costs as follows:

	Per unit
	£
A	1.25
B	0.75

(b) Three appropriate cost drivers are:
receiving components;
receiving raw materials;
disbursing kits of components and raw materials.

Relating overhead costs to these drivers using the number of indirect staff engaged in each activity as the basis gives the following results:
receiving components – £250,000; £10 per receipt;
receiving raw materials – £125,000; £12.50 per receipt;
disbursing kits – £125,000; £25 per issue
The products therefore attract overheads as follows:

	Total	*Per unit*
	£	£
A	2,875	2.87
B	1,225	0.05

(c) Advocates of ABC would argue that the product costs shown in (b) are more meaningful than those shown in (a) because the former are based on a more sensitive analysis of the activities giving rise to overhead costs.

It is clear that the relative cost impact of the activities involved in producing the two products appears much more clearly when ABC is used.

☑ Solution 7

In some types of popular management literature the terms 'cost control' and 'cost reduction' are used as if they are interchangeable. Actually, they mean very different things. The question invites students to explore relevant differences.

(a) Cost control is the process of containing costs to some predetermined norm. This is usually carried on by the formal comparison of actual results with those planned – the routine of budgets and standard costs and operating statements and the investigation of variances. Cost reduction is the wider-ranging attempt to reduce costs below the previously accepted norm or standard, preferably without reducing quality or effectiveness. This is a dynamic rather than routine process, quite possibly only carried out at infrequent intervals, for example at time of financial crisis.

(b) A wide range of examples can be given.

(i) *Cost control:*
Budgetary control
Standard costing
Setting of spending limits by level of management
Procedures for formal authorisation of recruitment
Control of caaaapital expenditure

(ii) *Cost reduction:*
Value analysis, value engineering
Systems analysis, O&M
Work study
Operations research (OR)
Standardisation of components and processes
Product range standardisation/simplification
Investment appraisal, terotechnology
Value-for-money analysis
Arbitrary cutting of overhead budgets
Zero-based budgeting

Any three of the above are sufficient to answer the question.

(c) The cost-control techniques of standard costing and budgetary control would tend to support the proposal. However, a study of OR techniques (essentially cost-reduction techniques) and of recent developments, reported in *Management Accounting*, would lead to the conclusion that current practice is not purely control, but active cost reduction.

There has been considerable interest in a range of topics relating to new manufacturing techniques, and to Japanese methods – quality management, quality costs, JIT stock and production control, flexible manufacturing systems and computer-integrated manufacturing.

There has also been interest in a range of other innovations, in IT making management accounting faster and more effective especially with developments in data capture and transmission, in strategic management accounting and the links between management accounting and long-range planning, and in the extension of management accounting in areas where it has been relatively underdeveloped in service industries and the public sector, often with the development of new techniques such as data envelopment analysis.

✓ Solution 8

The question covers much the same ground as question 2 in this chapter. It invites students to demonstrate a grasp of the basic principles of ABC and how they compare to traditional product costing.

(a) Labour hour overhead absorption rate:

$$\frac{£310{,}000}{2{,}000} = £155 \text{ per labour hour}$$

Traditional unit costs:

	r	*s*	*t*
	£	£	£
Direct labour costs	300	5,760	600
Direct material costs	1,200	2,900	1,800
Overheads	3,875	74,400	7,750
Total costs	5,375	83,060	10,150
Cost per unit	£9.60	£6.49	£4.23

Workings for *r*

Direct labour costs	25 × £12	£300
Direct material costs	as stated	£1,200
Overheads	25 × £155	£3,875
Cost per unit	£5,375 ÷ 560	£9.60

(b) An ABC system would be developed by analysing the cause of overhead costs as a function of the support activities carried out within the organisation. The 'cost drivers' are then used to apportion costs in a meaningful way to the different products produced in a multi-product company.

Rapier Consultants have already identified the cost drivers for KL, that is:

receiving components from suppliers;
setting up production runs;
quality inspections;
dispatching goods to customers.

The apportionment of costs to *r, s* and *t* is carried out as follows:

Step 1 – Determine the total costs for each activity (£000)

Activities	*Operations*	*Maintenance*	*Costs Technicians*	*Stores*	*Dispach*	*Total*
	£	£	£	£	£	£
Receiving supplies	18.75	3.75	3.83	35.00		61.33
			34.00			
Set-ups	87.50	17.50	17.85			156.85
Quality inspections			25.50			25.50
Dispatching goods	18.75	3.75	3.83		40.00	66.33
Total	125.00	25.00	85.00	35.00	40.00	310.00

Operations (equipment), maintenance and the portion of technicians' wages for maintenance are all apportioned on the book value of equipment.

Workings for set-up cost activities
Operations and maintenance have 70 per cent of their costs apportionable to manufacturing (i.e. set-ups):

$$125 \times 0.70 = 87.50$$

and

$$25 \times 0.70 = 17.50$$

Technicians have 40 per cent of their cost apportionable to set-ups, that is:

$$85 \times 0.40 = 34$$

They also have 30 per cent of their costs apportionable to maintenance, which in turn has 70 per cent of its costs apportionable to set-ups, that is:

$$85 \times 0.30 \times 0.70 = 17.85$$

Step 2 – Calculate the cost for each activity

		£
Receiving suppliers	£61,330 ÷ 980	62.58
Set-ups	£156,850 ÷ 1,020	153.77
Quality inspections	£25,500 ÷ 640	39.84
Dispatching goods	£66,330 ÷ 420	157.93

Step 3 – Apply these rates to calculate the unit costs

	r	*s*	*t*
	£	£	£
Direct labour costs	300.00	5,760.00	600.00
Direct material costs	1,200.00	2,900.00	1,800.00
Receiving supplies	2,628.36	1,501.92	1,752.24
Set-ups	2,460.32	2,767.86	1,845.24
Quality inspections	398.40	318.72	717.12
Dispatching goods	3,474.46	13,424.05	7,264.78
Total	10,461.54	26,672.55	13,979.38
Cost per unit	£18.68	£2.08	£5.82

Example working for overhead costs: receiving supplies for *r*

£62.58 × 42 = £2,628.36

(c) Quarterly charge (for 1,000 units)

		£
Design costs	£40,000 ÷ 8	5,000
Direct labour	80 × £12	960
Direct materials		2,000
Overheads		
Receiving supplies	£62.58 × 20	1,252
Set-ups	£153.77 × 15	2,307
Quality inspections	£39.84 × 30	1,195
Dispatching goods	£157.93 × 4	632
Total		13,346
25% mark-up		3,337
Charge per quarter		16,683

The actual quarterly marginal cost is:

	£
Design costs: £40,000 ÷ 7.02	5,698
Direct labour	960
Direct materials	2,000
Variable overheads:	
Labour-related:	
80 × ((310,000 × 0.6 × 0.5) ÷ 2,000)	3,720
Inspection-related:	
30 × ((310,000 × 0.6 × 0.5) ÷ 640)	4,359
	16,737

The method suggested by the sales director does not cover the actual marginal costs.

In the short term, the use of Rapier's analysis of fixed and variable overheads allows the traditional method to give a more accurate costing. Work needs to be undertaken to discover the reasons for the discrepancies between the two methods, that is, a more fundamental understanding of cost drivers and their unit costs is still required.

Workings for the actual quarterly marginal cost 7.02 represents the cumulative discount factor for the eight quarters at 3 per cent per quarter.

The labour-related overhead is found from the fact that 60 per cent if the overheads are variable of which 50 per cent vary with labour hours, that is:

$$\frac{310{,}000 \times 0.6 \times 0.5}{2{,}000} = \text{per labour hour}$$

✓ Solution 9

The question invites an evaluation of ABC practice relative to traditional product costing. It also invites discussion of how the traditional product costing system used by KL might be improved. This invites students to draw on knowledge gained in their Foundation level studies or equivalent.

(a) Activity-based costing (ABC) is based on the principle that all overhead costs can vary over the medium to long term and that each category varies with the level of support activity that is being provided. This is a more sophisticated argument than the simplistic division into fixed or variable costs with respect to one measure of activity, that is, production output.

This more complicated approach was developed in response to a significant change in many modern manufacturing environments. Specifically, these change include:

constant and low levels of materials and products owing to the implementation of just-in-time (JIT) principles;

constant and how direct labour costs owing to the high level of automation and a multi-skilling and teamworking approach;

high capital investment cost, driving up overheads;

many production set-ups to provide a wide range of customer-specific products while keeping low product inventory – this will influence the production overhead costs;

more paperwork and progress expediting is required to ensure supply of materials and delivery of product – this also drives production overheads.

The ABC approach is to identify the relevant activities that drive up overhead costs, and to use the need for these activities for each product, as the basis for apportionment of these costs. Advocates claim that this is more attuned to the situation of high overhead and low direct costs than the traditional method, which catered for the opposite situation.

The company KL manufactures several products:

r complex, low-volume product;
s a simple, high-volume product;
t an intermediate product in terms of composition and volume.

The traditional system will tend to over-apportion costs to large volumes of production and under-apportion costs to complicated products.

Thus *r* will be undercharged and *s* overcharged by both inadequacies in the traditional system. This may make the product costs grossly inaccurate in some situations.

(b) The existing system uses a single overhead absorption rate (OAR), which produces the gross inaccuracies highlighted in part (a). This could be replaced with several OARs, one for each cost centre, and, rather than using direct labour hours, direct material costs, machine hours or power usage, might be chosen as the basis for apportionment.

This might reflect more accurately the extra costs attributable to more complex products but would not reflect the extra costs attributable to small production batches.

Thus the system needs to be fully augmented with a complete analysis of overhead cost drivers to give meaningful results.

(c) The proponents of ABC claim that it gives more meaningful results in both AMT industries and service industries. Specifically, they state that it gives not only accurate and meaningful product costs, but that it also gives management a handle on controlling and reducing overhead costs.

This is based on the fuller understanding gained of how the overhead costs vary with the operating strategy and indirect support activities undertaken within the organisation.

Management decision-making for pricing, project appraisal, buy-or-make options, etc., depend on an accurate and meaningful cost analysis. The ABC system is the most sophisticated system developed for this purpose.

ABC produces an average cost per unit. However, when this changes with the level of activity (e.g. a stepped fixed cost, a discount on bulk purchases, etc.) this average cost per unit may not be the marginal cost per unit that should be taken into consideration.

Although the theory of ABC is simple, the process of analysis required to implement it is complex and costly. If the analysis is flawed then the results obtained will also be flawed and may be less accurate and less meaningful than the 'arbitrary' traditional approach.

☑ Solution 10

This is another question that invites students to draw on their general knowledge of modern development in management.

(a) The just-in-time (JIT) philosophy aims to enable scheduled production targets to be met while reducing to a minimum the non-added-value activities of maintaining more than minimal stock levels of raw materials, subassemblies, work in progress and finished goods.

To achieve this aim, customer relations must be close to enable accurate demand forecasts and relevant product offerings. The factory layout and product design may need to be simplified and a multitask and teamwork culture needs to be established among the workforce. Supplier relationships are crucial and long-term contracts, including component research and development, will follow from a focus on reliable delivery of many on-specification and on-time batches of small quantities of materials.

These are all attributes of a world-class manufacturing standard in an advanced manufacturing technology environment. The old ways of mass production of a single product, in a dedicated production facility with large buffer stockholding, have been replaced with a flexible production facility producing small batches of different product variations, which have shorter life cycles.

Total quality management (TQM) aims to ensure that quality is the primary concern of every employee at every stage of producing a good or service. This implies empowerment of the workforce, that is, each individual has responsibility and authority, for example, to stop the production line if necessary to maintain quality.

Both JIT and TQM radically alter the management function from directing to supporting, from organising to coaching, from deciding to facilitating, from problem-solving to providing resources. KL makes a wide variety to complex product and to be economic and to maintain customer satisfaction it will be forced to adopt such practices.

(b) It is not always economic to manufacture every product on a continuous basis. Therefore, a great deal of manufacturing is organised in the form of batches. Production lines periodically switch from one product to another. Operating in this manner will usually involve holding stocks of each product and producing fresh batches of each product as stocks are depleted by sales.

Manufacturing in large, infrequent batches incurs high inventory-holding costs. Manufacturing in small, frequent batches minimises holding costs but may give rise to certain additional costs. For example:

- set-up costs – that is, the opportunity cost of lost production capacity as machinery and the workforce reorganise for a different product;
- extra materials-handling costs as the materials and subassemblies, etc., used for the previous batch are replaced with those required for the next batch;
- quality costs – every time a new batch is commenced more emphasis (workers' and inspectors' time) must be put into assuring that quality is maintained;
- increased paperwork (or software data entry) and expediting corresponding to increased movements of smaller amounts of raw materials, subassemblies and finished products.

All the above factors give rise to costs and it is these costs that the writer is referring to.

These costs will be relatively higher in small-batch production than in large-batch production.

The purpose of any cost accounting system is to attribute production costs to individual products in a meaningful way. One weakness with KL's existing cost accounting system is that it may not adequately identify the full costs of small-batch production. Some of those costs (high labour and material usage in early production) are direct and will be correctly allocated to the products they relate to.

The factory overheads are distributed over all batches at a single overhead rate, for example, labour hour rate, which takes no account of batch sizes. So, overheads are absorbed in a manner that discriminates in favour of small batches at the expenses of large batches.

Adopting a cost accounting system that allows a more meaningful treatment of small-batch costs (and ABC is not the only option) offers advantages including:

- by providing an accurate figure for batch-size costs it allows the calculation of accurate optimum batch sizes for each production;
- by correctly treating and reporting small-batch costs, the need to control and manage those costs may become more apparent to managers;
- better short-term decision-making regarding whether to make a product or to buy it in, and better-informed pricing and portfolio decisions;
- better medium- to long-term decision-making, especially relating to reducing these overhead costs by use of IT, better systems and procedures, a better-trained and more flexible workforce, etc.

(c) Academic accountants are expected to carry out research and publish scholarly papers as well as teach undergraduates. Thus, such writers are likely to communicate new practices to the profession as a whole.

There are also numerous consultancy firms that generate business for themselves on the basis of new practices that produce superior results. They too are likely to communicate the general outline of their proprietary practices.

As to the development of new practices, this usually occurs as an empirical solution to a practical problem. This problem may be encountered by practising accountants, by academic accountants via their research, or by consultant accountants working for a client. The last two categories of accountant may have more resources and time to develop a radically new practice, but all three situations could lead to a new practice.

ABC is an example of a new practice based on old principles but applied in a new way to give new insights into production costing. The academic Kaplan is credited with publicising the idea via academic journals, a book, and in conjunction with a major group of consultants. All the ideas in ABC may have been developed and used individually by different practising accountants, but Kaplan took the time to develop them into a coherent theory for modern manufacturing and service sectors.

Some new practices have been developed by academics and all are communicated, tested, debated and explained to the accounting body as a whole by their activities. Thus academic research plays an important role in the development of new practices within the management accounting profession.

This Page Intentionally Left Blank

Responsibility Centres and Transfer Pricing

9

Learning Outcomes

After completing study of this chapter you should be able to:

- discuss the use of cost, revenue, profit and investment centres in devising organisation structure and in management control;
- prepare cost information in appropriate formats for cost centre managers, taking due account of controllable/uncontrollable costs and the importance of budget flexing;
- prepare revenue and cost information in appropriate formats for profit and investment centre managers, taking due account of cost variability, attributable costs, controllable costs and identification of appropriate measures of profit centre 'contribution';
- calculate and apply measures of performance for investment centres (often 'strategic business units' or divisions of larger groups);
- discuss the likely behavioural consequences of the use of performance metrics in managing cost, profit and investment centres;
- explain the typical consequences of a divisional structure for performance measurement as divisions compete or trade with each other;
- identify the likely consequences of different approaches to transfer pricing for divisional decision making, divisional and group profitability, the motivation of divisional management and the autonomy of individual divisions.

9.1 Introduction

In this chapter, we will explore the manner in which an organisation can be split into 'responsibility centres' for accounting and financial control purposes. The concept of responsibility accounting was encountered earlier in this text within the context of budgeting and budgetary control. The thrust of this approach is that an organisation can be split into parts for each of which an individual manager or management team is responsible.

A budget is prepared for each of the constituent parts ('responsibility centres') and results reported on a strictly consistent basis. Hence, the central method of performance evaluation is the comparison of budget and actual results for each responsibility centre. This comparison can be between particular cost/revenue figures or between particular performance indicators judged appropriate.

We will proceed to consider detailed aspects of the operation of responsibility centres (including 'transfer pricing') and the manner in which performance indicators are selected and applied. We will also consider the manner in which the selection of performance indicators can influence and/or distort the manner in which responsibility centre managers behave.

9.2 Cost, Revenue, Profit and Investment Centres

9.2.1 Cost centres

You should already have encountered cost centres as part of your Foundation level studies. The role that cost centres play in the determination of product costs and in general management accounting practice is not therefore explored fully here. The CIMA *Official Terminology* defines a cost centre as:

Cost centre. A production or service location, function, activity or item of equipment for which costs are accumulated.

A cost centre is used as a 'collecting place' for costs. The cost of operating the cost centre is determined for the period, and then this total cost is related to the cost units that have passed through the cost centre.

For instance, an example of a production cost centre could be the machine shop in a factory. The production overhead cost for the machine shop might be £100,000 for the period. If 1,000 cost units have passed through this cost centre we might say that the production overhead cost relating to the machine shop was £100 for each unit.

The CIMA definition of a cost centre also mentions a service location, a function, an activity or an item of equipment being used as a cost centre. Examples of these might be as follows but you should try to think of some others:

Type of cost centre	*Examples*
Service location	Stores, canteen
Function	Sales representative
Activity	Quality control
Item of equipment	Packing machine

If you are finding it difficult to see how a sales representative could be used as a cost centre, then work carefully through the following points:

1. What are the costs that might be incurred in 'operating' a sales representative for one period?

   Examples might be the representative's salary cost, the cost of running a company car, the cost of any samples given away by the representative and so on. Say these amount to £20,000.
2. Once we have determined this cost, the next thing that we need to know is the number of cost units that can be related to the sales representative.

   The cost unit selected might be £100 of sales achieved. If the representative has achieved £200,000 of sales, then we could say that the representative's costs amounted to £10 per £100 of sales. The representative has thus been used as a cost centre or collecting place for the costs, which have then been related to the cost units.

9.2.2 Profit centres

In an organisation, the degree of authority delegated by top management to lower level operating management can be viewed as a continuum. At one end, where complete executive control over activities is maintained by head office, and all decisions are made at the top level, the organisation is totally *centralised*. At the other end, where the degree of autonomy exercised by lower level managers gives them full control over activities and decisions, it would be described as totally *decentralised*. Neither end of this continuum is seen as desirable. In the case of total centralisation, routine decisions best handled (from the point of view of timeliness and detailed knowledge) by the manager at local level will divert valuable top management time and attention from the broader policy and strategic issues that face the firm as a whole. In the case of total decentralisation, it is extremely difficult to obtain a sufficient number of competent subordinate managers to operate the system successfully; not all will have equally good decision-making skills, and top management must therefore be willing to let them make some costly mistakes. Furthermore, head office is faced with the problem of selecting an appropriate performance measurement system that will ensure that the managers of the operating units (often called divisions) act in a way that is consistent with the goals of the organisation as a whole (goal congruence). In reality, of course, few organisations operate at these extremes, but as any movement away from complete centralisation necessarily involves a degree of decentralised activity, the problems associated with it must be recognised and solved.

In the weakest form of decentralisation, a simple system of *cost* or *revenue* centres is often used, where managers are responsible for cost containment or revenue generation respectively. In such cases, a single financial measure may be deemed appropriate, and performance is likely to be evaluated primarily by reference to the materiality of the variances between budgeted and actual costs and revenues. As decentralisation becomes stronger, managers will be responsible for both costs and revenues in their divisions (*profit centres*), and in its strongest form for costs, revenues and the acquisition and disposal of the assets used to support the divisions' activities (*investment centres*). In these situations, other measures of performance are appropriate to reflect the greater degree of independence enjoyed by the managers of the centers, and these measures must be designed to minimise the dysfunctional tendencies that inevitably accompany greater autonomy.

9.2.3 Revenue centres and investment centres

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. The fund raising function of an NFP organisation might be split into revenue centres (with each centre responsible for a geographic area) and a marketing operation might be split into revenue centres (with each responsible for a particular product range).

An investment centre is responsible for justifying, making and then operating particular investments. Hence, an investment centre is responsible for the selection and performance of particular investments. The core technique associated with this is 'investment appraisal', which is not a topic within this particular course. It is explored fully in CIMA's Paper P2

Management Accounting Decision Making. However, the Investment Centre is central to our discussion of strategic business units (SBUs) below.

9.2.4 Reporting responsibility centre results

The reporting of responsibility centre results has already been explored within our study of budgetary control and financial reporting (see Chapters 6 and 7).

The key points to note are:

- The results reported for a given centre should genuinely reflect only those costs and revenues which lie within the control of that centre. Costs that are 'uncontrollable' (e.g. an apportionment of head office overheads) might be either excluded from the report or clearly segregated. The end result is that the results (in terms of profit, contribution and capital employed) reported for a given centre are only those for which the centre's management are strictly responsible.
- The results reported for a centre should be compared only with a meaningful benchmark in order to evaluate performance. With the context of a traditional budgetary control system, this means that the budget may be 'flexed' to allow for the actual level of output/activity achieved. Hence the financial control report involves a comparison of likes. This issue has been explored earlier in this text.
- Any reported result becomes most meaningful when it is expressed in some context, that is, in the form of a performance indicator. The context may be a comparison of a financial actual with budget, a comparison of a financial actual with some non-financial measure (e.g. to give a cost per unit output), a current actual compared with a previous period actual or an actual compared with some industry-wide benchmark.
- A performance indicator can be either financial or non-financial (see relevant discussion in Chapter 7). For a given business unit, the most meaningful and full form of performance evaluation might involve a mix of performance indicators along the lines of the balanced scorecard. The choice of indicators should be related to the key success factors of the unit.

In the performance evaluation exercise, the management accountant should be aware that there is ultimately no such thing as an uncontrollable cost or a fixed cost – if one takes a long enough view over time and span of activity level. All costs may be considered to vary if you take enough time to research what activities they vary with. It is then just a matter of determining who controls the relevant levels of activity in order to determine which responsibility centre the costs concerned should be attributed to.

The various component parts of the management accounting function relate to one another. Meaningful performance evaluation requires a rigorous cost accounting system. Our discussion of costing systems in Chapter 1 is relevant to subsequent discussion of performance evaluation in Chapter 7 and our discussion of responsibility centres in this chapter.

9.3 Transfer pricing

In a divisionalised organisation, the managers of the different investment centres are encouraged to operate them as separate economic entities. This separation will only rarely complete, however, as goods and services are often provided by one division to another, particularly in a focused manufacturing environment. A value must obviously be placed on these intra-company transfers, and is known as the *transfer price*. In the absence of divisionalisation, the value that would be placed on goods or services that would otherwise be transferred would be *cost* (however calculated), and this can still be used as a transfer price. An alternative, however, that reflects the autonomous nature of divisions, would be for the selling division to transfer at a price *above* cost, and thus record a profit. It is the character and allocation of such profit, and the concomitant potential for suboptimality for the organisation as a whole, that forms the nub of the transfer-pricing problem.

9.3.1 Aims and features

Any transfer-pricing system should aim to:

- ensure that resources are allocated in an optimal manner;
- promote goal congruence;
- motivate divisional managers;
- facilitate the assessment of management performance;
- retain divisional autonomy.

Its two overriding features should be:

- simplicity in calculation and implementation;
- robustness (i.e. not requiring frequent adjustment).

Needless to say, a number of these aims and features can conflict with each other, and prove difficult to achieve in practice. It is highly unlikely that any one method would meet all the firm's requirements in all circumstances; the best that can be hoped for is a reasonable compromise.

9.3.2 General rules

Although different approaches will result in different figures, limits within which the transfer price should fall can be summarised as follows:

- *Minimum*. The sum of the selling division's marginal cost and the opportunity cost of the resources used. Note that in many practical circumstances, the opportunity cost of the resources used in making a transfer is 'nil'. Hence it is often stated in management literature that the minimum limit for a transfer price is marginal cost.
- *Maximum*. The lowest market price at which the buying division could acquire the goods or services externally, less any internal cost savings in packaging and delivery.

This is so because (a) the transferor division will not agree to transfer units if the transfer price is set at less than marginal cost plus opportunity cost, and (b) the transferee division will not accept internally transferred units if it can buy them for less from an outside supplier. If the marginal cost of unit is £5 and £3 contribution from an outside sale is lost through using that unit for an internal transfer – then the transferor division will not agree to transfer for less than £8. If such a unit can be bought from an outside supplier for £9 then the transferee division will not accept an internally transferred unit at any price greater than £9. So, in this case the lower and upper limits of the transfer price are £8 and £9 respectively.

The difference between the two limits represents the savings made by producing internally as opposed to buying in from outside.

We will now look at a number of different transfer pricing methods, using the example data which follows.

Example

XY has two divisions – A and B. Division A manufactures advanced computer microchips, and most of its production is taken up by division B, which assembles computers. Data for division A are:

Standard unit production cost

	£	£
Direct materials		35
Direct labour		10
Variable manufacturing overhead		5
		50
Fixed overhead*	20	
Fixed selling and administration*	5	
		25
Total cost		75
Normal mark-up: 40%		30
List price to outside buyers		105

* Fixed costs are allocated on the basis of estimated volume.

Estimated production

	Units
Internal transfers	300,000
External sales	200,000
Total production	500,000

9.3.3 Cost-based prices

Four versions of 'cost' are commonly used: marginal cost, absorption cost, standard cost, and marginal cost plus a fixed fee ('two-part tariff'). Actual costs will vary with volume, seasonal and other factors; furthermore, if actual costs are used as a basis for transfer prices, any inefficiency in the producing department will be passed on in the form of increased cost to the receiving department. The use of standard costs is therefore recommended, so that all of the supplying division's efficiencies and inefficiencies are reflected in its own accounts.

(i) **Marginal cost**
If we assume that variable cost can be used as marginal cost, then the transfer price based thereon would be £50. If costs, revenues and volume are as expected, the use of this price will result in a 'loss' for the selling division of £1.5m:

	£m
Internal transfers: 300,000 @ £50	15.0
External sales: 200,000 @ £105	21.0
	36.0
Total costs: 500,000 @ £75	(37.5)
Loss	(1.5)

This loss must be contrasted with the profit of £15m that would accrue if all of A's production could be sold externally:

	£m
Sales: 500,000 @ £105	52.5
Total costs – as above	(37.5)
	15.0

However, if no more than the current 200,000 could be sold externally, and the capacity represented by the production on chips for internal transfer would otherwise remain idle, there is no opportunity cost associated with a transfer at marginal cost, other things being equal, and division A would be indifferent to the production and transfer.

Obviously, if more than the current 200,000 could be sold externally, A's indifference may change, depending on whether a price in excess of marginal cost is offered. If no excess is offered, A would have a strong *disincentive* to supply B.

(ii) **Absorption cost**

Using this variant of cost gives a transfer price of £70 (variable costs £50 + fixed manufacturing cost £20) and a rather happier income statement:

	£m
Internal transfers: 300,000 @ £70	21.0
External sales: 200,000 @ £105	21.0
	42.0
Total costs – as above	(37.5)
profit	4.5

Although the new transfer price does not generate the same level of profit as a sale of that quantity to an outside party, nevertheless a contribution towards fixed costs is provided thereby, thus modifying the disincentive noted above. However, as the level of the transfer cost is increased, its effect on the buying division, B, could lead to problems of suboptimalisation for the firm as a whole. For example, suppose B could buy the same components from an *outside supplier* at a cost of £65. An internal transfer price of £70 would force B to buy in a product at £65 that could be manufactured in-house for a variable cost of £50. Although the buying division would 'save' £5 per chip (£70−£65), the firm would *lose* £4.5m thereby:

	£
Marginal cost to produce	50
External purchase cost	(65)
Loss if buy in	(15)
300,000 × £15 = £4.5m	

This loss assumes that the opportunity cost of the released capacity is *less* than £15 per unit. If alternative goods generating *more* than this could be produced with the spare capacity – if, for example, the marginal 300,000 units *could* be sold externally at the list price – then XY would be optimising its resources by buying in the components:

	£
List price	105
Marginal cost	(50)
Contribution	55
Loss if buy in	(15)
Incremental profit	40
300k × £40 = £12m	

We can see here a clear application of the minimum/maximum rule noted above: the sum of the selling division's marginal cost and the opportunity cost of the resources used (at list price) is £105, the minimum transfer price that the selling division could change without making a loss for the firm, which exceeds the £65 maximum transfer price dictated by the prevailing market price. XY should not transfer the components internally as long as the market price is less than £105.

(iii) **Standard cost**

One of the problems of cost-based systems is that they allow a transferor division to pass on cost inefficiencies to a transferee division. Such inefficiencies can result from anything as simple as high fixed overheads per unit arising from low output levels in the current period, or high unit material costs resulting from machine defects in the current period.

One variant on the absorption cost method is standard cost. Such standards are used irrespective of what actual costs were, with the result that the impact of adverse or favorable cost variances rests with the transferor division. Many business managers would consider that this gives the most equitable distribution of profit.

(iv) **Two-part tariff**

Under this variant, the selling division transfers at marginal cost (including any opportunity cost), but raises a fixed annual fee on the buying division for the privilege of receiving transfers at that price. The theory underlying this approach is that the buying division will have a correct understanding of the selling division's cost behaviour patterns. The buying division will be able to correctly identify the appropriate marginal cost when calculating the optimum output level. The fixed fee is designed to cover a share of the selling division's fixed costs and provide a return on the capital employed in it, and thus both selling and buying divisions should be able to record a profit on intra-company transfers.

Drawbacks of this system include:

The supplying division has no incentive to supply units swiftly, because individual units do not generate a profit.

A profit is made when the fixed fee is transferred.

9.3.4 Market-based prices

The price of a comparable product or service in the market can be seen as an objective basis for the transfer price between divisions. It is the price that reflects the autonomous nature of divisionalisation, inasmuch as it simulates the price that would be offered and paid by fully independent entities. If the selling division is operating efficiently relative to its competitors, it would be expected to show a profit at such a price, and, similarly, a market-based price should not cause problems for an efficiently managed buying division, as the only alternative to an internal transfer would be to buy the goods of services in the open market at that price.

However, it is not always easy to determine the appropriate market price to use:

A comparable product might not be available on the market.

Different suppliers will quote different initial prices.

Different buyers command different discounts and credit terms, depending on the order size and their status.

Current market prices may reflect temporary aberrations in trading conditions, and thus might not prevail in the longer term.
An internal transfer of goods may involve savings in advertising, packaging and delivery costs, and thus an external market price would not be entirely appropriate.

Exercise

The XY group comprises two divisions – X and Y. Each divisional manager is paid a salary bonus linked to divisional profit. X produces the Exe and Y produces the Why. There is a 'perfect' outside market for the Exe with a going market price of £20 over which X has no influence. One unit of the Exe is incorporated in each unit of the Why.

The marginal cost of an Exe is £10 and the marginal cost of a Why (excluding the cost of the component Exe) is £10.

At unit selling price £50 no Whys are sold but demand for Whys rises by 100 units per period with each £5 reduction in the unit selling price.

Requirements

(a) Assuming that there is no production constraint in division X, tabulate the contribution generated by XY from sales of Whys ranging from nil to 500 units per period in 100-unit increments. Use this tabulation to identify the optimum unit selling price (usp) and output of the Why.

(b) Tabulate the contribution generated by division Y from sales of Whys ranging from nil to 500 units per period at 100-unit increments with the Exe being transferred from X to Y at market price. Use this tabulation to identify the unit selling price (usp) and output of the Why that is likely to be induced if Exes are transferred from X to Y at market price.

(c) Assuming that there is a production constraint in division X (with each unit of Why produced resulting in an outside sale of a unit of Exe being forgone), tabulate the contribution generated by XY from sales of Whys ranging from nil to 500 units per period in 100-unit increments. Use this tabulation to identify the optimum unit selling price (usp) and output of the Why.

(d) Comment on the results you have produced in answer to requirements (a) to (c) and outline any 'general rule' for transfer pricing that they might suggest.

Solution

(a) Optimum usp and output with no capacity constraint in X

Units Why	*USP £*	*Sales £*	*MC £*	*XY Cont. £*
0	50	0	0	0
100	45	4,500	2,000*	2,500
200	40	8,000	4,000	4,000
300	35	10,500	6,000	4,500
400	30	12,000	8,000	4,000
500	25	12,500	10,000	2,500

* The marginal cost is £20 per unit of Why (£10 + £10)

It can be seen that the optimum usp is £35 and output is 300 units. The critical point is that transferring Exe to Y involves no opportunity cost to X or XY as a whole.

(b) Induced usp and output

The marginal cost per unit charged to division Y will be:

	£
Transfer price of Exe (market price)	20
Marginal cost of Why	10
	30*

Units Why	*USP £*	*Sales £*	*MC £*	*Division Y Cont. £*
0	50	0	0	0
100	45	4,500	3,000*	1,500
200	40	8,000	6,000	2,000
300	35	10,500	9,000	1,500
400	30	12,000	12,000	0
500	25	12,500	15,000	−2,500

The transfer price system is likely to induce division Y to charge a usp of £40 and an output of 200 units. This maximises Y's contribution but is suboptimal from the point of view of XY as a whole, since we have proved in part (a) that the optimum usp is £35, with no capacity constraint.

(c) Optimum usp and output with capacity constraint in X

Units Why	*USP £*	*Sales £*	*MC £*	*Op. cost £*	*XY cont. £*
0	50	0	0	0	0
100	45	4,500	2,000	1,000	1,500
200	40	8,000	4,000	2,000	2,000
300	35	10,500	6,000	3,000	1,500
400	30	12,000	8,000	4,000	0
500	25	12,500	10,000	5,000	−2,500

The critical thing here is that each unit of Why sold results in the sale of a unit of Exe (with £10 contribution) being forgone. Hence an opportunity cost of £10 results from each unit of Why sold.

It can be seen that the optimum usp is £40 and output is 200 units. In this case, the transfer price of £20 (being marginal cost plus opportunity cost, or market price) induces optimum behaviour from the point of view of XY as a whole.

(d) What the above analysis suggests is that the general rule for transfer pricing is that units should be transferred at marginal cost plus opportunity cost. Where there is no production constraint in X then this rule gives a transfer price of £10, which will induce the optimum usp and output in Y.

Where there is a production constraint in X then the rule gives a transfer price of £20 (£10 marginal cost plus £10 opportunity cost) and this now induces the optimum usp and output in Y. In these circumstances, the rule specifies a transfer price that will usually approximate to market price.

As with all mathematical models, this rule provides a theoretical case that may be very difficult to apply in practice. For one thing, what constitutes 'opportunity cost' may vary from day to day.

The general point concerning transfer pricing is that a system based on marginal cost plus opportunity cost of resources used (commonly known as 'opportunity cost') is commonly considered to provide the mathematically correct method of transfer pricing, but it has practical limitations. This issue is explored in the Readings item 'Opportunity Cost: the Mathematically correct transfer price . . . ' appended.

9.3.5 Marginal cost

We have already seen that the use of marginal cost as a transfer price penalises the selling division by forcing it to transfer goods below total cost. In this case the selling division will be providing a concealed subsidy to the buying division.

In this section we will look in a little more detail at the potential behavioural impact of a transfer pricing system based on marginal cost.

Economic theory suggests that, where the market is imperfect, marginal cost is the correct price to use if the group's profit is to be optimised. Marginal cost is assumed to equate with variable cost in this discussion. Table 9.1 contains data that illustrates this. Up to five units are demanded, according to the selling price asked. The transfer price between the divisions is marginal cost plus 100 per cent mark-up to cover fixed costs and profit. The receiving division will wish to continue selling units until the 'perceived marginal cost' (that is the transfer price of the component plus the receiving division's own marginal cost) is equal to marginal revenue. This occurs after the second unit, and so the receiving division will sell only two units – assuming its management acts selfishly and wishes to maximise the division's contribution rather than that of the group. The maximum contribution under these circumstances will be £14. (At this point the supplying division will make a contribution of £20 and so the group's total contribution will be £34.) However, from the group's perspective the receiving division should continue to sell until the group's marginal cost is equal to the marginal revenue – this occurs at the fourth unit, where a contribution of £42 is made. (This is the point where neither a profit nor a loss is made and so sales would stop after three units.)

Using marginal cost as a basis for transfer pricing does little for the morale and motivation of the supplying division as that division will always make a loss to the extent of its fixed costs. Using marginal cost plus a mark-up helps to overcome this, but the receiving division may not then be aware of the marginal cost itself. Even if the receiving division is aware of the marginal cost, the managers will be tempted to act in the interests of the division rather than that of the group.

We have seen that a two-part tariff system can help in this situation, but it does have its limitations.

Table 9.1

Supplying Division		Receiving Division					
Units	Marginal cost per unit £	Units	Transfer price £	Marginal cost per unit £	Perceived total marginal cost £	True total marginal cost £	Selling price £
1	10	1	20	5	25	15	35
2	10	2	20	6	<u>26</u>	16	<u>30</u>
3	10	3	20	7	27	17	25
4	12	4	24	8	32	<u>20</u>	<u>20</u>
5	12	5	24	9	33	21	15

9.3.6 Dual pricing

The dual price method of transfer pricing was introduced in order to overcome the problems caused by using marginal cost, namely poor morale in the selling division, and lack of motivation by the receiving division to maximise the group's profit. The dual pricing method uses two prices:

- The supplying division is credited with a price based on total cost plus a mark-up.
- The receiving division is debited with marginal cost.

This means that the selling division is allowed to earn a profit and the receiving division has the correct information in order to make the correct selling decision to maximise the group's profit. The difference between the two prices will be debited to a group account – a transfer price adjustment account. At the end of the year the profits of the two divisions, and hence of the group, will be overstated to the extent of the price difference. In order to correct this the total amount in the transfer price adjustment account must be subtracted from the two profits to arrive at the correct profit for the group as a whole.

Dual pricing can also be used with market price in place of marginal cost for the receiving division. This can aid the supplying division in a particular circumstance. For example, where market prices are very volatile and the market price of the component suddenly collapses it may be unrealistic to expect the supplying division to cope with the decrease. Under these circumstances the receiving division would wish to buy elsewhere if the transfer price set was higher than the market price. So the supplying division could be credited with total cost-plus and the receiving division debited with the much reduced market price. The receiving division would then be happy to continue to buy internally.

However, despite its advantages dual pricing is not used widely in practice for the following reasons:

- It is a complicated system to operate when many goods are being transferred between a number of different divisions.
- It involves head office in the accounting side and so notification of transactions must be sent to the head office. Head office involvement goes against the principle of decentralisation and as a result the managers of the divisions may feel they are not being given the freedom they might expect as managers of an autonomous division.
- If total cost-plus and market price is used because prices have collapsed, it may cocoon the divisional managers of the supplying division from the rigours of the market place.
- Total cost plus and marginal cost may not prove helpful either. Very few organisations require the economic theory approach of using marginal costs to optimise profit, and taxation issues and repatriation of funds are often of more importance when setting transfer prices.

9.3.7 Profit-maximising transfer prices

One can consider more complex situations where both marginal cost and marginal revenue move with output level.

It is possible to determine a range of transfer prices within which divisional managers will be motivated to operate at the level of output which maximises profit for the organisation as a whole. The following exercise will demonstrate this.

Exercise

CD Ltd has two divisions, C and D. C transfers all its output to D, where the units are finished before being sold on the external market. Recent costs and revenues are as follows:

Monthly output units	*Cost incurred in division C £000*	*Cost incurred in division D £000*	*Division D revenue £000*	*Company profit £000*
14	150	60	350	140
15	163	64	371	144
16	177	69	392	146
17	194	77	412	141
18	211	85	431	135

The profit-maximising output for the company as a whole is 16 units per month. In order to determine the range of transfer prices that will encourage both divisions to operate at this level, we need to consider each division's marginal cost and marginal revenue.

Each divisional manager will be willing to increase supply until the point is reached where marginal cost = marginal revenue. Therefore we need to look at the marginal costs and revenues for each division.

Monthly output units	*Marginal cost Division C £000 per unit*	*Net revenue Division D £000 per unit*	*Net marginal revenue Division D £000 per unit*
14	–	(350–60) 290	–
15	(163–150) 13	307	(307–290) 17
16	14	323	16
17	17	335	12
18	17	346	11

Division C will be willing to increase output until the marginal cost exceeds the marginal revenue, or the transfer price. In order to be encouraged to produce and transfer 16 units, the profit maximising output, the transfer price must exceed £14,000 per unit, which is the marginal cost of the 16th unit. However, the transfer price must be lower than £17,000 per unit, otherwise Division C will wish to expand output to 17 units.

Division D will be willing to purchase 16 units from Division C as long as the transfer price is lower than £16,000 per unit. However, if the price is as low as £12,000 per unit, Division D will wish to purchase 17 units.

A transfer price must therefore be selected that is higher than £14,000 per unit but lower than £16,000 per unit.

To check this for yourself, select a transfer price within this range of, say, £15,000 per unit.

Division C would be willing to supply 16 units at this price, but not 17 units, since the 17th unit would have a marginal cost of £17,000.
Division D would be willing to purchase 16 units at this price, but not 17 units, since the net marginal revenue for the 17th unit is only £12,000.

9.3.8 Negotiated transfer prices

We have seen that transfer prices may be determined by various means, including the use of mathematical formulae based on opportunity cost and by determining the correct transfer price to encourage all divisions to operate at the profit-maximising output level.

Alternatively, transfer prices could be set through a process of negotiation between the buying and selling divisions. It could be argued that this is the correct procedure in a truly autonomous system, with no interference whatsoever from central management or head office. The resulting transfer price should be acceptable to both the buying and selling division since the relevant managers have been directly responsible for the negotiations.

However there are disadvantages to the use of negotiated transfer prices.

- The negotiations may be protracted and time-consuming.
- The managers may find it impossible to reach agreement. In this case central management may need to intervene. If a transfer price is imposed as a consequence then this may cause behavioural problems and would negate the objective of giving autonomy to divisions. On the other hand central managers might act simply as arbitrators in any dispute during negotiations, providing a mediation service to assist the negotiations to reach a conclusion that is acceptable to all concerned.
- The managers may not be negotiating from an equal basis. For example one of the managers may be more experienced than the other with the result that the outcome of negotiations may be unfair. This could lead to poor motivation and consequent behavioural problems.

9.3.9 Other behavioural considerations

Transfer prices tend to vary over the product life cycle according to Cats-Baril *et al.* (1988). During the introductory phase they suggest a cost plus fixed fee or cost plus a profit share. During the growth phase they suggest a price related to the closest substitute and during maturity a price based on identical products. This is common sense to a large extent. It is probably only during the maturity stage that identical substitutes exist and during the introductory phase there may be no basis other than cost on which to base price.

Using any actual cost or cost plus as a transfer price does not motivate the supplying division to act in the interest of the group. Standard or predetermined costs should always be used in place of actual cost. If actual cost is used the supplying division is not encouraged to be efficient and control costs as inefficiencies are passed on to the receiving division by way of a higher transfer price. It is even worse if a mark-up is used because the selling division is encouraged to *push up the actual cost* as this will increase the mark-up, and increase the division's profit. Standard costs are at least subject to scrutiny when they are set once a year and the receiving division has a chance to challenge them. If standard cost is used the selling division has an incentive to control actual costs below that level and so increase its own profits.

It is usual to imagine transfer pricing taking place in vertically integrated manufacturing organisations. This is not the norm today. Transfer pricing takes place in many different types of organisation and it can have a profound effect on behaviour. For example, a garage carries out a number of different activities that are linked to the activities of another section. The activities include selling new cars, selling old cars, servicing cars sold, general repairs, repairing and servicing used cars accepted in part payment, providing financing, etc. A transfer price is used to transfer a used car accepted in part-payment for a new car between the new car sales and used car sales divisions. A transfer price will also have to be established for transferring the cost of servicing and repairing these cars for sale between the servicing division and the used car sales division. These prices will have considerable implications for the profitability of the different sections and on the actions of the employees when making sales deals. If performance measurement and assessment is to be fair, transfer prices need to be set carefully.

Transfer prices can also be used to deter competitors. If a vertically integrated company concentrates profits at the stage of production where there is least competition competitors may be attracted to enter. On the other hand competitors operating at the other stages may be disadvantaged by the low profits the vertically integrated company is taking and they may not be able to achieve a satisfactory return if they are only operating in a limited area of the value chain. Neghandhi (1987) cites cases of US oil companies and Japanese trading and manufacturing companies doing this.

9.4 Taxation and other financial aspects of transfer pricing

International and intra-group trading is a very important part of business today. One-third of the UK's exports to Europe are intra-group transactions. Foreign-owned assets in Europe and the USA increased considerably during the 1980s and 1990s. During the 1980s foreign-owned assets in the USA tripled, but the tax paid changed very little, as more than half the companies involved reported no taxable income (Pear, 1990).

International intra-group transfer pricing has its own special considerations, and so a multinational organisation will have matters other than behavioural ones to consider when it sets its transfer prices. There is a natural inclination to set transfer prices in order to minimise tax payments, or to repatriate profits from one country to another or minimise payments to minority shareholders. These three aspects will now be considered.

9.4.1 Taxation

If a group has subsidiaries that operate in different countries with different tax rates, the overall group corporation tax bill could be reduced by manipulating the transfer prices between the subsidiaries.

For example, if the taxation rate on profits in Country X is 25 per cent and in Country Y it is 60 per cent, the group could adjust the transfer price to increase the profit of the subsidiary in Country X and reduce the profit of the subsidiary in Country Y.

Thus, if the subsidiary in Country X provides goods or services to the subsidiary in Country Y, the use of a very high transfer price would maximise the profits in the lower-tax country, and minimise the profits in the higher-tax country.

There is also a temptation to set up marketing subsidiaries in countries with low corporation tax rates and transfer products to them at a relatively low transfer price. When the products are sold to the final customer, a low rate of tax will be paid on the difference between the two prices.

According to a survey by Ernst and Young (1995), more than 80 per cent of multinational companies viewed transfer pricing as a major international tax issue, and more than half of those companies saw it as the major issue. The taxation authorities in most countries monitor transfer prices in an attempt to control the situation and in order to collect the full amount of taxation due. Double taxation agreements between countries mean that companies pay tax on specific transactions in one country only. However, if the company sets an unrealistic transfer price in order to minimise tax, and the tax authority spots this, the company will pay taxation in both countries, that is, double taxation. This additional payment can amount to millions of pounds and, as a result, is quite an effective deterrent. On the other hand, the gains of avoiding taxation may be even greater.

There have been many cases of transfer price fixing for one reason or another over the years. One of the most notorious of UK transfer pricing cases was that of Hoffman La Roche, as it was then called. Hoffman La Roche had developed the drugs of Librium and Valium. The products were imported into the UK at prices of £437 and £979 per kilo respectively. The UK tax authority accepted the prices; however, the Monopolies Commission sprang into life and questioned the prices on the grounds that the same chemical ingredients, which were unbranded, could be obtained from an Italian company for £9 and £28 per kilo. Hoffman La Roche argued on two grounds: (1) that the price was not set on cost but on what the market would bear, and (2) they had incurred the research and development costs and so had to recover those in the price. However, this was not accepted and they were fined £1.85m in 1960.

More recently in the UK in 1992 Nissan was caught for unpaid tax of £237m for falsely inflated invoices that were used to reduce profits. The freight charges were inflated by 40–60 per cent by a Norwegian company. The next year Nissan was required to pay £106 m in unpaid tax in the USA because the authorities felt that part of their USA marketing profits were being transferred to Japan as transfer prices on imports of cars and trucks were too high. Interestingly the Japanese tax authorities took a different view and returned the double tax, which is a very rare occurrence.

Most countries now accept the Organisation for Economic Co-operation and Development's (OECD) 1995 guidelines. These guidelines were produced with the aim of standardising national approaches to transfer pricing as part of the OECD's charter to encourage the freedom of world trade. They provide guidance on the application of 'arm's length' principles. They state that where necessary transfer prices should be adjusted using an 'arm's length' price, that is a price that would have been arrived at by two unrelated companies acting independently. There are three methods the tax authorities can use to determine an arm's length price.

The first is the comparable price method. This is the most widely used and involves setting the arm's length price by using the prices of similar products, that is, the market price or an approximation to one. The method is known as using comparable uncontrolled prices (CUPS) and is the preferred method wherever possible. This may seem a straightforward basis but as most international trade is carried out between related companies meaningful comparisons are hard to find. For example, in the UK in the 1980s it was possible to use independent car distributorships to find a CUP but now that car manufacturers have developed their own dependent distributor networks finding arm's length comparability is much more difficult.

Where a CUP cannot be found, or is inappropriate, one of two gross margin methods should be used. These involve a review of gross margins in comparable transactions between uncontrolled organisations. The resale price method is used for the transfer of goods to distributors and marketing operations where goods are sold on with little further processing. The price paid for a final product by an independent party is used and from this a suitable mark-up (to allow for the seller's expenses and profit) is deducted. The second gross margin method is the cost-plus method. Here an arm's length gross margin is established and applied to the seller's manufacturing cost.

These methods are of little help when attempting to establish an arm's length price for intangible property such as a patent right or trade name. Also much of the data needed may not be in the public domain and so setting fair transfer prices is not easy. In the past this did not matter so much but today it is often up to the taxpayer to 'prove' the price.

For example, the US section 482 regulations on transfer pricing cover 300 pages and the onus is on the taxpayer to support the transfer price with 'timely' documentation. If this is not done a non-deductible penalty of up to 40 per cent of the arm's length price may be levied. In the past in the UK it was up to the tax authorities to detect cases of inappropriate transfer pricing. This left the UK vulnerable to a certain amount of tax leakage. But now under the self-assessment regulations the onus has switched to the taxpayer to provide correct information. Failure to demonstrate a reasonable attempt at an arm's length price in the tax return will give rise to a penalty of 100 per cent of any tax adjustment. Other European countries are also tightening their regulations in response to the USA and OECD's moves.

To safeguard the position the taxpayer may enter into an Advanced Pricing Agreement (APA) with the relevant two tax authorities involved. This is a new approach and is done in advance to avoid any dispute and the costly penalty of double taxation and penalty fees. According to the Ernst and Young (1995) survey referred to earlier more than 60 per cent of companies intend to do or are doing this.

Exercise

Assume that Division A, which is part of the ABC group, manufactures a single product M. Division A's maximum capacity is 450,000 Ms a year. It sells 420,000 Ms to external customers at a price of £75.95 a unit. This gives Division A a contribution of £30.50 a unit.

Division B is also part of the ABC group but is situated in a different country to Division A. Division B purchases 120,000 units of product M each year from a local company X (which is not part of the group) at a local currency price which is equivalent to £65.33 a unit.

It has been suggested that, in the interests of maximising the group's profit, Division B should purchase Ms from Division A. As there are no marketing costs involved when transferring goods to Division B, Division A would set the transfer price for an M at £69.60. This would give Division A the same contribution as an external sale, i.e. £30.50 per unit. Division A would give Division B's orders priority and so some external customer orders could no longer be met.

Requirements

Should Division B continue to purchase from company X or switch to Division A in order to maximise the group's profit if:

(a) the tax rate in the country in which Division A operates is 40 per cent and the tax rate in Division B's country is 50 per cent;
(b) the tax rate in the country in which Division A operates is 55 per cent and the tax rate in Division B's country is 10 per cent?

(Assume that changes in the contribution can be used as a basis for calculating changes in tax charges and that Division B generates sufficient profit from other activities to absorb any tax benefits.)

Solution

The problem can be solved by using relevant costs, that is by considering the change in contribution and tax paid only (Tables 9.2 and 9.3):

Table 9.2

	£000	Answer (a) Tax £000	Answer (b) Tax £000
Current position-B buys from X:			
B buys 120,000 Ms @ £65.33	7,839.6		
This is set against profits taxed @ 50%/10% – this reduces B's tax liability by		(3,919.8)	(783.96)
A sells 420,000 Ms externally @ contribution £30.50	12,810		
A's tax @ 40%/55%		5,124	7,045.5
If B buys from A:			
B buys 120,000 Ms @ £69.60	8,352		
This is set against profits taxed @ 50%/10% – this reduced B's tax liability by		(4,176)	(835.2)
A sells 450,000 Ms @ contribution £30.50	13,725		
A's tax @ 40%/55%		5,490	7,548.75

Summary:

Table 9.3

	Answer (a)		Answer (b)
If B switches to A:	**Workings £000**	**Net gain/(loss) £000**	**Net gain/(loss) £000**
Decrease in B's contribution	7,839.6–8,352	(512.4)	(512.40)
Tax saving on B's decreased contribution	(3,919.8)–(4,176)	256.2	51.24
Increase in A's contribution	12,810–13,725	915.0	915.00
Tax increase for A @ 40% or 55%	5,124–5,490	(366.0)	(503.25)
Net gain to group		292.8	(49.41)

So Division B should buy from Division A in order to maximise group profit in scenario (a) and from Company X in scenario (b).

9.4.2 Repatriation of funds

During the 1970s, in particular, repatriation of funds from a subsidiary to the group's HQ was not always easy. For example, the Andean Common Market Pact (1970) limited the amount of profit that could be repatriated to 14 per cent of registered capital. Repatriation of funds was particularly important to the company if inflation was very high, as it was in South America in the 1970s. Funds remaining unused in the host country would rapidly lose value but if they could be repatriated immediately their value was saved. If dividends could not be repatriated, prices to subsidiaries could be increased so that the subsidiary's profits were smaller and funds were repatriated by the higher price paid for the goods. Research into foreign companies in South America at that time showed that pharmaceutical companies inflated transfer prices between 30 and 300 per cent.

Where import duty exists on goods imported into a country it is obviously advantageous to keep the transfer price as low as possible in order to avoid high duty payments.

9.4.3 Minority shareholders

Transfer prices can also be used to reduce the amount of profit paid to minority shareholders by artificially depressing a subsidiary's profit. Eiteman and Stonehill (1989) cite the case of the Ford Motor Co. buying out minority share interests in its British subsidiary in 1961 to avoid transfer price problems. Tate and Lyle was another company to have problems in this area. In a similar way different profit sharing schemes in different parts of the group can influence the way in which transfer prices are set.

9.5 Using subsidies to spread risk

In some countries, in particular, small suppliers manufacture goods or components for large organisations. These small suppliers may be partly owned by the large organisation, as is often the case in Japan, or they may rely heavily on the large organisation for their work and be, in effect, in a partnership with the larger business. In either case both organisations will want each other to do well. The method described below was observed and described by Yasuhiro Monden in the Japanese automobile industry. It has also been used by UK companies in, for example, the electronics industry dealing with small Far Eastern suppliers.

If the large organisation develops a new product it will probably require the small supplier to make some components for the product. This may mean that the small supplier has to invest heavily in new machinery. This fixed cost may be very large for a small organisation and could prove very risky if demand did not turn out as expected or for some reason the relationship between the two companies was severed. For a large organisation, however, this cost would be nothing out of the ordinary and would not be a major risk. The small supplier may be reluctant to shoulder this risk. If this is the case it can be reduced if the large company is willing to finance the machinery cost and adjust the transfer price accordingly. This is because the utilities of different sums of money vary for the two businesses. Utility was explained in Chapter 2.

The following exercise illustrates this point.

Exercise

A large organisation has asked its small supplier to manufacture a part, M7. The supplier's variable cost for M7 will be £15 per unit and it will incur fixed costs of £120,000 in Department S and £280,000 in Department T per annum. Demand for M7 could vary between 23,000 and 33,000 units per annum with equal probability. The utility (utiles) (U) of the small supplier for different amounts of profit/loss (P) is:

$U = P$ where $P > 0$
$U = 5P$ where $P < 0$

The large organisation has offered a transfer price of £30 per unit.

Requirements

(a) What is the expected profit of the small supplier?
(b) Will the supplier be happy to supply at a transfer price of £30 a unit?

(c) The large organisation has offered to pay the fixed costs of Department T while reducing the transfer price so that the supplier stands to make the same profit as before at the expected sales level. Will the small supplier be happier with this pricing agreement?

Solution

Figure 9.1 shows the relationship between £s and utiles for the supplier. A profit of £50,000 is represented by 50,000 utiles and a loss of £20,000 is represented by −100,000 utiles.

(a) Expected demand = 28,000 units per annum
Expected profit = (£30 − £15) × 28,000 units − (£120,000 + £280,000)
= £20,000

(b) Profit if demand is high = £15 × 33,000 units − £400,000
= £95,000(which is 95,000 utiles)
Profit if demand was low = £15 × 23,000 units − £400,000
= (£55,000)(which is −275,000 utiles)

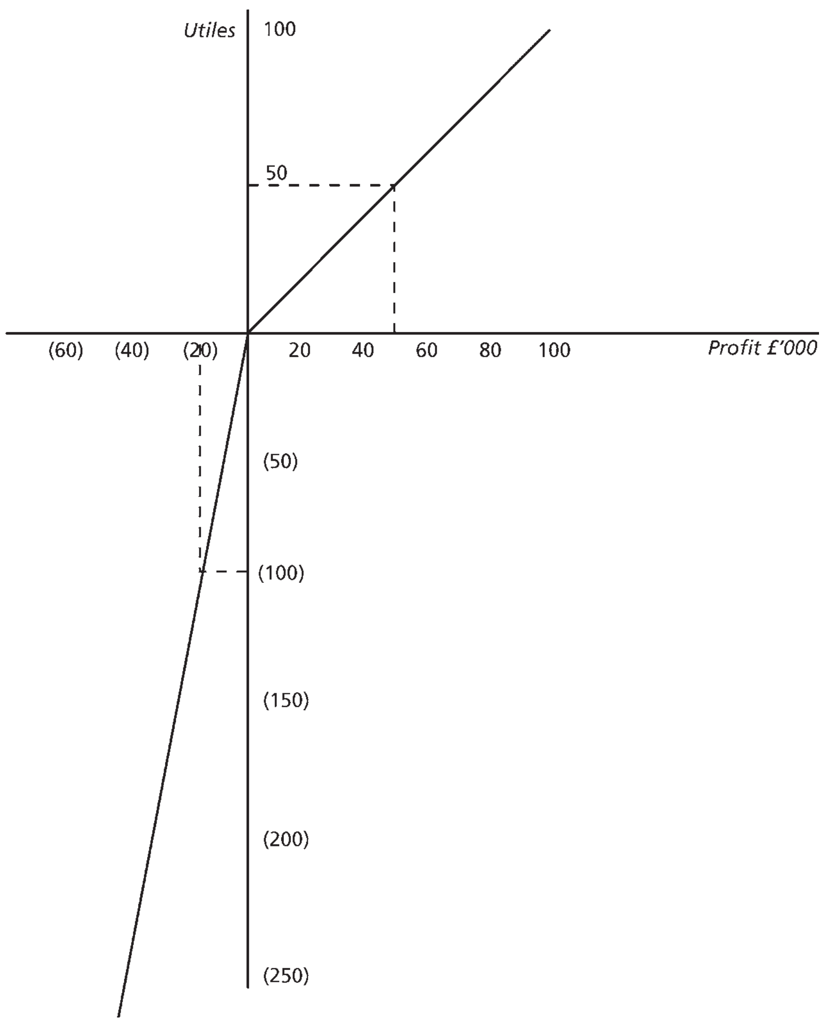


Figure 9.1 Supplier's utility chart

Expected utility = 0.5 × 95,000 + 0.5 × (−275,000)
= (£90,000) utiles

As the expected utility is negative the supplier will not be happy to supply.

(c) Required profit = £20,000
Contribution required = £120,000 + £20,000
Transfer price − Variable cost = Contribution
Let x = transfer price per unit
(x − £15) × 28,000 = £140,000

$$x = \frac{420{,}000 + 140{,}000}{28{,}000}$$

= £20

Profit if demand is high = £5 × 33,000 − £120,000
= £45,000 (which is 45,000 utiles)
Profit if demand is low = £5 × 23,000 − £120,000
= (£5,000) (which is −25,000 utiles)

Expected utility = 0.5 × 45,000 + 0.5 × (25,000)
= £10,000

The supplier's utility is now positive and so the supplier will be happy to supply. The large organisation is expected to make the same profit as before, and because of the size of the organisation its attitude to risk (which is not given) is unlikely to be the same as the small organisation. As a consequence both businesses are now content with the arrangement.

Figure 9.2 shows the supplier's utility chart with the two lines representing the original proposal (b) and the revised one (c).

9.6 Investment centres and performance measures

9.6.1 Investment centres/strategic business units

At the beginning of this chapter we mentioned a third type of responsibility centre, in addition to cost centres and profit centres. The third type of responsibility centre is an investment centre.

The manager of an investment centre will be responsible for the costs and revenues of the centre in the same way as the manager of a profit centre. The revenues may be earned from external sales or through transfers made to other responsibility centres. The difference is that in addition, the manager of an investment centre will be responsible for the capital investment in the centre, for example, in terms of fixed assets and working capital.

This means that the investment centre's performance can be monitored according to the profit earned relative to the capital invested in the centre.

A*n investment centre* is defined in the CIMA Terminology as being: '*A profit centre with additional responsibilities for capital investment and possibly for financing, and whose performance is measured by its return on investment*.'

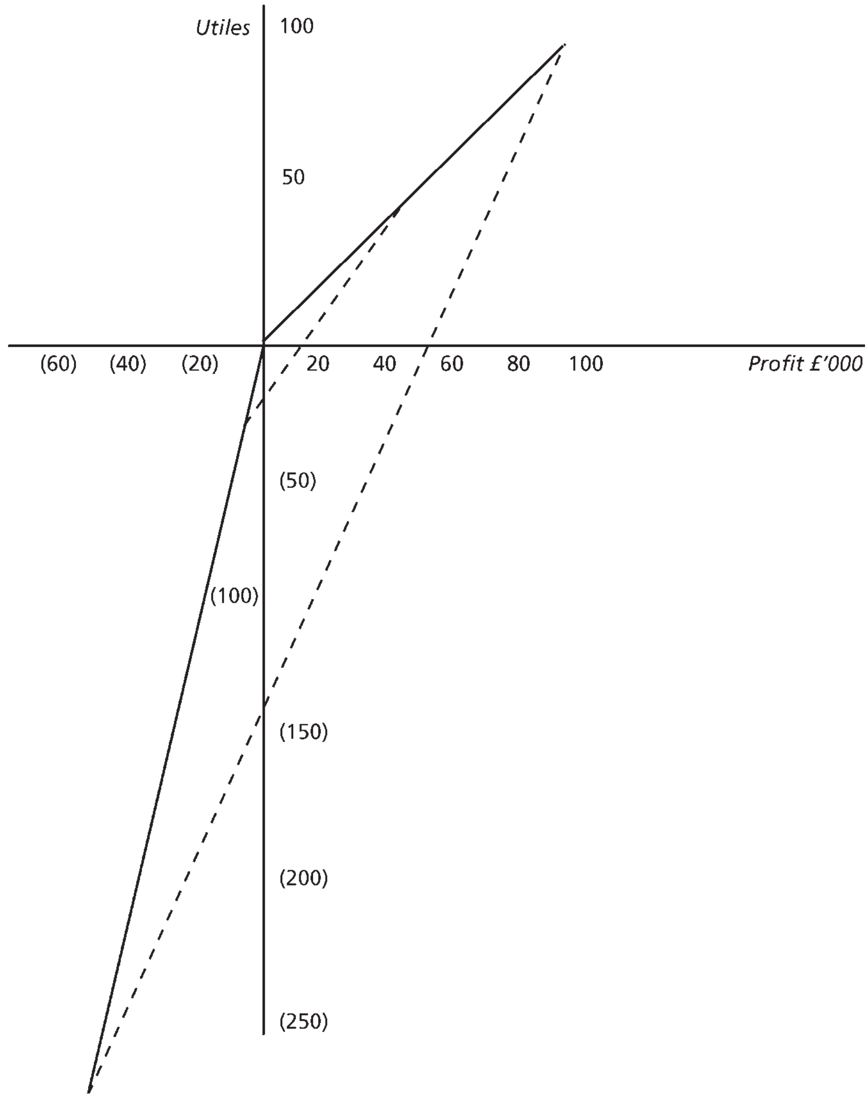


Figure 9.2 Supplier's utility chart

The term investment centre is to some extent interchangeable with the term strategic business unit (SBU). The CIMA Terminology provides the following definition for a SBU: *'A section, within a larger organisation, responsible for planning, developing, producing and marketing its own products or services.'*

SBUs may be treated as profit centers but they are more usually treated as investment centers as an organisation's SBUs cannot be compared and assessed by the profit they generate alone, since they will inevitably differ in terms of size and operating characteristics at the very least. As a consequence a means of comparing the benefit of investing in each SBU is needed. The section will use the terms investment centres and SBUs as interchangeable.

Each investment centre or SBU will have a manager and management team in charge of activities and performance. The aim of head office management must be to:

motivate the manager of the investment centre, and the team, to achieve the goals of the group;

provide the right incentive for the manager, and his or her team, to make decisions that are consistent with the goals of the group's management.

One of the traditional methods of doing this is by using a return on investment (ROI) as a target performance measure, and tying in the management's bonus payments to its achievement. Investments will only be undertaken if they increase the investment centre's ROI.

9.6.2 Return on investment

ROI is almost a universal measure. It was introduced early this century and is still widely used today as a key performance measure for SBUs by many organisations throughout the world. Japan is the main exception to this, where return on sales (ROS) plays a more important role. (This is largely due to the differences in financing.) One of the problems of using ROI is that it has a variety of slightly different definitions and meanings according to how it is to be used. For example, return on net assets (RONA) and return on capital employed (ROCE) are also names given to very similar measures of profit over assets.

When used for internal performance measurement the formula for the return on investment is:

$$\text{ROI} = \frac{\text{Operating profit before tax}}{\text{Net operating assets}}$$

The manager of an SBU (or investment centre) is not usually responsible for, or in control of, the tax paid and so if the measure is to be fair taxation should be excluded. Also, only those assets that are actually being used in the business unit should be used in the calculation, as these are the only assets the investment centre's management is responsible for. In the UK the term operating assets is taken to mean net assets (as stated above), that is both fixed and current assets minus current liabilities. In the USA only fixed and current assets are used in the ROI calculation. This treats the current liabilities as part of the financing – a method which has considerable advantages.

$$\text{ROI} = \frac{\text{Pre-tax profit}}{\text{Net assets}} = \frac{\text{Pre-tax profit}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Net assets}}.$$

These two ratios can be used to assess the performance of investment centres. Table 9.4 illustrates this; it shows the ratios for three investment centres, A, B and C.

If, and this is a big if, the three SBUs are identical in terms of business area and assets it is possible to say that A is the best investment centre in terms of performance. If the

Table 9.4 Investment centres

	A £'000	B £'000	C £'000
Sales	400	400	800
Profit	40	40	40
Assets	200	400	400
Profit/sales ratio (ROS)	10%	10%	5%
	×	×	×
Asset turnover ratio	2	1	2
	=	=	=
ROI	20%	10%	10%

management of investment centre C wishes to emulate A they need to improve ROS, the profit/sales ratio. Perhaps their operating costs are too high in comparison to A, or they might be discounting the product(s) in order to increase sales turnover.

The management of B should look at the other ratio and try to improve the unit's asset turnover. Their factory or business may not be operating close to 100 per cent capacity and as a consequence the equipment or resources are not being fully utilised.

When interpreting the ratio care must be taken with the valuation of the assets. If the assets are new they will not have been depreciated by a great deal, but as they age depreciation will reduce the asset value and the asset turnover ratio will appear to improve – but all that has happened is that the asset base has decreased.

9.6.3 The problems with ROI

ROI is not an ideal internal performance measure. It has a number of problems that are listed below:

Percentage return versus the size of investment. Is it better to have a return of 15 per cent on £100,000, or to have a 12 per cent return on £200,000? Shareholders would probably prefer the higher return on the smaller amount because this gives them the freedom to invest the remainder of their funds at the highest alternative rate on the stock market. A manager would probably prefer the lower return on the larger amount – as long as it was an adequate return. This is because business growth safeguards his job and as the business grows the manager's role also expands and becomes more interesting. As a consequence the aims of management and shareholders may differ.

Using ROI as a measure tends to limit growth – is it the intention of the directors of the group to do this? If the directors require a 15 per cent return on investment for the group, and a SBU currently earns an 18 per cent return the SBU management are unlikely to undertake investments which will reduce their ROI towards the required level. It is partly a psychological issue – the management will feel that they are doing well and that if they let the ROI fall to, say, 14.5 per cent they would have failed. The directors on the other hand might prefer growth and a return of 14.5 per cent rather than the existing size and a ROI of 18 per cent.

Short- versus long-term returns. Generally speaking a business has to invest now in order to obtain positive cash flows and profits in the future. Thus a successful business is always reducing the profit it could earn this year in order to create a situation which will generate a greater profit in the future. But what are the rules for this? What is an acceptable current ROI, and what is the required ROI in the long term? The ROI measure does not help solve this problem.

If a manager's performance is judged on the ROI of his SBU this year there is always the possibility that he will endeavour to make this as large as possible and, as a consequence, not invest for the future. His success in achieving a high ROI may bring him promotion to the board of directors; if this is so another manager will have to sort out the mess he has left behind. By the time the new manager is appointed the lack of investment in the SBU is probably beginning to show in a reducing ROI, and it will be a hard battle for the new manager to turn the SBU round.

One way to overcome this problem is to exclude items that benefit the future such as R&D, staff development and advertising from the initial calculation of profit.

	£'000	£'000
Sales		600
Less: cost of sales		300
Gross profit		300
Less operating costs		170
Profit generated by operations		130
Less: cost benefiting the future:		
R&D	40	
Advertising	20	
Staff development	20	80
Net profit		50

The ROI can be calculated on both the profit generated by operations and the final net profit if required.

Different busineses and industries have different ROIs. Traditional manufacturing organisations tend to have a large number of physical assets – tangible fixed assets. An advertising company, by comparison, does not have a great deal in the way of tangible fixed assets – its employees and their skills are the main assets of the organisation. This means that the ROI of an advertising company will normally appear to be much greater that than of, say, a steel company.

Massaging the ROI. Wherever a single performance measure is used to assess a manager's performance there is the likelihood that the manager will attempt to make the measure look as good as possible. If a large bonus depends on the measure being met the chances of the manager massaging the measure grows considerably. Is this what the head office directors intend? The asset base of the ratio can be altered by increasing or decreasing the creditors and debtors, that is by speeding up or delaying payments to and from the business unit. A 5 per cent discount will tend to reduce the debtors but if they would have paid in the next month anyway it is likely to be a costly exercise. Companies regularly work a considerable amount of overtime at the end of the financial year, so as to complete orders and invoice customers within the financial year, thereby increasing the annual sales revenue. A fortnight later at the beginning of the next year the production employees wait for work because all the orders in the pipeline have been completed ahead of schedule. The overtime cost reduces the overall profit unnecessarily.

Intra-group transfers. Where goods or services are transferred between different investment centres within the group, managers must feel that the transfer price is fair, as it affects profit and therefore the ROI of the investment centre. If one SBU is required to transfer at a low price for taxation or other purposes, and ROI is used as a performance measure, the SBU's management may find the use of the measure demotivating.

Asset value. It is quite usual for ROI to compare the profit earned during the year with the assets in place at the end of the year. If the business is growing this will always understate the return, as the latest assets purchased will not have had a chance to start to earn a profit. This could conceivably deter management from purchasing new assets altogether, but they will certainly think carefully before purchasing them towards the end of the financial year.

The central problem with ROI (otherwise known as ROCE) is that reliance on it as a performance indicator can induce divisional managers to destroy the business they are being paid to run.

Michael Black, the vice-president of management consultancy CSC index, tells of a bank that bought a growing life insurance firm and imposed a strict return-on-capital regime. It was the wrong test to use: any growing insurance company will eat capital because costs come early, whereas returns take longer. But management remuneration was tied to capital, so it fired the sales force and the firm stopped growing. After four years return on capital (and managers' pay) had soared – but the insurance business was worth half its original price. Says Black: 'The bank had in effect paid the managers to destroy the company'.

Simon Caulkin, 'Stampede to Replace the Principle of Profit', the Observer, 1/97

ROI is a relative performance measure that contains no element of scale. The linking of management remuneration to ROI can result in a manager slimming down their his/her business to a small high-yield core. This can result in the loss of a large volume of perfectly profitable trade. It is often argued that what is required is an 'absolute' measure of performance expressed in pounds or dollars. That brings us to Residual Income.

9.6.4 Residual income (RI)

The concept of residual income may have been around for a century or so but it was certainly used in the 1950s by General Electric to overcome some of the problems encountered with ROI. For example, the information in Table 9.5 relates to the current performance of the three SBUs within the group ABC. If the directors of the group ask the SBU managers to improve their performance and aim for a group ROI of 20 per cent what is likely to happen? The management of C will probably expand the business and reduce its ROI somewhat. The management of B will contract the business by selling assets that are not giving an adequate return. The managers of A will probably feel rather smug as they may feel that they are operating as the directors require. They are unlikely to expand slightly and reduce A's ROI to 20 per cent, but this is precisely what the group's directors require.

A residual income requires that each division's profit must bear a charge for capital – in this instance 20 per cent. The residual figure is known as 'residual income', as shown in Table 9.6. The management of each SBU is required to maximise the unit's residual income. This is achieved if any project providing a return in excess of 20 per cent is accepted.

Table 9.5

	A £'000	B £'000	C £'000	Total £'000
Profit	110	100	35	245
Assets	500	1,000	100	1,600
ROI	22%	10%	35%	15.3%

Table 9.6

	A £'000	B £'000	C £'000
Profit	110	100	35
Less:			
Capital charge (500 × 20%)	100	(1,000 × 20%) 200	(100 × 20%) 20
Residual income	10	(100)	15

Example

The managers of A have a project under consideration which involves purchasing £20,000 of assets in order to earn an annual profit of £4,100.

The effect on the residual income (RI) and ROI are shown in Table 9.7.

Table 9.7

	A £000	
Profit (110 + 4.1)	114.1	ROI = 114.1/520 = 21.9%
Less:		
Captial charge (520 × 20%)	104.0	
Residual income	10.1	

The project would be accepted if the investment centre's performance is monitored using the RI approach, because the project offers a marginal increase in RI.

The ROI shows a slight decrease on the previous figure therefore the managers may be unwilling to accept the project if monitored on this basis.

The RI will always increase if a proposed project offers an ROI which exceeds the percentage capital charge.

Residual income has never been a particularly widely used technique in practice. Drury (1996) reported a survey that showed that 20 per cent of companies used RI whereas 55 per cent used a target ROI to assess the performance of the divisions. But ROI was not relied on, as measures such as profit before tax and the ability to stay within budget were generally regarded as being more important than ROI.

9.6.5 Current thinking about performance metrics

The problems associated with reliance on traditional financial performance metrics have been explored earlier in this text. A range of financial metrics judged to be more appropriate to the New Economy have been developed. These include economic value added (EVA) and cash flow return on investment (CFROI).

According to a recent survey by the US Institute of Cost and Management Accountants, nearly two-thirds of companies are losing faith in accounting based performance measures and are seeking new 'value criteria' to get a better handle on their businesses.

Driving the stampede to the new measures (or 'metrics' as they are fashionably known) is the obsession with shareholder value, itself booted merrily along by the tidal swell of management share options. What performance measurements best correlate with movements in a company's share price?

Simon Caulkin, 'Stampede to Replace the Principle of Profit', the Observer, 1/97

EVA is a variant on RI which is more attuned to the economics of a business than to the traditional accounting model. Both EVA and RI are 'profit less finance cost of capital'. But whereas RI is based on the traditional accounting model, EVA adopts an economic valuation of the capital employed in the business. Hence, for EVA calculation purposes, the capital figure is based on assets at replacement cost – or even possibly the whole business unit at estimated sales value.

Similarly, calculation of EVA will adopt an economic version of profit – distinguished from the traditional accounting profit by its treatment of certain items. For example, the EVA calculation may involve capitalising certain R&D costs that would be charged direct to profit on the basis of current accounting standards.

CFROI is the yield for a business unit taking the economic value of its assets as the capital base and using projected future cash flows as the return. This involves the use of discounted cash flow technique which is explored fully in CIMA's Management Accounting – Decision Making course. However, be aware that CFROI is a forward looking measure linked to what is forecast to happen in the future rather than what has happened in the past. Obviously, one has to have reservations about a performance measure based on forecasts, but the logic is significant.

The selection of appropriate metrics to measure business unit performance is essentially a behavioural and business economics issue. As indicated in the quotation above, the current thinking is that metrics should be adopted that are linked to the drivers of shareholder value. Performance should be evaluated and managers rewarded on the basis of achieving objectives that cause share price to rise.

The executive 'share option' is a classic example of issues that link management motivation and business performance. A manager is given an option to buy company shares at a future date at a specified price (say $5). If the current share price is $4 then the manager is motivated to do whatever is needed to get the share price over $5 by the date on which the executive options can be exercised. By going down the executive share option route, company owners do not even have to think too hard about value drivers and performance metrics.

However, experience has shown that this can be a dangerous strategy. Managers can be induced to do things that get the share price above a certain price on a certain date – without regard to what might happen later. This is just a variation on the problems that can arise from the use of budget compliance or ROCE/ROI/RI as the key performance indicators.

In practice, a more sophisticated approach may involve the adoption of packages of financial and non-financial performance indicators along the lines of the balanced scorecard.

Example

SM Ltd manufactures and sells mugs. These mugs carry logos to the order of customers. It has a capacity to produce up to 3,000,000 mugs per year. Its cost structure is £1,950,000 fixed production costs per year plus £0.50 variable production costs per mug. The market unit price for mugs is £2.00.

SM's profit statement for 2004 may be summarised as follows:

	£
Sales (1.5 million mugs)	3,000,000
Production Cost of Sales	2,700,000
Gross Profit	300,000
Marketing & Admin. Costs	400,000
Net Profit	(100,000)

There were no significant stocks of unsold mugs throughout 2004.

Concerned by the loss, SM's directors engage a new Chief Executive at the start of 2005. The new CE is to be paid a salary package comprised:

(1) a fixed salary of £50,000 per year,
(2) a performance bonus being 15% of Net Profit before deduction of the bonus.

SM's accounting policies include absorption costing, with stock valued at full production cost.

During 2005, the new CE did the following:

Raised production to 2,500,000 mugs,
Raised sales to 1,800,000 mugs,
Raised Marketing & Admin costs (including CE salary) to £650,000

At the end of 2005 the CE met SM's directors and made the following statement:

'Gentlemen, thankyou for giving me the opportunity to exercise and develop my management skills in your business. I am delighted that I have been able to put your business successfully on track. I have now accepted a new appointment which will involve turning around another struggling company.'

Requirements

(a) Prepare a summary Profit Statement for SM in 2005. Calculate the CE's bonus.
(b) Evaluate the performance of SM and the CE having regard to any criteria you consider relevant. State whether or not the CE deserves his bonus.
(c) Having regard to the foregoing, explain the advantages of non-financial relative to financial performance measures.

Solution

(a)

SM Profit Statement, 2005

		£
Sales (1.8 million mugs)		3,600,000
Production costs	3,200,000	
Closing stock	896,000	
Production cost of sales		2,304,000
Gross profit		1,296,000
Marketing & admin. costs		650,000
Net profit		646,000

CE bonus = £646,000 × 15% = £96,900

(b) The Net profit achieved looks remarkable, but it may be just a pure mathematical manipulation. A sharp rise in stock allows a significant element of fixed costs to be carried forward into 2006. One wonders about the worth of that stock given that the mugs carry customised logos.

If the stock has to be written off then that will more than wipe out the profit achieved in 2005.

If production had been set at the same level as sales in 2005 then the profit achieved would have only been £100,000.

The CE certainly does not deserve his performance bonus. He appears to have carried out a cynical manipulation linked to an inappropriate choice of performance measure. Quite apart from the matter of a flawed performance measurement system, what the CE has done raises questions about his integrity.

(c) The use of simple financial performance measures may very easily induce dysfunctional behaviour. In this case, the choice of 'profit' as the performance measure seems obvious – but it invites manipulation. For one thing, the objective given to the CE is far too 'short term'.

A more sensitive approach to performance measurement in this case might involve the adoption of a number of non-financial performance indicators linked to the development of new customers, sales volume and minimising the cash conversion period of the business.

9.7 Summary

In this chapter, we have considered the manner in which a business can be split into 'strategic business units' (or 'divisions') for organisational and control purposes. The thrust behind this approach is that each unit functions as an independent business with its management taking its share of the associated risks and rewards. In this manner, the managers are motivated to adopt courses of action which are consistent with the overall objective of maximising shareholder value.

The approach involves various difficulties. One difficulty is the design and operations of a transfer pricing system for transactions between divisions in the same business. Another difficulty is selecting appropriate performance metrics to be used as determinants of management remuneration.

Handling these difficulties is a central part of the design and operation of management accounting systems.

This Page Intentionally Left Blank

Reading 9

The content of the following article is simple in concept, but it addresses the one issue that is central to most examination questions on transfer pricing.

'Opportunity Cost' – the mathematically correct transfer price. But, is it realistic?

Bob Scarlett, CIMA Insider March 2004

Transfer pricing is the practice of one strategic business unit ('SBU') within an organisation charging another SBU within the same organisation for the supply of goods or services. The main features of an SBU are:

- Its managers are allowed a degree of independence in how they run it.
- Its performance is measured and reported as if it were an independent business.
- Its managers are normally rewarded in a manner linked to SBU performance.

Hence, the affairs of an SBU should be arranged in order to give it many of the characteristics of an independent business. One problem that arises in making such arrangements is the issue of transfer pricing. In designing a transfer pricing system the management accountant should have regard to the following main requirements:

- The system should provide an *equitable* distribution of profit between divisions.
- The system should be *neutral* in that it does not induce sub-optimal behaviour.
- The system should be *simple* and transparent in order to be cost-effective.

The benchmarks against which any transfer pricing system can be judged are therefore (1) equity, (2) neutrality and (3) simplicity.

All sorts of different transfer pricing systems are possible. But, there are two extreme positions:

- Outside market selling price – above which no SBU would accept transfers in.
- Marginal cost – below which no SBU would agree to make transfers out.

For obvious reasons, the receiving SBU will never accept transfers at above market price and the supplier SBU will never agree to make transfers at below its marginal cost of production. One other possible transfer pricing system is 'opportunity cost' – the costs incurred and contribution foregone by the transferor division as the direct result of making a transfer.

Let us use a simple worked example to explore the merits of three alternative transfer pricing systems in two different sets of circumstances.

Example

AB Ltd has two divisions – A and B. Division A produces Units at a marginal cost of £5 each. Division B produces Products (each incorporating 1 Unit), at a marginal cost of £3 each (excluding the cost of the Unit). The outside selling price of the Unit is £10 and that of the Product is £12.

Question

Should AB adopt a transfer price system based on (i) marginal cost, (ii) market selling price or (iii) opportunity cost? In answering this question one should consider two alternative Scenarios – (1) where there is no capacity constraint in A and (2) where A is operating at full capacity and Unit transfers to B mean that outside sales must be foregone.

Solution

Scenario 1 (no capacity constraint in A)

The manufacture of Products is to the advantage of AB as a whole. The total cost of manufacture is £8 per Product (£5 in A and £3 in B), the selling price is £12 – giving a contribution of £4 per Product. But the manager of B is the person who will decide whether or not Products are manufactured. He/she will be guided in this only by the impact such manufacture has on the profit of Division B.

Let us consider the likely outcome given each of the three alternative transfer pricing systems. Consider the impact on the profit of B from the manufacture of one Product, given each possible transfer pricing system:

Impact on B profit from manufacture of one Product

Transfer price system	*(i) Marginal cost*	*(ii) Market price*	*(iii) Opportunity cost*
Transfer price	−5	−10	−5
B marginal cost	−3	−3	−3
Selling price	12	12	12
Contribution	4	−1	4

In this case, the opportunity cost to A of transferring one Unit is the same as marginal cost. A simply manufactures 1 extra Unit and its opportunity cost is the marginal cost thereof. Transfer pricing systems based on marginal and opportunity cost both achieve the 'correct' result, in that the manager of B would manufacture and sell the Product. However, a transfer pricing system based on market price experiences the 'wrong' result. The manager of B would decline to manufacture the Product – sub-optimal or dysfunctional behaviour that is not in the interests of AB as a whole.

Scenario 2 (capacity constraint in A)

The manufacture of Products is to the disadvantage of AB as a whole. The total cost of manufacture is £8 per Product and £5 contribution has to be foregone as a result of reducing outside sales from A by one Unit. Hence the manufacture and sale of a product at £12 gives rise to a negative contribution to AB as a whole of £1.

Impact on B profit from manufacture of one Product

Transfer price system	*(i) Marginal cost*	*(ii) Market price*	*(iii) Opportunity cost*
Transfer price	−5	−10	−10
B marginal cost	−3	−3	−3
Selling price	12	12	12
Contribution	4	−1	−1

In this case, the opportunity cost to A of transferring one Unit is its marginal cost of production (£5) plus the contribution foregone (£5) by being forced to reduce sales to outside customers by one Unit. Hence, the transfer price at opportunity cost is £10. Transfer pricing systems based on market price and opportunity cost both achieve the correct result – the manager of B would decline to manufacture the Product. However, a transfer pricing system based on marginal cost might induce the wrong result. If the manager of B could force the transfer of a Unit at a transfer price of £5 then division B might benefit but AB as a whole would lose.

Note that only the transfer pricing system based on opportunity cost produces the correct outcome in both Scenarios.

General Conclusion

Having regard to the workings and discussion above, what are we to conclude?. Let us appraise each of the three transfer pricing systems considered against the relevant benchmarks.

Equity

A transfer price system based on marginal cost cannot be relied on to produce a fair distribution of profit between divisions. It leaves no element of profit with the transferor division and this is entirely inappropriate if the transferor has to forego profitable outside business in order to manufacture the Unit being transferred. Similarly, a transfer price based on market price cannot be relied on to produce a fair distribution of profit given that it allows the transferor to earn a full market profit on a transaction which involves no risk or management cost. Neither of these systems are satisfactory if rigidly applied in all possible circumstances.

A system based on opportunity cost is more sensitive in this regard since it takes account of circumstances. If the transferor does not have to forego outside business in order to make a transfer then there is no reason why the transferor should make a profit from a risk free internal transfer – and opportunity cost achieves that result. Conversely, if the transferor has to forego a market profit to make the transfer then the transfer should carry a market profit margin – and opportunity cost achieves that result. A case can be made that opportunity cost gives the most equitable result.

Neutrality

Both marginal cost and market price based transfer systems can induce dysfunctional behaviour in certain circumstances. However, opportunity cost avoids this possibility under all circumstances. Transfer at opportunity cost means that the manager of the transferee division will always be charged the amount the company as a whole incurs and foregoes in order to make the transfer. In theory, an opportunity cost based transfer pricing system offers perfect neutrality.

Simplicity

Marginal cost and market price based systems are usually fairly simple to operate. Marginal cost is easy to calculate and market price (so long as there is one) is easy to identify.

However, opportunity cost can be ambiguous since it depends on the precise circumstances of the business at any given moment in time. In the worked example above, whether or not Division A is operating at full capacity may vary from day to day. Hence determining an appropriate transfer price for a particular Unit will require detailed investigation and negotiations every time a transfer is made. An opportunity cost based transfer price system may be theoretically correct but it may be too complicated for practical use.

In designing management accounting systems, the accountant must have regard to various priorities. This often involves judicious compromise between theoretical correctness and practicality.

This Page Intentionally Left Blank

Revision Questions

9

Question 1

1.1 Division A transfers 100,000 units of a component to Division B each year.

The market price of the component is £25.
Division A's variable cost is £15 per unit.
Division A's fixed costs are £500,000 each year.

What price would be credited to Division A for each component that it transfers to Division B under
(i) dual pricing (based on marginal cost and market price)?
(ii) two-part tariff pricing (where the Divisions have agreed that the fixed fee will be £200,000)?

	Dual pricing	*Two-part tariff pricing*
(A)	£15	£15
(B)	£25	£15
(C)	£15	£17
(D)	£25	£17
(E)	£15	£20

1.2 TM plc makes components which it sells internally to its subsidiary RM Limited, as well as to its own external market. The external market price is £24.00 each unit, which yields a contribution of 40 per cent of sales. For external sales, variable costs include £1.50 each unit for distribution costs, which are not incurred on internal sales.
TM plc has sufficient capacity to meet all of the internal and external sales. In order to maximise group profit, the component should be transferred to RM Limited at a price for each unit of:

(A) £9.60
(B) £12.90
(C) £14.40
(D) £22.50
(E) £24.00

1.3 Divisions A and B are part of the same group. Division A makes a component, two of which are used in each unit of a product made by Division B. There is no established market for the component. The transfer price for the component is Division A's variable cost plus 60 per cent. Division A's variable cost is £10 per unit of component;

Division B's variable costs for the product, excluding components from Division A, are £6 per unit.

Division B												
Units produced	1	2	3	4	5	6	7	8	9	10	11	12
Marginal revenue, £	46	44	42	40	38	36	34	32	30	28	26	24

How many units of the product will the management of Division B sell if they act if they act so as to maximise the division's profit?

(A) 4
(B) 5
(C) 6
(D) 7
(E) 8

Data for Questions 1.4 and 1.5

CF Multinational transferred 10,000 units of product Z from its manufacturing division in the USA to its selling division in the UK during the year just ended.

The manufacturing cost of each unit of product Z was $150 (60% of which was variable cost). The market price for each unit of product Z in the USA was $270. The USA division's profit after tax for its sales to the UK division for the year just ended was $900,000.

The UK division incurred marketing and distribution costs of £30 for each unit of product Z and sold the product for £200 a unit. The UK tax rate was 30%. (Exchange rate: £1 = $1.5)

1.4 If product Z had been transferred at the USA market price, the tax rate in the USA must have been

(A) 15%
(B) 20%
(C) 25%
(D) 30%
(E) 33%

1.5 If the transfers had been made at variable cost, the UK division's profit after tax would have been

(A) £490,000
(B) £770,000
(C) £840,000
(D) £960,000
(E) £1,100,000

1.6 Division Q makes a single product. Information for the division for the year just ended is:

Sales	30,000	units
Fixed costs	£487,000	
Depreciation	£247,500	
Residual income	£47,200	
Net assets	£1,250,000	

Head Office assesses divisional performance by the residual income achieved. It uses a cost of capital of 12% a year.

Division Q's average contribution per unit was

(A) £14.82
(B) £22.81
(C) £28.06
(D) £31.06
(E) £32.81

1.7 EF plc has 3 divisions – P, Q and R – whose performance is assessed on return on investment (ROI). The ROI for the divisions for the coming year is expected to be 24%, 28% and 23% respectively. EF plc operates a policy that all surplus cash balances are transferred to Head Office.

Three new proposals are now being considered:
P is considering investing £75,000 in order to increase profit by £21,600 each year.

Q is considering selling a machine, forecast to earn a profit of £2,500 in the coming year, for its net book value of £7,000.

R is considering giving a $2\frac{1}{2}$% discount for prompt payment. This should reduce debtors by £20,000. R's sales revenue is £500,000 each year and a 50% take up of the offer is expected.

The following division(s) will REJECT the proposal under consideration because of its effect on ROI:

(A) P
(B) Q
(C) P and Q
(D) P and R
(E) Q and R

? Question 2

CD plc is organised on a divisional basis. Two of the divisions are the Components division and the Products division. The Components division produces components d, e and f. The components are sold to a wide variety of customers including Products division at the same price. The Products division uses one unit of component d, e and f respectively in products X, Y and Z.

Recently, Products division has been forced to work below capacity because of limits in the supply of components from Components division. CD's chief executive has therefore directed Components division to sell all its output to Products division.

Price, cost and output data for Components division are as follows:

Component	*d*	*e*	*f*
	£	£	£
Unit selling price	20	20	30
Unit selling cost	7	12	10
Period fixed cost	50,000	100,000	75,000

Components division has a maximum output capacity of 50,000 of which each component must number at least 10,000.

Price, cost and output data for Products division are as follows:

	X	Y	Z
Products	£	£	£
Unit selling price	56	60	60
Unit variable cost	10	10	16
Period fixed cost	100,000	100,000	200,000

Products division has been forced to operate at 20,000 units below capacity because of the lack of components coming from Components division. Products division is able to sell all the output it can produce at the current selling price.

Requirements

(a) Assuming all components are supplied to Products division, calculate the different component and product output mixes that would maximise the profit of:
   (i) the Components division;
   (ii) the Products division;
   (iii) CD plc as a whole.

(b) Comment on the effectiveness of the transfer pricing system used by CD plc and on the merits of preventing Components division from selling outside the company.

? Question 3

(a) Outline and discuss the main objectives of a transfer pricing system.
(b) Transfer prices based on 'total cost-plus' are inappropriate. Discuss.
(c) Discuss the major factors to be considered when setting transfer prices for an international group.

? Question 4

B Limited, producing a range of minerals, is organised into two trading groups: one handles wholesale business and the other sales to retailers.

One of its products is a moulding clay. The wholesale group extracts the clay and sells it to external wholesale customers as well as to the retail group. The production capacity is 2,000 tonnes per month but at present sales are limited to 1,000 tonnes wholesale and 600 tonnes retail.

The transfer price was agreed at £200 per tonne in line with the external wholesale trade price at the 1st July which was the beginning of the budget year. As from 1st December, however, competitive pressure has forced the wholesale trade price down to £180 per tonne. The members of the retail group contend that the transfer price to them should be the same as for outside customers. The wholesale group refute the argument on the basis that the original budget established the price for the whole budget year.

The retail group produces 100 bags of refined clay from each tonne of moulding clay which it sells at £4.00 a bag. It would sell a further 40,000 bags if the retail trade price were reduced to £3.20 a bag.

Other data relevant to the operation are:

	Wholesale group	*Retail group*
	£	£
Variable cost per tonne	70	60
Fixed cost per month	100,000	40,000

You are required to:

(a) calculate the estimated profit for the month of December for each group and for B Limited as a whole based on transfer prices of £200 per tonne and of £180 per tonne when producing at:
  (i) 80% capacity;
  (ii) 100% capacity utilising the extra sales to supply the retail trade;
(b) comment on the results achieved under (a) and the effect of the change in the transfer price; and
(c) propose an alternative transfer price for the retail sales which would provide greater incentive for increasing sales, detailing any problems that might be encountered.

? Question 5

PQR is a company that develops bespoke educational computer software. The company is based in Germany. It has recently acquired two companies: W and Z.

W is a well-established company that is also based in Germany. It develops educational computer software and was a direct competitor of PQR.

Z, which is based in Malaysia, is a new but rapidly growing company that develops off the shelf educational software and also produces CD ROMs. Z was acquired so that it could produce CD ROMs for PQR and W.

The Managing Director of PQR has now realised that the acquisition of these two companies will cause problems for him in terms of planning, control and decision making. He is thinking of implementing a decentralised structure but is unsure of the advantages and disadvantages of such a structure, of how much autonomy to grant the new companies, and also which performance measure to use to appraise their performance. Consequently he has contacted you, the Finance Director of PQR, for help.

Requirements

Write a report to the Managing Director which:

(i) explains the advantages and disadvantages that would be experienced by PQR in operating a decentralised structure;
(ii) explains which types of responsibility centres you would recommend as being most appropriate for W and Z in a decentralised structure;
(iii) critically evaluates the possible use of the financial performance measures 'return on capital employed' and 'residual income' for the decentralised structure of PQR;
(iv) discusses the issues that need to be considered in relation to setting transfer prices for transfers made from Z to PQR and W.

? Question 6

Division A and Division B are both parts of C plc. A makes product *i* and B makes product *j*. Every unit of product *j* requires one unit of product *i* as a component. B purchases most of its *i* requirement from A although sometimes it makes purchases from outside suppliers.

Relevant details of products *i* and *j* are tabulated as follows:

	Product i	*Product j*
Established selling price £	30	50
Variable costs per unit		
Material	8	5
Transfers from A	–	30
Labour	5	3
Overhead	2	2
Total	15	40
Fixed costs	500,000	225,000
Annual outside demand units	100,000	25,000
Plant capacity	130,000	30,000

Investment in Divisions:

(A) £ 6,625,000
(B) £ 1,250,000

Division B is currently achieving an ROI below target. It's manager blames this on the high transfer price of product *i*. The manager of Division A claims that the current transfer price (£30) is appropriate since 'it is determined by the market'. The manager of division argues that the transfer price for the *i* should be set 'at production cost plus a reasonable mark up'.

The manager of Division B has made two specific proposals aimed at improving his ROI:

Pay £50,000 per year for new premises which should allow an additional 5,000 units of *j* to be sold each year at the existing price

The Board of C plc should intervene to reduce the transfer price of the *i*

Requirements

(a) Write a report explaining the merits to C plc of the proposed new investment by Division B. **(5 marks)**

(b) Write a report explaining the impact of the proposed investment on the annual profit of C plc and the divisional profits of A and B respectively. Explain the likely attitude of the Divisional managers to the investment on the basis of your findings. **(6 marks)**

(c) Advise C plc's Board on the proposal of the Division B manager concerning transfer price. Explain the general considerations that are involved in the determination of transfer prices. In answering this, consider how the position would be affected if the capacity of Division A were only 125,000 units of *i*. **(9 marks)**

(Total marks = 20)

Solutions to Revision Questions

9

Solution 1

1.1 Answer: (B)

Dual price transfer price from division A's point of view is market price £25. This ensures that the supplying division can earn a profit.

The two-part tariff transfer price per unit is marginal cost £15.

1.2 Answer: (B)

Using the general profit-maximising rule, the transfer price should be (marginal cost plus opportunity cost). There is sufficient capacity to meet all demands, therefore the opportunity cost is zero and the internal variable cost should be used: (£24 × 60%) − £1.50 = £12.90.

1.3 Answer: (B)

Variable cost of components for B's product = £10 × 2 = £20

Transfer price = variable cost plus 60% = £32

Division B's variable cost per product = £6

Total variable/marginal cost to B = £38

B will sell till its marginal cost equals marginal revenue, that is, when marginal revenue = £38.

1.4 Answer: (C)

	$
Market price	270
Less: Total cost	150
Pre-tax profit	120
Post-tax profit per unit	
$900,000 + 10,000 units	90
Therefore tax is	30

Tax as a percentage of pre-tax profit = $30 + $120 × 100 = 25%

1.5 Answer: (B)

	£	£	
Market price in UK		200	
Less: Transfer price $150 × 0.6 × 1/1.5	60		
UK costs	30	90	
		110	
Less: Tax 30%		33	
		77	× 10,000 units = £770,000

1.6 Answer: (D)

	£
Capital charge £1.25m × 12%	150,000
Residual income	47,200
Profit	197,200
Depreciation	247,500
Fixed costs	487,000
Total contribution	931,700
Contribution per unit	£31.06

1.7 Answer: (E)

$$\text{P's return: } \frac{21{,}600}{75{,}000} = 29\% \text{ accept, because higher than expected } 24\%.$$

$$\text{Q's return: } \frac{\text{Decrease in profit}}{\text{Decrease in capital}} = \frac{(£2{,}500)}{(£7{,}000)}$$

$$= 36\% \text{ reject, because average ROI will reduce}$$

$$\text{R's return: } \frac{\text{Cost of discount}}{\text{Reduction in debtors}} = \frac{(£500{,}000 \times 50\% \times 2\tfrac{1}{2}\%)}{(£20{,}000)} = \frac{(£6{,}250)}{(£20{,}000)}$$

$$= 31\% \text{ reject, because average ROI will reduce}$$

Solution 2

Tips

This is a simple question that illustrates the central problem behind transfer pricing. It turns around the concept of marginality. You must understand issues connected with marginal cost and marginal revenue.

The critical issue is that the pattern of output that maximises the reported profit of the Products division is based on a distorted perception of marginal cost. The Products division manager will perceive the marginal cost of components as being their market selling price – not the true marginal cost to CD plc as a whole.

Another issue is that the manager of the Components division is indifferent between whether he sells to outside customers or to the Products division. Requirement (b) invites you to comment on the implications of this for CD plc.

(a) The rankings of the products can be determined in each case by simply calculating the contributions of the products from the three alternative points of view.

(i) *Components division*

	d	*e*	*f*
	£ per unit	*£ per unit*	*£ per unit*
Selling price	20	20	30
Variable cost	7	12	10
Contribution	13	8	20
Ranking	2nd	3rd	1st

The division profit will be maximised by a mix of:
10,000 d/X
10,000 e/Y
30,000 f/Z

(ii) *Products division*

	X	*Y*	*Z*
	£ per unit	*£ per unit*	*£ per unit*
Selling price	56	60	60
Variable cost	10	10	16
Transfer cost of d,e,f	20	20	30
Contribution	26	30	14
Ranking	2nd	1st	3rd

The division profit will be maximised by a mix of:
10,000 d/X
30,000 e/Y
10,000 f/Z

(iii) *CD plc as a whole*

	X	*Y*	*Z*
	£ per unit	*£ per unit*	*£ per unit*
Selling price	56	60	60
Variable cost	10	10	16
Component variable cost	7	12	10
Contribution	39	38	34
Ranking	1st	2nd	3rd

The whole company's profit will be maximised by a mix of:
30,000 d/X
10,000 e/Y
10,000 f/Z

(b) A perfect transfer pricing system has to satisfy three criteria. First, it has to give a 'fair' impression of divisional profit. Second, it has to avoid distorting the decision-making processes in the business. Third, it has to be cheap and simple to operate. In practice almost no system of transfer pricing is capable of meeting all three of these criteria.

The transfer pricing system used by CD plc involves transfers at 'market selling price' accompanied by an obligation to supply all components internally. This system possibly meets the first and third criteria but it certainly does not meet the second. For one thing, who decides which components are to be prioritised? If the decision is left to the Components division then it is likely that a pattern of output will emerge (see (i) above) that gives an aggregate profit to the two divisions of £1,165,000 − £100,000 less than the maximum possible (see (iii) above).

One possibility, if 'outside' sales are allowed, is that production of Z could be discontinued and all the output of component f be sold to outside customers. This would increase aggregate profit by £60,000 over the maximum otherwise possible – by forgoing £300,000 net revenue but avoiding £160,000 of variable costs and £200,000 of fixed costs.

☑ Solution 3

Tip

A straightforward essay-type question. Remember to read the question carefully and plan your answer.

(a) The objectives of a transfer pricing system are:
- (i) to record intra-company transfers;
- (ii) to enable a fair evaluation of divisional performance;

(iii) to motivate divisional managers to make sound decisions and achieve goal congruence;
(iv) to reduce the overall tax burden in international transfers;
(v) to encourage a healthy inter-divisional competitive spirit;
(vi) to preserve the autonomy of divisional managers.

(b) Transfer prices based on 'total cost-plus' are often used when there is no competitive market for the product. However these prices include fixed costs, which can be misread as variable costs leading to incorrect pricing and output decisions. The receiving division could make a suboptimal decision to restrict output to below that of the optimal level of the group.

The inefficiencies of the supplying division are passed on to the receiving division when actual full costs are used as a basis for setting transfer prices. This would not provide a fair representation of divisional performance evaluation and will undermine divisional autonomy.

Furthermore, when actual cost-plus is used, there is actually an incentive for the supplying division to overspend. This is because all of the costs incurred will be passed on, and the supplying division will also earn a profit on all costs incurred.

(c) When setting transfer prices for an international group the following points need to be considered:

Taxation – transfer prices must be set so that the tax burden for the group as a whole is minimised.

Repatriation of funds – this is an important factor to consider when dealing with countries with a high inflation rate or stringent foreign exchange regulations. Transfer prices have to be set depending on where and in which currency cash balances should be held.

Currency risk management – decisions concerning in which currency to invoice and in which currency to settle invoice, etc.

Import duties – transfer prices kept as low as possible when goods are imported into countries with high import duties.

Minority shareholders – transfer prices can be used to reduce the amount of profit paid to minority shareholders.

Profit sharing – profit sharing in different parts of the group can influence the transfer price set.

☑ Solution 4

Tips

You will need to calculate profit figures for four different situations. Do not waste time by starting from scratch each time. It is much quicker to use your first profit calculation as a base, and then adjust this profit figure for the effects of changes in capacity and transfer price.

There is no single correct answer to part (c). Your answer may be quite different from ours but as long as it is accompanied by logical reasoning you should earn all the marks available.

(a) (i) *80% capacity; transfer price £200 per tonne*

		Wholesale group £000		*Retail group £000*	*B Ltd total £000*
Internal transfers	600t × £200	120		–	
External sales	1,000t × £180	180	60,000 bags × £4	240	
		300		240	
Variable costs	1,600t × £70	112	600t × £60	36	
Transfer charge				120	
Fixed cost		100		40	
Monthly profit		88		44	132

80% capacity; transfer price £180 per tonne

	Wholesale group £000	*Retail group £000*	*B Ltd total £000*
Monthly profit as above	88	44	132
Change in transfer charge 600t × £20	(12)	12	
Monthly profit	76	56	132

(ii) *100% capacity; transfer price £200 per tonne*

	Wholesale group £000		*Retail group £000*	*B Ltd total £000*
Monthly profit from (a) (i)	88		44	132
Extra internal transfer charge 400t × £200	80		(80)	
Extra variable costs 400t × £70	(28)	400t × £60	(24)	(52)
Extra external sales	–	40,000 bags × £3.20	128	128
Redn. in revenue from existing sales	–	60,000 bags × £0.80	(48)	(48)
Monthly profit	140		20	160

100% capacity, transfer price £180 per tonne

	Wholesale group £000	*Retail group £000*	*B Ltd total £000*
Monthly profit from (a) (ii)	140	20	160
Change in transfer charge 1,000 × £20	(20)	20	
Monthly profit	120	40	160

(b) Profit for B Limited as a whole would not be affected by the change in transfer price but operating at 100 per cent capacity produces a £28,000 increase is profit.

However the profit earned by the Retail group would be lower at 100 per cent capacity for both transfer prices. Therefore there is a lack of goal congruence because the manager of the Retail group will prefer to operate at 80 per cent capacity, to the detriment of the company as a whole.

(c) At the moment the Retail group is bearing all of the effect of the revenue reduction as a result of the lower external selling price.

The transfer price needs to be set so as to encourage the Retail group to be willing to increase output.

Perhaps the best approach would be to have a separate transfer price for the extra output, which provides each group with a fair share of the incremental contribution earned.

	£000
Incremental contribution from 20 per cent increase in capacity (160 − 132)	28
Equal share credited to wholesale group	14
Plus incremental variable costs (from (a) (ii))	28
Transfer charge for extra 20 per cent capacity	42

The resulting monthly profit will be, at 100% capacity:

	Wholesale group £000	*Retail group £000*	*B Ltd total £000*
Monthly profit from (a) (ii)	120	40	160
Change in transfer charge			
Existing charge 400t × £180	(72)	72	
Revised charge as above	42	(42)	
Revised monthly profit	90	70	160

Both groups will experience an increase in profit on the extra output and both will therefore be willing to increase activity to 100 per cent capacity.

The recommended transfer price structure is therefore:

£180 per tonne for the first 600 tonnes transferred
£105 (£42,000 ÷ 400t) per tonne for the next 400 tonnes transferred

Possible problems that might be encountered include:

If the potential external market for wholesale increases there will be an opportunity cost involved in supplying the Retail group
Confusion may arise with a two-tier transfer pricing structure

☑ Solution 5

Report

To: Managing Director **From:** Finance Director
Re: Acquisition of W and Z and decentralisation issues **Date:** 26 May 2004

Further to our recent acquisition of W and Z, I have prepared a report which I hope addresses the concerns which you have raised.

Advantages and disadvantages that we would experience by operating a decentralised structure

Advantages

Improved decision making process – quality and speed.
Motivational – delegation of decision making.
Autonomy for divisional managers.
Allow top management to focus on strategic rather than operational matters.
Reduce head office bureaucracy.
Good training ground for junior and middle management.

Disadvantages

Dysfunctional decision making, where divisions make decisions in their own best interests which may not be good from the company viewpoint.

Costs of activities that are common to all divisions may be greater for a decentralised organisation rather than a centralised one.

Loss of control by top management as decision making is delegated to the divisional managers.

The above advantages and disadvantages of decentralisation would apply to our company. However, some of those in favour and against are linked. For example, the ability of decentralised operations managers to make speedy decisions will increase the lack of control in circumstances in which the head office cannot be informed of these decisions in a timely manner. This was more important in the past. Whereas Z is based overseas, modern communications like email will enable us to keep in close contact.

Responsibility centres and decentralised structures

Types of responsibility centres include

cost centres,
profit centres,
investment centres.

Conditions

Divisional structure is best suited to those companies engaged in several dissimilar activities.

Activities should be as independent as possible for decentralisation to be successful.

Recommendation

W and Z could become cost centres, profit centres or investment centres.

W and Z have already operated independently so maintaining this structure would seem feasible. Therefore a profit or investment centre structure may work.

W and Z would need to be integrated with our systems, policies and procedures.

Integration of the two companies with our company must be done in such a way as to promote goal congruence and to discourage sub-optimal behaviour.

There are however potential problems which may make decentralisation difficult:

PQR and W were direct competitors. This situation must cease and the companies should work through their client lists and decide who will manage particular clients so that crossover between clients is avoided, thus eliminating internal competition.

They should also seek to find a way to strengthen their position in the market by working together in order to secure new clients and business going forward.

Obvious decisions should be taken such as agreeing target markets and not competing against each other when bidding for work (bespoke offerings). Once the lines have been drawn the two companies would be free to operate within their own sectors.

There may be some synergies between the work and offerings of Z and both PQR and W. This may be particularly true in the area of identifying new business opportunities – buyers of bespoke software may have some generic needs and vice versa. Salespeople/bidding teams (W) need to be trained to identify these opportunities. If divisions are autonomous some reward structure may be payable. Alternatively, a separate sales/marketing division covering all the companies may be considered.

Financial performance measures – ROCE and RI

The objective of performance measurement is to

- promote goal congruence;
- encourage initiative and motivation;
- provide feedback to management;
- encourage long-term rather than short-term views.

The method of performance measurement we will choose depends on the form of decentralisation chosen for W and Z.

Autonomous units (which is being recommended) should have:

(1) Financial targets – revenue generation, cashflow, profit, ROCE, RI.
(2) Non-financial targets – market share, sales growth, product development and so on.

We will need to set the targets centrally and implement them locally. By doing so we should be able to avoid some of the pit falls associated with decentralisation. Once the plans have been agreed, local managers will have the autonomy to implement the plans working within the parameters we set.

Return on capital employed

This is also known as ROI and is calculated as follows:

$$\text{ROCE} = \frac{\text{Earnings before interest and tax}}{\text{Capital employed}} \times 100\%$$

This method has the following advantages and disadvantages:

Advantages

- Widely used and accepted.
- As a relative measure it enables comparisons to be made between divisions or companies of different sizes.
- It can be broken down into secondary ratios for more detailed analysis.

Disadvantages

- May lead to dysfunctional decision making. For example, a division with an current ROCE of 30% would not wish to accept a project offering a ROCE of 25%, as this would reduce its current figure.
- Different accounting policies can confuse comparisons.
- ROCE increases with the age of assets if NBVs are used, thus giving managers an incentive to hang on to possibly inefficient, obsolete machines.

Residual income

Residual income is divisional profit less an imputed interest charge for invested capital.

The imputed interest charge is the amount of capital employed in the division multiplied by the cost of capital.

This method has the following advantages and disadvantages:

Advantages

It reduces ROCE's problem of rejecting projects with an ROCE in excess of the company's target, but lower than the division's current ROCE.
The cost of financing a division is brought to the attention of divisional managers.

Disadvantages

Does not facilitate comparisons between divisions.
Does not relate the size of a division's profit to the assets employed in order to obtain that profit.

Transfer prices for Z

It is likely that Z will be asked to supply off the shelf products and CD-ROMs for the customers of PQR and W. Therefore, transfer pricing will be an issue for PQR. The transfer price should be set at marginal cost plus opportunity cost to ensure profit maximisation for the group. However, if no opportunity cost exists then the transfer price will be set at marginal cost. If this situation arises, it will be demotivating for Z as no profit is realised and may, therefore, discourage them from transferring to PQR and W. PQR, therefore, needs to monitor inter company activity carefully to ensure that the correct decisions are made. If a situation is envisaged where Z transfers at marginal cost only, then the company would need to consider avoiding dysfunctional behaviour remedying this by introducing a two-part tariff system or a dual pricing system.

Another issue to consider when operating in two countries is that the group can use its transfer pricing policies to move profits around the world and thereby minimise the global tax liability. Where there are differential tax rates it is beneficial to set a transfer price which results in the highest taxable profit in the country with the lowest tax rates.

✓ Solution 6

(a) So long as the proposed project does not displace other sales (that is, that there is no opportunity cost associated with the 5,000 extra j units sold) then the impact is as follows:
C plc

Extra annual revenues	£	250,000
Variable costs – *i*		75,000
Variable costs – *j*		50,000
Fixed costs		50,000
Profit		75,000

Clearly, the project offers a profit advantage and it should be adopted.

(b) The problem arises out of how the extra profit is distributed between the two divisions. Using the £30 transfer price the impact is as follows:

		Division A	*Division B*
Capital Employed	£	6.525 m	1.125 m
Profit at existing sales levels		1.375 m	0.025 m
ROI at existing sales levels		21%	2%
Impact of proposal			
Sales/Transfers		150,000	250,000
Variable costs		75,000	50,000
Transfer costs		nil	150,000
Fixed costs		nil	50,000
Profit		75,000	nil
Total profit with proposal		1.450 m	0.025 m
ROI with proposal		22%	2%

The transfer pricing system works in a manner that locates all the incremental profit from the project with Division A. Given that the decision maker is the manager of Division B, this makes adoption of the project problematic. In spite of its merits, the project might not be adopted since B takes all the risk but none of the reward.

(c) Any transfer pricing system has to reconcile two basic criteria – (1) that the system should provide an equitable distribution of profit between divisions and (2) that the system should not distort decision-making behaviour. In practice it is difficult to find any transfer pricing system or any unique transfer price for an intermediate good that does reconcile these two criteria.

C plc's existing system is based on market price. This does, under some circumstances, provide for a fair distribution of profit between the divisions. However, it may distort decision making. As seen in the example explored, an attractive project may be declined because the benefit it offers is all concentrated with a Division that does not decide on the project or operate it. This is clearly inappropriate since B has to take the risk of the project but A gets all the rewards.

This suggests that a transfer price should be set at a level nearer marginal cost. If the transfer price for the *i* were set at marginal cost then all the reward from the project would reside with Division B, which may be a reasonable result. A small mark up on marginal cost might provide a reward to A without being a significant disincentive to A.

However, the merits of particular systems and prices depend very much on circumstances. If Division A only had a capacity of 125,000 units and it was directed to supply B in order to run the project, then C plc as a whole would incur an opportunity cost of £15 for each unit of *i* transferred to support extra production of *j*. This £15 is the contribution from the outside sales of *i* that would have to be foregone. In this case the merits of the project would become neutral when a £75,000 opportunity cost (5,000 units × £15) is considered. The transfer price of £30 would correctly reflect C plc's cost for the units transferred (£15 variable cost plus £15 opportunity cost) and there would be no scope for dysfunctional behaviour. The manager of Division B would correctly perceive that the project would offer nil profit.

If there is an efficient outside market for the *i* then it might be very difficult to have any transfer price other than £30. Any price higher than that would induce Division B to buy outside. Division A would vigorously resist any lower price, particularly if the Division was operating at full capacity.

So long as Division A is operating comfortably inside capacity, then a case might be made for reducing the transfer price below the outside market price. This is so because an internal transfer does not involve the risk or administrative costs of an outside sale. In the circumstances specified in the question, a transfer price of £25 might well be justified and ultimately acceptable to both Divisional managers.

This Page Intentionally Left Blank

Preparing for the Examination

This Page Intentionally Left Blank

Revision Questions

Foreword

Most of the revision questions given below are old CIMA examination questions, taken (although sometimes lightly adapted) from management accounting papers set under now discontinued schemes. The content, thrust and level of all these questions is entirely appropriate to provide teaching or study exercises for Performance Evaluation.

However, be aware that the general arrangement of those papers was not identical in every respect to CIMA's current Performance Evaluation paper. These revision questions should not all be considered as 'practice examination questions'. Students should refer carefully to the Pilot Paper when preparing to sit the Performance Evaluation examination in order to ensure that they are familiar with the style and arrangement of questions that they are likely to encounter.

That said, the questions in this chapter have been split into four sections (A multi-choice, A non-multi choice, B and C) which are intended to correspond approximately to the arrangement of the Performance Evaluation examination paper. A number of the questions in Section C may be considered as general teaching or study exercises which are relevant to any part of the Performance Evaluation paper.

Learning outcomes	Questions
Compare and contrast marginal and absorption costing methods in respect of profit reporting and stock valuation	3.6, 12
Apply marginal and absorption costing approaches in a job, batch and process environments	2.7
Prepare ledger accounts according to context: marginal or absorption based in job, batch or process environments, including WIP and related accounts	11, 35
Explain why and how standards are set in a manufacturing and service industries with particular reference to the maximisation of efficiency and minimisation of risk	1.7
Calculate and interpret material, labour, variable overhead, fixed overhead and sales variances	1.1, 1.2, 1.3, 1.6, 1.8, 2.1, 5.1, 5.2, 6.5
Prepare and discuss a report which reconciles budget and actual profit using absorption and/or marginal costing	7, 23, 34
Calculate and explain planning and operational variances	4.7, 4.8
Discuss the behavioural implications of setting standard costs	18
Apply standard costing methods within costing systems and demonstrate the reconciliation of budgeted and actual profit margins	33
Prepare reports using a range internal and external benchmarks	13
Explain why organisations prepare forecasts and plans	1.10
Calculate projected product/service volumes employing appropriate forecasting techniques	3.1, 6.3, 25, 26, 27

Learning outcomes	Questions
Calculate projected revenues and costs based on product/ service volumes, pricing, pricing strategies and cost structures	1.4, 1.5, 2.2, 2.3, 2.6, 3.2, 3.4, 4.1, 4.2, 4.5, 5.4, 6.1, 6.6, 6.7, 28, 29
Describe and explain the possible purposes of budgets including planning, communication, co-ordination, motivation, authorisation, control and evaluation	31, 32
Evaluate and apply alternative approaches to budgeting	1.9, 4.6, 6.2, 9
Calculate the consequences of 'What if' scenarios and evaluate their impact on master profit and loss account and balance sheet	8, 14
Explain the ideas of feedback and feed-forward control and their applications in the use of budgets for control	19
Explain the concept of responsibility accounting and its importance in the construction of functional budgets that support the overall master budget	3.3, 3.7
Identify controllable and uncontrollable costs in the context of responsibility accounting and explain why 'uncontrollable' costs may or may not be allocated to responsibility centres	30(b)
Evaluate performance using fixed and flexible budget reports	10
Explain the impact of budgetary control systems on human behaviour	4.3
Evaluate projected performance by calculating key metrics including profitability, liquidity, and asset turnover ratios	30(a)
Discuss the role of non-financial performance indicators and compare and contrast traditional approaches to budgeting with recommendations based on the 'balanced scorecard'	3.5
Evaluate the criticisms of budgeting particularly from the advocates of techniques that are beyond budgeting	4.4, 15, 17
Explain the role of MRP and ERP systems in supporting standard costing systems, calculating variances and facilitating the posting of ledger entries	16
Evaluate the impact of JIT manufacturing methods on cost accounting and the use of 'backflush' accounting when WIP stock is minimal	2.4, 36, 43
Compare activity-based costing with traditional marginal and absorption costing methods and evaluate its potential as a system of cost accounting	2.5, 5.3, 6.4, 24, 37, 38
Explain the origins of throughput accounting as 'super variable costing' and its application as a variant of marginal or variable costing	2.8, 2.9, 40, 41
Discuss the use of cost, revenue, profit and investment centres in devising organisation structure and in management control	20
Prepare cost information in appropriate formats for cost centre managers, taking due account of controllable/ uncontrollable cost and the importance of budget flexing	4.9
Prepare revenue and cost information in appropriate formats for profit and investment centre managers, taking due account of cost variability, attributable costs, controllable costs and identification of appropriate measures of profit centre 'contribution'	21
Calculate and apply measures of performance for investment centres (often 'strategic business units' or divisions of larger groups)	22
Discuss the likely behavioural consequences of the use of performance metrics in managing cost, profit and investment centres	39(a)
Explain the typical consequences of a divisional structure for performance measurement as divisions compete or trade with each other	42
Identify the likely consequences of different approaches to transfer pricing for divisional decision making, divisional and group profitability, the motivation of divisional management and the autonomy of individual divisions	39(b)

Section A – Multi-choice questions

? Question 1

1.1 F Ltd has the following budget and actual data:

Budget fixed overhead cost	£100,000
Budget production (units)	20,000
Actual fixed overhead cost	£110,000
Actual production (units)	19,500

The fixed overhead volume variance:

(A) is £500 adverse;
(B) is £2,500 adverse;
(C) is £10,000 adverse;
(D) is £17,500 adverse.

1.2 J Ltd operates a standard cost accounting system. The following information has been extracted from its standard cost card and budgets:

Budgeted sales volume	5,000 units
Budgeted selling price	£10.00 per unit
Standard variable cost	£5.60 per unit
Standard total cost	£7.50 per unit

If it used a standard marginal cost accounting system and its actual sales were 4,500 units at a selling price of £12.00, its sales volume variance would be:

(A) £1,250 adverse;
(B) £2,200 adverse;
(C) £2,250 adverse;
(D) £3,200 adverse.

1.3 T plc uses a standard costing system, with its material stock account being maintained at standard costs. The following details have been extracted from the standard cost card in respect of direct materials:

8 kg @ £0.80/kg = £6.40 per unit

Budgeted production in April was 850 units.

The following details relate to actual materials purchased and issued to production during April when actual production was 870 units:

Materials purchased	8,200 kg costing £6,888
Materials issued to production	7,150 kg

Which of the following correctly states the material price and usage variances to be reported?

	Price	*Usage*
A	£286 (A)	£152 (A)
B	£286 (A)	£280 (A)
C	£286 (A)	£294 (A)
D	£328 (A)	£152 (A)

1.4 The following details have been extracted from the debtor collection records of C Ltd:

	%
Invoices paid in the month after sale	60
Invoices paid in the second month after sale	25
Invoices paid in the third month after sale	12
Bad 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 per cent settlement discount.

Credit sales values for June to September are budgeted as follows:

June	*July*	*August*	*September*
£35,000	£40,000	£60,000	£45,000

The amount budgeted to be received from credit sales in September is:

(A) £47,280
(B) £47,680
(C) £48,850
(D) £49,480

1.5 The following extract is taken from the production cost budget of S Ltd:

Production (units)	2,000	3,000
Production cost (£)	11,100	12,900

The budget cost allowance for an activity level of 4,000 units is:

(A) £7,200;
(B) £14,700;
(C) £17,200;
(D) £22,200.

1.6 PQ Ltd operates a standard costing system for its only product. The standard cost card is as follows:

	£
Direct materials: (4 kg @ £2/kg)	8.00
Direct labour: (4 hours @ £4/hour)	16.00
Variable overhead: (4 hours @ £3/hour)	12.00
Fixed overhead: (4 hours @ £5/hour)	20.00

Fixed overheads are absorbed on the basis of labour hours. Fixed overhead costs are budgeted at £120,000 per annum arising at a constant rate during the year.

Activity in period 3 is budgeted to be 10 per cent of total activity for the year. Actual production during period 3 was 500 units, with actual fixed overhead costs incurred being £9,800 and actual hours worked being 1,970.

The fixed overhead expenditure variance for period 3 was:

(A) £2,200 (F);
(B) £200 (F);
(C) £50 (F);
(D) £200 (A).

1.7 The following data has been extracted from the budget working papers of BL Ltd:

	Production volume 1,000 £/unit	*2,000 £/unit*	
Direct materials		4.00	4.00
Direct labour		3.50	3.50
Production overhead department 1		6.00	4.20
Production overhead department 2		4.00	2.00

The total fixed cost and variable cost per unit is:

	Total fixed cost £	*Variable cost/unit* £
A	3,600	9.90
B	4,000	11.70
C	7,600	7.50
D	7,600	9.90

1.8 Z plc uses a standard costing system and has the following labour cost standard in relation to one of its products:

4 hours skilled labour @ £6.00 per hour = £24.00

During October 3,350 of these products were made, which was 150 units less than budgeted. The labour cost incurred was £79,893 and the number of direct labour hours worked was 13,450. The direct labour variances for the month were:

	Rate	*Efficiency*
A	£804 (F)	£300 (A)
B	£804 (F)	£300 (F)
C	£807 (F)	£297 (A)
D	£807 (F)	£300 (A)

1.9 A flexible budget is:

(A) a budget of variable production costs only;
(B) a budget that is updated with actual costs and revenues as they occur during the budget period;
(C) a budget that shows the costs and revenues at different levels of activity;
(D) a budget that is prepared for a period of six months and reviewed monthly; following such review a further one month's budget is prepared.

1.10 A master budget comprises:

(A) the budgeted profit and loss account;
(B) the budgeted cash flow, budgeted profit and loss account and budgeted balance sheet;
(C) the budgeted cash flow;
(D) the entire set of budgets prepared.

? Question 2

2.1 The standard ingredients of 1 kg AB are 0.7 kg A (cost £5 per kg) and 0.3 kg B (cost £8 per kg). In the current period, 100 kg AB has been produced using 68 kg A and 32 kg B. The material mixture variance is:

(A) £10 adverse;
(B) £6 favourable;
(C) £12 favourable;
(D) £6 adverse.

2.2 In period 1 production costs are £2,800 and output is 1,500 units. In period 2 production costs are £3,100 and output is 1,700 units. By applying a linear regression analysis to these figures it is possible to represent the production costs as an equation in the form $y = a + bx$. In this case, b is:

(A) £480
(B) −£25
(C) £0.80
(D) £1.50

2.3 Budget profit for the period is £1,000. During the period the following developments are also budgeted: debtors to rise by £50, creditors to decline by £20, stock to rise by £100 and £45 depreciation to be charged to profit. Budget net cash flow for the period is:

(A) £875
(B) £125
(C) −£125
(D) £1,100

2.4 The adoption of JIT normally requires which one of the following factors to increase:

(A) stock levels;
(B) work-in-progress levels;
(C) batch sizes;
(D) quality standards.

2.5 In the practice of ABTs, a cost driver is:

(A) a reduction in unit cost without any loss of value;
(B) a factor that causes the total cost of an activity to change;
(C) the cost of converting raw materials into finished goods;
(D) a fee paid to the consultants who designed the ABT.

2.6 Q Limited has in stock 10,000 kg of V, a raw material which it bought for £5 per kg five years ago. This was bought for a product line which was discontinued four years ago. At present, V has no use in its existing state but could be sold as scrap for £1.50 per kg. One of the company's current products (QX) requires 2 kg of a raw material which is available for £4.50 per kg. V can be modified at a cost of £1 per kg so that it may be used as a substitute for this material. However, after modification, 3 kg of V is required for every unit of QX to be produced.

Q Limited has now received an invitation to tender for a product which could use V in its present state. The relevant cost per kg of V to be included in the cost estimate for the tender is:

(A) £1.00
(B) £1.50
(C) £2.00
(D) £5.00

2.7 XYZ plc manufactures its product through a series of processes. The FIFO method of valuing opening work in process is used; the following details relate to September 1995.

Opening work in process was 600 units, each 80% processed as to materials and 60% processed as to conversion costs.

Normal loss was 500 units, fully completed.

Finished output was 14,500 units; there were no abnormal losses or gains.

Closing work in process was 800 units, each 70 per cent processed as to materials and 40% processed as to conversion costs.

When calculating the costs per equivalent unit, the number of equivalent units to be used are:

	Materials	*Conversion*
A	14,580	14,460
B	14,940	14,580
C	15,180	15,060
D	15,540	15,180

2.8 A company operates a throughput accounting system. The details of product A per unit are:

Selling price	£24.99
Material cost	£8.87
Conversion costs	£12.27
Time on bottleneck resource	6.5 minutes

The return per hour for product A is:

(A) £35.54
(B) £117.42
(C) £123.80
(D) £148.80

2.9 A company manufactures four products – J, K, L and M. The products use a series of different machines but there is a common machine, X, which causes a bottleneck.

The standard selling price and standard cost per unit for each product for the forthcoming year are as follows:

	J	*K*	*L*	*M*
	£	£	£	£
Selling Price	2,000	1,500	1,500	1,750
Cost:				
Direct Materials	410	200	300	400
Labour	300	200	360	275
Variable overheads	250	200	300	175
Fixed overheads	360	300	210	330
Profit	680	600	330	570
Machine X – minutes per unit	120	100	70	110

Direct materials is the only unit-level manufacturing cost.

Using a throughput accounting approach, the ranking of the products would be:

	J	*K*	*L*	*M*
(A)	1st	2nd	3rd	4th
(B)	1st	2nd	4th	3rd
(C)	2nd	1st	4th	3rd
(D)	2nd	3rd	1st	4th
(E)	3rd	2nd	1st	4th

(3 marks)

Question 3

3.1 W plc is preparing its budgets for next year.
The following regression equation has been found to be a reliable estimate of W plc's deseasonalised sales in units:

$$y = 10x + 420$$

where y is the total sales units and x refers to the accountancy period. Quarterly seasonal variations have been found to be:

Q1	*Q2*	*Q3*	*Q4*
+10%	+25%	−5%	−30%

In accounting period 33 (which is quarter 4) the seasonally adjusted sales units are expected to be:

(A) 525
(B) 589
(C) 750
(D) 975

3.2 P Ltd is preparing its cash budget for the year ended 31 December 2000. An extract of its sales budget is as follows:

January	£50,000
February	£45,000
March	£60,000
April	£55,000
May	£48,000
June	£60,000

Twenty per cent of the monthly sales are for cash. The payment pattern of the credit sales is expected to be:

50 per cent in the month after sale;
25 per cent in the month two months after sale;
20 per cent in the month three months after sale.

The remainder is expected to be bad debts. The amount budgeted to be received from customers in May 2000 is:

(A) £41,200
(B) £50,800
(C) £51,500
(D) £61,100

3.3 An incremental budgeting system is:

(A) a system that budgets only for the extra costs associated with a particular plan.
(B) a system that budgets for the variable manufacturing costs only.
(C) a system that prepares budgets only after the manager responsible has justified the continuation of the relevant activity.
(D) a system that prepares budgets by adjusting the previous year's values by expected changes in volumes of activity and price/inflation effects.

3.4 The following cost per unit details have been extracted from the production overhead cost budget of E Ltd:

Output (units)	5000	8000
Production overhead (£/unit)	2.78	2.60

The budget cost allowance for production overhead for an activity level of 6,250 units is:

(A) £1,125
(B) £14,375
(C) £15,000
(D) £16,775

3.5 Which of the following perspectives are encompassed in a balanced scorecard?
(i) customer perspective,
(ii) financial perspective,
(iii) supplier perspective.

(A) (i) and (ii) only
(B) (i) and (iii) only
(C) (ii) and (iii) only
(D) (i), (ii) and (iii)

3.6 Activity-based costing is:

(A) a method of total costing which attributes costs to cost units using multiple activity drivers;
(B) a method of costing which is used to recognise the effects of changes in output activity and their effect on total costs;
(C) a method of costing which is used to calculate the cost per unit in organisations which have only one single activity;
(D) a method of cost accounting which derives unit costs according to planned outputs.

3.7 In the context of quality costs, training costs and reworking costs are classified as:

	Training costs	*Reworking costs*
A	prevention costs	internal failure costs
B	internal failure costs	internal failure costs
C	internal failure costs	external failure costs
D	prevention costs	external failure costs

? Question 4

4.1 XY Ltd manufactures two products – the X (which gives a contribution of £4 per unit) and the Y (which gives a contribution of £6 per unit). The X and the Y are budgeted to sell in the proportion two units of X for every one unit of Y. XY Ltd incurs £14,000 fixed costs per period and its production capacity is 3,000 units of X and 1,500 units of Y. XY Ltd's breakeven point is:

(A) 66.66% capacity
(B) 55.55% capacity
(C) 822 units of X and 411 units of Y
(D) 92.31% of capacity

4.2 PQ Ltd manufactures two products – the P (requiring 2 labour hours and 3 machine hours per unit, while giving a contribution of £2 per unit) and the Q (requiring 3 labour hours and 2 machine hours per unit, while giving a contribution of £2.25 per unit). In the coming period PQ will have 1,200 labour hours and 1,500 machine hours of capacity available. The maximum contribution that PQ can generate in the period is:

(A) £1,280
(B) £900
(C) £1,110
(D) £820

4.3 In the context of business performance management systems, the term 'dysfunctional behaviour' may best be defined as:

(A) stress-induced depression among accounting staff;
(B) managers acting to improve business performance;
(C) managers using 'creative accounting' practices to make business performance appear better than it really is;
(D) managers being induced by control systems to act in a manner that is not in the best interests of the whole business.

4.4 In a TQM environment, external benchmarking is preferred to standard costing as a performance measurement technique because:

(A) standard costs quickly become obsolete;
(B) TQM emphasises continuous improvement and reference to a predetermined internal standard gives no incentive to improve;
(C) TQM places an emphasis on employee empowerment, and the concept of a standard cost is alien to this;
(D) the use of standard costs is only possible in a traditional mass-production industry.

4.5 Extracts from FG Ltd's budget include the following:

	June	*July*
Net profit (£,000)		60
Closing stock	25	30
Closing debtors	45	35
Closing creditors	17	20
Depreciation		5
Equipment purchase		40
Cash balance	15	

On the basis of these figures alone, FG Ltd's cash balance at end July will be:

(A) £48,000
(B) £92,000

(C) £(31,000)
(D) £14,000

4.6 Zero-based budgeting is best defined as:

(A) a method of budgeting based on cash flow rather than profit;
(B) an approach to budgeting that assumes all costs to be variable in the long term;
(C) a method of performance evaluation using benchmarks linked to strategic objectives;
(D) an approach that requires each activity to be evaluated and justified as if it were being undertaken for the first time.

The following data relates to both questions 4.7 and 4.8:

P Ltd operates a standard costing system. The following information has been extracted from the standard cost card for one of its products:

Budgeted production		1,250 units
Direct material cost	7 kg @ £4.10 per kg	£28.70 per unit
Actual results for the period were as follows:		
Production		1,000 units
Direct material (purchased and used)	7,700 kg	£33,880

It has subsequently been noted that the market price of the material was £4.50 per kg during the period.

4.7 The value of the planning variance is

(A) £1,225 adverse.
(B) £2,800 adverse.
(C) £3,500 adverse.
(D) £4,375 adverse.
(E) £5,950 adverse. **(2 marks)**

4.8 The value of the material usage variance is

(A) £2,870 adverse.
(B) £3,080 adverse.
(C) £3,150 adverse.
(D) £3,587.50 adverse.
(E) £3,937.50 adverse. **(2 marks)**

4.9 X plc, a manufacturing company, has two divisions: Divisions A and B. Division A produces one type of product, ProdX, which it transfers to Division B and also sells externally. Division B has been approached by another company which has offered to supply 2,500 units of ProdX for £35 each.

The following details for Division A are available:

	£
Sales revenue	
Sales to Division B @ £40 per unit	400,000
External sales @ £45 per unit	270,000
Less	
Variable cost @ £22 per unit	352,000
Fixed costs	100,000
Profit	218,000

If Division B decides to buy from the other company, the impact of the decision on the profits of Division A and X plc, assuming external sales of ProdX cannot be increased, will be

	Division A	*X plc*
A	£12,500 decrease	£12,500 decrease
B	£15,625 decrease	£12,500 decrease
C	£32,500 decrease	£32,500 decrease
D	£45,000 decrease	£32,500 decrease
E	£45,000 decrease	£45,000 decrease

(3 marks)

? Question 5

The following data is to be used for Questions 5.1 and 5.2.

M plc sells televisions that it purchases through a regional distributor. An extract from its budget for the 4-week period ended 28 October 2001 shows that it planned to sell 500 televisions at a unit price of £300, which would give a contribution to sales ratio of 30%.

Actual sales were 521 televisions at an average selling price of £287. The actual contribution to sales ratio averaged 26%.

5.1 The sales price variance (to the nearest £1) was

(A) £6,773 (A)
(B) £6,500 (A)
(C) £6,500 (F)
(D) £6,773 (F)

5.2 The sales volume contribution variance (to the nearest £1) was

(A) £1,890 (F)
(B) £1,808 (F)
(C) £1,638 (F)
(D) £1,567 (F)

5.3 Z plc operates an activity based costing (ABC) system to attribute its overhead costs to cost objects.

In its budget for the year ending 31 December 2001, the company expected to place a total of 2,785 purchase orders at a total cost of £94,690. This activity and its related costs were budgeted to occur at a constant rate throughout the budget year, which is divided into 13 four-week periods.

During the four-week period ended 27 October 2001, a total of 202 purchase orders was placed at a cost of £7,318.

The under-recovery of these costs for the four-week period (to the nearest £1) was

(A) £34
(B) £416
(C) £443
(D) £450

5.4 M Limited manufactures four products from different quantities of the same material which is in short supply. The following budgeted data relates to the products:

	Product M1	*Product M2*	*Product M3*	*Product M4*
	£/unit	*£/unit*	*£/unit*	*£/unit*
Selling price	70	92	113	83
Materials (£4per kg)	16	22	34	20
Conversion costs	39	52	57	43
	55	74	91	63
Profit	15	18	22	20
Machine time per unit in minutes	40	40	37.5	45

The conversion costs include general fixed costs that have been absorbed using a rate of £24 per machine hour.

The most profitable use of the raw materials is to make

(A) product M1
(B) product M2.
(C) product M3.
(D) product M4.

Question 6

6.1 Z plc provides a single service to its customers. An analysis of its budget for the year ending 31 December 2002 shows that in period 4, when the budgeted activity was 5,220 service units with a sales value of £42 each, the margin of safety was 19.575%.

The budgeted contribution to sales ratio of the service is 40%.

Budgeted fixed costs in period 4 were nearest to

(A) £1,700
(B) £71,000
(C) £88,000
(D) £176,000 **(2 marks)**

6.2 Which of the following statements are true?

(i) A flexible budget can be used to control operational efficiency.
(ii) Incremental budgeting is a system of budgetary planning and control that measures the additional costs of the extra units of activity.
(iii) Participative budgeting is a method of centralised budgeting that uses a top-down approach and aspiration levels.

(A) (i) and (ii) only
(B) (ii) and (iii) only
(C) (iii) only
(D) (i) only **(2 marks)**

6.3 The overhead costs of RP Limited have been found to be accurately represented by the formula

$$y = £10{,}000 + £0.25x$$

where y is the monthly cost and x represents the activity level measured in machine hours.

Monthly activity levels, in machine hours, may be estimated using a combined regression analysis and time series model:

$$a = 100{,}000 + 30b$$

where a represents the de-seasonalised monthly activity level and b represents the month number.

In month 240, when the seasonal index value is 108, the overhead cost (to the nearest £1,000) is expected to be

(A) £35,000
(B) £37,000
(C) £39,000
(D) £41,000 **(3 marks)**

6.4 DRP Limited has recently introduced an Activity Based Costing system. It manufactures three products, details of which are set out below:

	Product D	*Product R*	*Product P*
Budgeted annual production (units)	100,000	100,000	50,000
Batch size (units)	100	50	25
Machine set-ups per batch	3	4	6
Purchase orders per batch	2	1	1
Processing time per unit (minutes)	2	3	3

Three cost pools have been identified. Their budgeted costs for the year ending 30 June 2003 are as follows:

Machine set-up costs	£150,000
Purchasing of materials	£70,000
Processing	£80,000

The budgeted machine set-up cost per unit of product R is nearest to

(A) £0.52
(B) £0.60
(C) £6.52
(D) £26.09 **(3 marks)**

6.5 The following data have been extracted from the budget working papers of WR Limited:

Activity (Machine hours)	*Overhead cost* £
10,000	13,468
12,000	14,162
16,000	15,549
18,000	16,242

In March 2002, the actual activity was 13,780 machine hours and the actual overhead cost incurred was £14,521.

The total overhead expenditure variance is nearest to

(A) £1,750 (F)
(B) £250 (F)
(C) £250 (A)
(D) £4,520 (A) **(4 marks)**

The following data is to be used to answer Questions 6.6 and 6.7 below.
A division of PLR plc operates a small private aircraft that carries passengers and small parcels for other divisions.

In the year ended 31 March 2002, it carried 1,024 passengers and 24,250 kg of small parcels. It incurred costs of £924,400.

The division has found that 70% of its total costs are variable, and that 60% of these vary with the number of passengers and the remainder varies with the weight of the parcels.

The company is now preparing its budget for the 3 months ending 30 September 2002 using an incremental budgeting approach. In this period it expects:

All prices to be 3% higher than the average paid in the year ended 31 March 2002;
Efficiency levels to be unchanged;
Activity levels to be:
209 passengers;
7,200 kg of small parcels.

6.6 The budgeted passenger related costs (to the nearest £100) for the **three months** ending 30 September 2002 is

(A) £81,600
(B) £97,100
(C) £100,000
(D) £138,700 **(2 marks)**

6.7 The budgeted small parcel related cost (to the nearest £100) for the **three months** ending 30 September 2001 is

(A) £64,700
(B) £66,600
(C) £79,200
(D) £95,213 **(2 marks)**

Section A – Non-multi-choice questions

Question 7

The following profit reconciliation statement has been prepared by the management accountant of ABC Ltd for March:

	£	£	£	
Budgeted profit			30,000	
Sales volume profit variance			5,250	Adv
Selling price variance			6,375	Fav
			31,125	
Cost variances	*A*	*F*		
Material:				
Price	1,985			
Usage		400		
Labour:				
Rate		9,800		
Efficiency	4,000			
Variable overhead:				
Expenditure		1,000		
Efficiency	1,500			
Fixed overhead:				
Expenditure		500		
Volume	24,500			
	31,985	11,700	20,285	Adv
Actual profit		10,840		

The standard cost card for the company's only product is as follows:

		£
Materials	5 litres @ £0.20	1.00
Labour	4 hours @ £4.00	16.00
Variable overhead	4 hours @ £1.50	6.00
Fixed overhead	4 hours @ £3.50	14.00
		37.00
Standard profit		3.00
Standard selling price		40.00

The following information is also available:

1. There was no change in the level of finished goods stock during the month.
2. Budgeted production and sales volumes for March 20X5 were equal.
3. Stocks of materials, which are valued at standard price, decreased by 800 litres during the month.

Requirements

Calculate the following:

(i) the actual production/sales volume;
(ii) the actual number of hours worked;
(iii) the actual quantity of materials purchased;
(iv) the actual variable overhead cost incurred;
(v) the actual fixed overhead cost incurred.

Question 8

Exe plc manufactures one standard product and, in common with other companies in the industry, is suffering from the current depression in the market. Currently it is operating at a normal level of activity of 70 per cent, which represents an output of 6,300 units, but the sales director believes that a realistic forecast for the next budget period would be a level of activity of 50 per cent.

	Level of activity		
	60%	*70%*	*80%*
	£	£	£
Direct materials	37,800	44,100	50,400
Direct wages	16,200	18,900	21,600
Production overhead	37,600	41,200	44,800
Administration overhead	31,500	31,500	31,500
Selling and distribution overhead	42,300	44,100	45,900
Total cost	165,400	179,800	194,200

Profit is 20 per cent of selling price.

Requirements

(a) From the data given in the current flexible budget above, prepare a budget based on a level of activity of 50 per cent, which should show clearly the contribution that could be expected.

(b) Discuss briefly three problems that may arise from such a change in level of activity.

(Total marks = 20)

Question 9

(a) Discuss the use of the following as aids to *each* of planning and control:

(i) rolling budgets;

(ii) flexible budgets; **(6 marks)**

(b) Discuss the extent to which the incidence of budgetary slack is likely to be affected by the use of each of the techniques listed in (a). **(4 marks)**

(Total marks = 10)

Question 10

The annual flexible budget of a company is as follows:

Production capacity	*40%*	*60%*	*80%*	*100%*
Costs:	£	£	£	£
Direct labour	16,000	24,000	32,000	40,000
Direct material	12,000	18,000	24,000	30,000
Production o/h	11,400	12,600	13,800	15,000
Administration o/h	5,800	6,200	6,600	7,000
Selling and distribution o/h	6,200	6,800	7,400	8,000
	51,400	67,600	83,800	100,000

Owing to trading difficulties the company is operating at 50% capacity. Selling prices have had to be lowered to what the directors maintain is an uneconomic level and they are considering whether or not their single factory should be closed down until the trade recession has passed.

A market research consultant has advised that in about twelve months' time there is every indication that sales will increase to about 75% of normal capacity and that the revenue to be produced in the second year will amount to £90,000. The present revenue from sales at 50% capacity would amount to only £49,500 for a complete year.
If the directors decide to close down the factory for a year it is estimated that:

(a) the present fixed costs would be reduced to £11,000 per annum;
(b) closing down costs (redundancy payments, etc) are £7,500;
(c) necessary maintenance of plant would cost £1,000 per annum; and
(d) on re-opening the factory, the cost of overhauling plant, training and engagement of new personnel would amount to £4,000.

The directors are considering three options – (i) keeping the factory operational without any interruption, (ii) closing the factory temporarily for 1 year and (iii) closing the factory permanently.

Requirements

Prepare statements showing:

(a) The cost structure of the operation expressed in terms of 'variable cost per 10% capacity' utilisation and fixed cost per period;
(b) The net profit at an operations level corresponding to 50% capacity utilisation;
(c) The costs of a 1 year closure plus the consequent reopening;
(d) The net profit at an operations level corresponding to 75% capacity utilisation.

Draw on your answers to (a) to (d) in order to state whether the Directors should (i) keep the factory operational throughout, (ii) close the factory temporarily for 1 year or (iii) close the factory permanently.

? Question 11

Process B receives units from process A and passes them on to Process C.
At the start of the current period, 200 units of work-in-progress (WIP) were held in Process B details as follows:

200 units, comprised as follows:

		£
Inputs from process A	100% complete	800
Labour costs	60% complete	540
Overhead costs	55% complete	620

During the current period, details of Process B's operation were as follows:

Units completed and transferred to Process C	2,900
Units input from Process A	3,000
	£
Value of inputs from Process A	12,300
Labour costs	14,210
Overhead costs	17,700

At the end of the current period, 300 units of work in progress (WIP) are held in process B details as follows:

Inputs from process A	100% complete
Labour costs	40% complete
Overhead costs	70% complete

Requirements

(a) Calculate the value of unit transfers from process B during the current period and the value of WIP in Process B at the end of the current period – using the first-in-first-out (FIFO) valuation method.
(b) Calculate the value of unit transfers from process B during the current period and the value of WIP in Process B at the end of the current period – using the average valuation method.

(Note: Figures should be accurate to the nearest pound and supported by relevant calculations.)

Question 12

The production department of RSO Inc. has £120,000 overheads allotted to it per period. The manufacturing department produces several products including the R and the S. Relevant details are:

Total direct labour hours worked per period	10,000
Quantity of R produced per period (Units)	500
Quantity of S produced per period (Units)	12,000
Direct labour hours per unit of R	0.4
Direct labour hours per unit of S	0.3
Direct cost per unit of R (£)	12.00
Direct cost per unit of S (£)	18.00

Investigation of the production department's operation demonstrates that it has two cost drivers:

(1) setting up for production runs – 100 production runs per period.
(2) dispatching consignments of finished goods to customers – 200 consignments per period.

Eight staff are engaged in managing the setting up of production runs and two staff are engaged in the dispatch of consignments of finished goods. Most of the overheads relate to the employment and use of these staff.

R production involves 25 production runs and 35 finished goods consignments per period.

S production involves 4 production runs and 6 finished goods dispatches per period.

Requirements

(a) Calculate the production cost of one Unit of R and the production cost of one Unit of S if a traditional direct labour hour overhead absorption rate is used.
(b) Calculate the production cost of one Unit of R and one Unit of S if an Activity Based Costing system is used.

Section B

Question 13

In recent years, writers have argued that standard costing and variance analysis should not be used for cost control and performance evaluation purposes in today's manufacturing world. Its use, they argue, is likely to induce behaviour that is inconsistent with the strategic manufacturing objectives that companies need to achieve in order to survive in today's intensely competitive international economic environment.

Requirements

(a) Explain the arguments referred to in the above paragraph concerning the relevance of standard costing and variance analysis.
(b) Explain the arguments in favour of the relevance of standard costing and variance analysis in the modern manufacturing environment.
(c) Suggest methods that might be used by management accountants to control costs and evaluate efficiency as alternatives or complements to standard costing and variance analysis.

? Question 14

It is common practice to flex a budget linearly according to the volume of production, using labour or machine hours as a proxy, yet this often results in a budget that is inaccurate and thus less useful for control purposes.

Requirements

(a) Explain why inaccuracies may result from the procedures commonly used to flex a budget.
(b) Explain how these inaccuracies may detract from effective control.

? Question 15

The new manufacturing environment is characterised by more flexibility, a readiness to meet customers' requirements, smaller batches, continuous improvements and an emphasis on quality. In such circumstances, traditional management accounting performance measures are, at best, irrelevant and, at worst, misleading.

Requirements

(a) Discuss the above statement, citing specific examples to support or refute the views expressed.
(b) Explain in what ways management accountants can adapt the services they provide to the new environment.

? Question 16

'Producing high-quality, low-cost products in competition with the Japanese is challenging but manageable. Understanding how MRP, JIT, CIM and FMS relate to each other is unmanageable and a waste of time.'
(Paraphrase of recent comments made by a factory production manager.)

Requirements

Having regard to the above statement:

(a) explain the main changes in the world business environment since 1970 that have influenced manufacturing management practices;

(b) explain what the four practices specified in the quotation have in common and how they differ; explain the relationship between these practices and the changes referred to in part (a); explain and discuss the production manager's comments;
(c) explain the developments in management accounting that have taken place as a result of the changes referred to in (a) and the adoption of the practices referred to in (b).

Notes:
MRP – material requirements planning; JIT – just-in-time; CIM – computer-integrated manufacturing; FMS – flexible manufacturing systems.

? Question 17

Electricity and gas costs may be associated with the following items in a factory:

maintaining a statutory temperature range in the workplace;
the operation of a specially humidified materials store;
power costs per unit of output;
power costs in the movement of raw materials and work in progress;
losses from steam pipelines and steam valves;
heat losses through windows.

Requirements

Explain how management may be assisted in the implementation of an energy cost-reduction strategy through the application of:

(a) zero-based budgeting;
(b) total quality management.

Your answers to (a) and (b) should each refer to any three of the energy cost examples given in the question.

? Question 18

State the range of behavioural issues that need to be addressed in the establishment of standard costs.

? Question 19

Explain the difference between information feedback and feed-forward within the context of a budgetary control system.

? Question 20

Explain the role of 'budget flexing' in the context of the preparation of financial control reports for strategic business units.

? Question 21

State the differences in the financial reporting requirements as between cost, profit, sales and investment centres.

? Question 22

State the advantages of using RI as a divisional performance indicator relative to ROI (otherwise ROCE).

Section C

? Question 23

A firm has recently commenced using a standard costing system but the manager is having some difficulty in identifying significant variances, that is, those that require further analysis and investigation.

Requirements

(a) Describe the factors which determine whether or not a variance is significant.

(5 marks)

(b) Suggest ways in which significant variances could be more easily identified.

(10 marks)

(Total marks = 15)

? Question 24

Frolin Chemicals Ltd produces FDN. The standard ingredients of 1 kg of FDN are:

0.65 kg of ingredient F	@ £4.00 per kg
0.30 kg of ingredient D	@ £6.00 per kg
0.20 kg of ingredient N	@ £2.50 per kg
1.15 kg	

Production of 4,000 kg of FDN was budgeted for April 20X8. The production of FDN is entirely automated and production costs attributed to FDN production comprise only direct materials and overheads. The FDN production operation works on a JIT basis and no ingredient or FDN inventories are held.

Overheads were budgeted for April 20X8 for the FDN production operation as follows:

Activity	*Total amount* £
Receipt of deliveries from suppliers (standard delivery quantity is 460 kg)	4,000
Despatch of goods to customers (standard despatch quantity is 100 kg)	8,000
	12,000

In April 20X8, 4,200 kg of FDN were produced and cost details were as follows: Materials used:

	Kg
F	2,840
D	1,210
N	860

at a total cost of £20,380.

Actual overhead costs: twelve supplier deliveries (cost £4,800) were made, and 38 customer despatches (cost £7,800) were processed.

Frolin Chemicals Ltd's budget committee met recently to discuss the preparation of the financial control report for April, and the following discussion occurred:

Chief accountant: 'The overheads do not vary directly with output and are therefore by definition "fixed". They should be analysed and reported accordingly.'
Management accountant: 'The overheads do not vary with output, but they are certainly not fixed. They should be analysed and reported on an activity basis.'

Requirements

Having regard to this discussion:

(a) Prepare a variance analysis for FDN production costs in April 20X8: separate the material cost variance into price, mixture and yield components; separate the overhead cost variance into expenditure, capacity and efficiency components using consumption of ingredient F as the overhead absorption base.
(b) Prepare a variance analysis for FDN production overhead costs in April 1998 on an activity basis.
(c) Explain how, in the design of an activity-based management system, you would identify and select the most appropriate activities and cost drivers.

? Question 25

A motor-transport company operates with two types of vehicles, 5-ton vans and 20-ton articulated lorries. Preliminary data for next year's budget is given below.

Requirements

Using the following information, you are asked to prepare a budget presentation under suitable departmental headings and showing vehicle operating costs per mile:

	5-ton vans	*20-ton lorries*
Number of vehicles	12	6
Capital cost per vehicle	£6,000	£13,500
Miles per annum, each vehicle	20,000	40,000
Fuel consumption (miles per gallon)	15.0	8.0
Tyre replacement cost per mile	£0.005	£0.015
Drivers' wages per vehicle per annum – basic and guaranteed pay, including holidays	£2,750	£3,250
Vehicle licence (each)	£180	£700
Vehicle insurance (each)	£50	£100

The forecast cost of fuel is £0.80 per gallon.

In addition to their basic wages, the drivers are expected to be given bonuses and overtime pay amounting to 5 per cent of the basic pay in the case of 5-ton vans and 40 per cent of basic pay in the case of the 20-ton lorries. This includes commission for obtaining return loads. Pension contributions by the company and other fringe benefits are to be calculated as 11 per cent on basic pay, and in the case of lorry drivers a further 10 per cent on basic pay should be provided for meals and accommodation on long journeys.

It is company policy to depreciate all vehicles on a straight-line basis over five years and to charge operating costs with notional interest at 7 per cent per annum on the capital cost of the vehicles employed.

Maintenance and repairs are carried out in the company's own workshop, which employs four mechanics at an average remuneration of £3,600 per annum. The forecast cost of maintenance materials and spare parts is £30,000. Two-thirds of the total cost of maintenance is attributed to the 20-ton lorries and one-third to the 5-ton vans.

Company administration costs, including premises charges, are budgeted at £70,000. The forecast revenue is £110,000 from the van operations and £180,000 from the lorry operations. **(20 marks)**

? Question 26

X plc manufactures product X using three different raw materials. The product details are as follows:

Selling price per unit	£250	
Material A	3 kg	material price £3.50 per kg
Material B	2 kg	material price £5.00 per kg
Material C	4 kg	material price £4.50 per kg
Direct labour	8 hours	labour rate £8.00 per hour

The company is considering its budgets for next year and has made the following estimates of sales demand for product X for July to October:

July	*August*	*September*	*October*
400 units	300 units	600 units	450 units

It is company policy to hold stocks of finished goods at the end of each month equal to 50 per cent of the following month's sales demand, and it is expected that the stock at the start of the budget period will meet this policy.

At the end of the production process the products are tested: it is usual for 10 per cent of those tested to be faulty. It is not possible to rectify these faulty units.

Raw material stocks are expected to be as follows on 1 July:

	Kg
Material A	1,000
Material B	400
Material C	600

Stocks are to be increased by 20 per cent in July, and then remain at their new level for the foreseeable future.

Labour is paid on an hourly rate based on attendance. In addition to the unit direct labour hours shown above, 20 per cent of attendance time is spent on tasks that support production activity.

Requirements

(a) Prepare the following budgets for the quarter from July to September inclusive:
  (i) sales budget in quantity and value;
  (ii) production budget in units;
  (iii) raw material usage budget in kg;
  (iv) raw material purchases budget in kg and value;
  (v) labour requirements budget in hours and value.

(b) Explain the term 'principal budget factor' and why its identification is an important part of the budget preparation process.

(c) Explain clearly, using data from part (a) above, how you would construct a spreadsheet to produce the labour requirements budget for August. Include a specimen cell layout diagram containing formulae that would illustrate the basis for the spreadsheet.

Question 27

Product X is produced from two materials, C and D. Data in respect of these materials is as follows:

	C	*D*
	Kg	*Kg*
Standard usage, per unit	5	10
Consumption per week:		
Minimum	1,000	2,000
Average	1,200	2,400
Maximum	1,500	3,000
Reorder quantity	5,000	10,000
Forecast stock, 1 December	6,000	8,000
Orders placed with suppliers, delivery expected in December	2,000	4,000
Lead time for delivery:	*Weeks*	*Weeks*
Minimum	4	2
Maximum	6	4
Standard price, per kg	£0.60	£0.20

During January there is to be an intensive sales campaign, and to meet the expected demand the production director requires the stocks of materials and product X to be at maximum level at 31 December.

Data in respect of product X are as follows:

	Units
Maximum stock level	1,000
Forecast stock, 1 December	420
Budgeted orders from customers for December	1,400
Work in progress planned to reach at	
1 December, degree of completion:	
Materials 40%, labour and overhead 20%	100
31 December, degree of completion:	
Materials 60%, labour and overhead 40%	200

Requirements

(a) From the data given above, prepare for the month of December:
  (i) the production budget;
  (ii) the purchasing budget.

(b) The reorder quantities for materials given above are estimated. In respect of material C, calculate the optimal reorder quantity based on data given above and that:
  a 50-week year is in operation;
  the cost of placing each order is £5;
  the cost of storage is 25 per cent per annum of the value of the stock held.

(Author note: 'Re-order quantities' is a Foundation topic that may possibly be encountered in Performance Evaluation questions.)

? Question 28

The following data relates to product Aye:

Budgeted data

	1 October to 31 December 20X5			1 January to 31 March 20X6		
Sales division	*1*	*2*	*3*	*1*	*2*	*3*
Sales of Aye, £	54,000	342,000	228,000	60,000	360,000	240,000
Stocks of Aye						
Opening units	90	320	260	100	350	250
Maximum units	150	500	350	150	500	350

Sales and production occur evenly each month during each budget quarter.
Debtors pay for sales in the month following that in which sales occur.
Creditors are paid for materials in the second month following that in which purchases occur.
On average, overhead incurred is paid for within the month following that in which it was incurred.
Wages are paid in the same month as earned.
Cash balance on 31 December 20X5, £(18,000).
Corporation tax of £50,000 is payable in January 20X6.
Special advertising campaign expenditure of £60,000 is due in March 20X6.
Standard cost data:

Direct materials	
DM1	10 kg @ £3 per kg
DM2	5 kg @ £2 per kg
Direct wages	
DW1	5 hours @ £4 per hour
DW2	2 hours @ £5 per hour

Production overhead is absorbed as a labour rate, i.e. £12 in respect of DW1 and £10 in respect of DW2.
Administration and selling overhead is recovered at 20 per cent of production cost. Profit is calculated at 10 per cent of selling price.
Direct materials data:

	Materials	
	DM1	*DM2*
	Kg	*Kg*
Maximum consumption per week	3,600	1800
Minimum consumption per week	2,400	1,200
Reorder quantity	20,000	12,000
Stock at 30 September 20X5	24,500	13,650
Stock at 31 December 20X5	23,000	14,400
Lead time from suppliers	*Weeks*	*Weeks*
Maximum	6	5
Minimum	4	3

A major sales campaign is planned in the budget period beginning 1 April 20X6. In anticipation of an increase in sales, an advertising campaign will commence in the previous quarter. The production director has requested that stocks of raw materials be increased to maximum level by 1 April 20X6, and the sales director has requested that stocks of finished goods be increased to maximum level by 1 April 20X6.

Requirements

Prepare the following budgets for the three months ending 31 March 20X6:

(a) production;
(b) purchases;
(c) production cost;
(d) cash (for each of the three months).

Question 29

The following budgeted sales values have been extracted from the budget of AZ Ltd for the year ending 31 December 20X7:

	£
April	400,000
May	450,000
June	520,000
July	420,000
August	480,000

The contribution/sales ratio is 40 per cent. Fixed costs are budgeted to be £1,200,000 for the year arising at a constant rate per month and including depreciation of £300,000 per annum.

Forty per cent of each month's sales are produced in the month prior to sale, and 60 per cent are produced in the month of sale. Fifty per cent of the direct materials required for production are purchased in the month prior to their being used in production.

Thirty per cent of the variable costs are labour costs, which are paid in the month they are incurred.

Sixty per cent of the variable costs are direct material costs. Suppliers of direct materials are paid in the month after purchase.

The remaining variable costs are variable overhead costs. Forty per cent of the variable overhead costs are paid in the month they are incurred, the balance being paid in the month after they are incurred.

Fixed costs are paid in the month they are incurred.

Capital expenditure expected in June is £190,000.

Sales receipts for the three months of May, June and July are budgeted as follows:

May: £401,700 June: £450,280 July: £425,880

The bank balance on 1 May 20X7 is expected to be £40,000.

Requirement

Prepare a cash budget for AZ Ltd.

Your budget should be in columnar format, showing separately the receipts, payments and balances for each of the months of May, June and July 20X7.

Question 30

You have been appointed as the management accountant of the DL Hospital Trust, a newly formed organisation with specific responsibility for providing hospital services to its local community. The hospital trust is divided into a number of specialist units: one of these, unit H, specialises in the provision of a particular surgical operation.

Although the trust does not have profit maximisation as its objective, it is concerned to control its costs and to provide a value-for-money service. To achieve this, it engages teams of specialist staff on a subcontract basis and pays them an hourly rate based upon the direct hours attributable to the surgical operation being carried out.

Surgical team fees (i.e. labour costs) are collected and attributed to each surgical operation, whereas overhead costs are collected and attributed to surgical operations using absorption rates. These absorption rates are based on the surgical team fees. For the year ended 31 December 20X3, these rates were:

Variable overhead	62.5% of surgical team fees
Fixed overhead	87.5% of surgical team fees

Each surgical operation is expected to take ten hours to complete, and the total fees of the team for each operation are expected to be £2,000.

The budget for the year ended 31 December 20X3 indicated that a total of twenty such surgical operations were expected to be performed each month, and that the overhead costs were expected to accrue evenly throughout the year.

During November 20X2 there were 22 operations of this type completed. These took a total of 235 hours and the total surgical team fees amounted to £44,400.

Overhead costs incurred in unit H in November 20X3 amounted to:

Variable overhead	£28,650
Fixed overhead	£36,950

Requirements

(a) Prepare a statement that reconciles the original budget cost and the actual cost for this type of operation within unit H for the month of November 20X3, showing the analysis of variances in as much detail as possible from the information given.

(15 marks)

(b) The DL Hospital Trust has been preparing its budgets for 20X4, and the finance director has questioned the appropriateness of using surgical team fees as the basis of attributing overhead costs to operations.

You are required to write a brief report to her explaining the arguments for and against the use of this method. **(5 marks)**

(Total marks = 20)

? Question 31

The newly appointed group finance director of a medium-sized quoted company has expressed considerable dissatisfaction with the budget prepared before his appointment. He considered that the comparisons of the budget with the results of the first quarter of the current financial year, which he had recently reviewed, were far from helpful in understanding changes in the business environment. He proposes significant changes in the process of budget preparation for next year.

In the past, budgets have been prepared after the third quarter's results were known and the fourth-quarter forecast prepared. This timetable left finance staff very little time to prepare the budgets before the end of the financial year and the start of the new year.

The group finance director proposes that the preparation of the budget for the next financial year should be commenced after the half-year results for the current financial year have been completed.

The group finance director wishes to implement the change in the current year, preparing the budget for the next financial year, but there are three problems:

Division A has no managing director. He resigned after very poor results for the first quarter followed disappointing results for the last financial year. A search is being made for a new managing director, almost certainly an external appointment, but this could take several months.

In the meantime, the divisional financial director is acting as managing director as well as carrying out his own duties.

Division B has launched in the first quarter of this year a new product range aiming at a new group of customers. This is effectively a new marketing strategy.

Division C is installing new plant that will not be fully operational until the third quarter. There are some doubts whether the plant will produce, without modification, products of acceptable quality, as customer requirements have changed since the plant was ordered.

Requirements

Prepare a report, on behalf of the group finance director, to the board, explaining the reasons for the proposed changes in budget preparation and planning for next year.

Discuss the three specific problems and any other anticipated difficulties, and advise how they could be dealt with in the new proposed system. **(20 marks)**

? Question 32

EF is a division of a large group, and is in the food processing industry. It employs about 1,000 people in a number of plants in isolated rural areas, processing and packing food sold mainly through supermarkets. There has recently been a considerable body of new regulation, following a series of incidents, some of which were extensively publicised. These have raised significant concern regarding public health.

There have also been sudden major changes in demand, to the extent that it now appears unlikely that demand would exceed 50 per cent of budget. Indeed, it seems that future demand may never again reach these levels. Hence it is clear that major cuts are needed in capacity. The budget for the financial year that started one month ago was prepared on the assumption that demand would be similar to previous demand.

Requirements

(a) Explain your role, as divisional management accountant of EF, in helping management within EF to produce and justify to head office a preferred solution to the problem of overcapacity. Recommend how activity should be reported against the original budget and any revised forecast during the remainder of the financial year. **(14 marks)**

(b) Explain how a senior management accountant at head office would review the proposed solution to the overcapacity problem, and determine the solution's adequacy and effectiveness. **(6 marks)**

(Total marks = 20)

Question 33

The budget for the Production Planning and Development Department of ABC plc is currently prepared as part of a traditional budgetary planning and control system. The analysis of costs by expense type for the period ended 30 November 20X1 where this system is in use is as follows:

Expense type	*Budget* %	*Actual* %
Salaries	60	63
Supplies	6	5
Travel cost	12	12
Technology cost	10	7
Occupancy cost	12	13

The total budget and actual costs for the department for the period ended 30 November 20X1 are £1,000,000 and £1,060,000 respectively.

The company now feels that an activity-based budgeting approach should be used. A number of activities have been identified for the Production Planning and Development Department. An investigation has indicated that total budget and actual costs should be attributed to the activities on the following basis:

Activities	*Budget* %	*Actual* %
1. Routeing/scheduling – new products	20	16
2. Routeing/scheduling – existing products	40	34
3. Remedial rerouteing/scheduling	5	12
4. Special studies – specific orders	10	8
5. Training	10	15
6. Management and administration	15	15

Requirements

(a) Prepare *two* budget control statements for the Production Planning and Development Department for the period ended 30 November 20X1 that compare budget with actual cost and show variances using:
  a traditional expense-based analysis;
  an activity-based analysis.

(b) Identify and comment on *four* advantages claimed for the use of activity-based budgeting over traditional budgeting, using the Production Planning and Development example to illustrate your answer.

(c) Comment on the use of the information provided in the activity-based statement that you prepared in (a) in activity-based performance measurement and suggest additional information that would assist in such performance measurement.

Question 34

A manufacturing company has a materials handling department that provides a service to production departments and to other service departments. The materials handling department has 40 forklift trucks and charges users of the service at a rate per forklift truck hour that is compiled using the following budget information:

Each forklift truck attracts drivers' salaries of £26,000 per annum plus a bonus of 5p per cubic metre handled (all paid four-weekly – based on thirteen four-week periods per year).
The forklift trucks are powered by electric batteries. The charge to the materials handling department for keeping the batteries at full power is made at a cost equivalent to £1.50 per forklift truck running hour.
Forklift trucks cost £26,000 each and are depreciated over five years on a straight-line basis with nil residual value.
Maintenance per forklift truck is implemented by the company maintenance department at an average cost of £120 per truck per four-week period. This is considered to be a fixed cost.
Each forklift truck is expected to be used for 80 per cent of company operating time. The budget for company operating time is 115 hours per week.
The average quantity handled per forklift truck running hour is 10 cubic metres.
Forklift truck time is charged to users at a rate per running hour based on the above information.

The actual data relating to the four-week period ended 28 November 20X1 is as follows:

Forklift truck drivers' salaries: £81,600, bonus £7,400.
Total power cost £21,800. This is based on the actual time required to keep the batteries at full power where the time is charged at £1.50 per hour.
Total forklift truck maintenance cost: £6,000.
Depreciation charge is as per budget.
The company operated for 120 hours per week with each forklift truck operating on average for 80 per cent of the time. All forklift truck running time was charged to users.

Requirements

(a) Prepare a cost statement for the materials handling department for the four-week period ended 28 November 20X1 that compares flexed budget with actual costs and shows:
  (i) variances for each expense type;
  (ii) the total cost charged out to user departments;
  (iii) the over-/underabsorption of cost for the period.

(b) Comment on advantages that may be claimed for the use of a charge rate to user departments for the materials handling service that uses budgeted rather than actual costs.

? Question 35

Ryman Inc produces three chemical products – X, Y and Z. Raw materials are processed in a single plant to produce two intermediate products – 1 and 2, in fixed proportions. There is no outside market for these intermediate products. 1 is processed further in process A to give X, product 2 is converted into Y by a separate finishing process B. Process B produces both Y and a waste material 'beta' which has no market value. However, beta can be passed through process C in order to convert it into a saleable product Z. Unlimited quantities of Z can be sold at a going market price of £1.50 per kg.

At normal levels of production and sales, 600,000 kg of the common raw material are processed each period, giving an output of 440,000 kg of 1 and 110,000 kg of 2 respectively.

After the separate finishing processes described above, the products X, Y and Z emerge as follows:

Product	*Quantity kg (£)*	*Selling price*
X	400,000	2.425
Y	100,000	4.500
Z	10,000	1.500

At these normal volumes, material and processing costs are as follows:

£'000	*Plant*	*A*	*B*	*C*
Materials	320	110	15	1
Labour	150	225	90	5.5
Variable overhead	30	50	25	0.5
Fixed overhead	50	25	5	3
Total	550	410	135	10

Requirements

(a) Draw a diagram to illustrate the flow of materials and products through the various processes. Label the diagram with appropriate titles and quantities to show the normal operation specified in the figures given.

(b) Calculate the cost per unit of products X and Y and the total manufacturing profit for the period attributed to individual products – on both of the following alternative methods of allocating joint costs (i) physical units and (ii) net realisable value. (Note: or 'notional sales value at point of separation.')

(c) Advise Ryman Inc management on a request from a potential customer to buy 10,000 kg of Y for £40,000. Support this advice with a financial analysis and a statement of the critical assumptions contained in this analysis.

? Question 36

PSA Ltd pays its operatives an hourly rate which at the start of 20X2 was forecast to be £10.50 throughout the year. Both hardwood and softwood are used on jobs, the 20X2 costs of which were forecast to be £55 per cubic metre (hardwood) and £9 per cubic metre (softwood). Overheads (absorbed on a labour hour overhead absorption rate [OAR]) for 20X2 were forecast to be £96,000 (fixed) and £72,000 (variable). It was forecast that 24,000 labour hours would be worked on all jobs at an even rate in 20X2. PSA Ltd uses a conventional cost accounting system and reports cost variances at the end of each month, with labour and material variances split into operational and planning components.

At the start of April 20X2 there was no work-in-progress and, during the month, work started on jobs 98, 107 and 109. Jobs 98 and 107 were fully complete by the end of the month. Job 109 was estimated to be 60 per cent complete as regards labour and 80 per cent complete as regards materials. The evaluator had calculated the following requirements for the jobs, based on the original standards specified above:

	Job 98	*Job 107*	*Job 109*
Standard labour hours	1,000	600	780
Hardwood (cubic metres)	200	180	120
Softwood (cubic metres)	320	400	300

During April, 2,200 labour hours were worked (wages paid were £24,500), 520 cubic metres of hardwood were used (cost £28,600) and 1,100 cubic metres of softwood were used (cost £9,200). Conditions in the labour market meant that operatives had to be engaged who were less able than those planned for. On average, operatives were able to work only at 4 per cent below the original standard level of efficiency (i.e. expected output per hour is 4 per cent less than standard). Hardwood available during 20X2 is 5 per cent below forecast quality (that is, the output per cubic metre is 5 per cent below standard). During March, the standard price of softwood for 20X2 was revised to £8 per cubic metre. April overheads were £7,800 (fixed) and £6,900 (variable).

Rapier Management Consultants have reported as follows:

Your cost system looks like something from an accounting textbook written forty years ago. What you need is backflush costing. Rapier will be delighted to design you a backflush costing system for a modest fee.

Requirements

(a) Explain why conventional cost accounting systems use predetermined OARs.
(b) Construct PSA Ltd's April cost control report.
(c) Explain what backflush costing is and (as far as you can on the basis of available information) comment on the suitability of PSA Ltd's operation for backflush costing.

? Question 37

Apollo plc manufactures and sells several products, two of which are Alpha and Beta. Estimated data for the two products for the forthcoming period is as follows:

(i)

Product data	*Alpha*	*Beta*	*Other products*
Production/sales units	5,000	10,000	40,000
	£000	*£000*	*£000*
Total direct material cost	80	300	2,020
Total direct labour cost	40	100	660

(ii) Variable overhead cost is £1,500,000 of which 40 per cent is related to the acquisition, storage and use of direct materials and the remainder is related to the control and use of direct labour.
(iii) It is current practice for Apollo plc to absorb the two types of variable overhead cost to products using an overall company-wide percentage based on either direct material cost and direct labour cost as appropriate.
(iv) Apollo are considering the use of activity-based costing. The cost drivers for material and labour related overheads have been identified as follows:

	Alpha	*Beta*	*Other products*
Direct material related overheads – cost driver is weight of material			
Weight of material/unit	4	1	1.5
Direct labour related overheads – cost driver is number of labour operations			
Labour operations/unit	6	1	2

(v) Market investigation indicates that market prices for Alpha and Beta of £75 and £95 per unit respectively will achieve the estimated sales shown in (i) above.

(vi) Apollo plc require a minimum estimated contribution: sales ratio of 40 per cent before proceeding with the production or sale of any product.

Requirements

(a) Prepare estimated unit product costs for Alpha and Beta where the variable overhead is charged to product units as follows:
  (i) using the existing absorption rates as detailed above,
  (ii) using an activity-based costing approach. **(5 marks)**

(b) Using the information in (a) prepare an analysis that will help Apollo determine whether both A and B should remain in production.
  Your answer should include relevant calculations and discussion and be prepared in a form suitable for presentation to management. **(10 marks)**

(c) Explain how Apollo could make use of target costing in conjunction with activity-based costing with respect to Alpha and Beta. **(5 marks)**

(Total marks = 20)

Question 38

Having attended a CIMA course on activity-based costing (ABC) you decide to experiment by applying the principles to the four products currently made and sold by your company. Details of the four products and relevant information are given below for one period:

Product	*A*	*B*	*C*	*D*
Output in units	120	100	80	120
Costs per unit	£	£	£	£
Direct material	40	50	30	60
Direct labour	28	21	14	21
Machine hours (per unit)	4	3	2	3

The four products are similar and are usually produced in production runs of 20 units and sold in batches of 10 units.

The production overhead is currently absorbed by using a machine hour rate, and the total of the production overhead has been analysed as follows:

	£
Machine department costs (rent, business rates, depreciation and supervision)	10,430
Set-up costs	5,250
Stores receiving	3,600
Inspection/quality control	2,100
Material handling and dispatch	4,620

You have ascertained that the 'cost drivers' to be used are as listed below for the overhead costs shown:

Cost	*Cost driver*
Set-up costs	Number of production runs
Stores receiving	Requisitions raised
Inspection/quality control	Number of production runs
Materials handling and dispatch	Orders executed

The number of requisitions raised on the stores was 20 for each product and the number of orders executed was 42, each order being for a batch of 10 of a product.

Requirements

(a) Calculate the total costs for each product if all overhead costs are absorbed on a machine hour basis.
(b) Calculate the total cost of each product, using activity-based costing.
(c) Calculate and list the unit product costs from your figures in (a) and (b) above, to show the differences and comment briefly on any conclusions which may be drawn which could have pricing and profit implications.

? Question 39

KDS Ltd is an engineering company which is organised for management purposes in the form of several autonomous divisions. The performance of each division is currently measured by calculation of its return on capital employed (ROCE). KDS Ltd's existing accounting policy is to calculate ROCE by dividing the net assets of each division at the end of the year into the operating profit generated by the division during the year. Cash is excluded from net assets since all divisions share a bank account controlled by KDS Ltd's head office.

Depreciation is on a straight-line basis. The divisional management teams are paid a performance-related bonus conditional upon achievement of a 15 per cent ROCE target. On 20 December 20X1 the divisional managers were provided with performance forecasts for 20X1 which included the following:

Forecast	*Net assets at 31 December 20X1*	*20X1 operating profit*	*ROCE*
	£	£	
Division K	4,400,000	649,000	14.75%
Division D	480,000	120,000	25.00%

Subsequently, the manager of Division K invited members of her management team to offer advice. The responses she received included the following:

From the divisional administrator: 'We can achieve our 20X1 target by deferring payment of a £90,000 trade debt payable on 20 December until 1 January. I should add that we will thereby immediately incur a £2,000 late payment penalty.'

From the works manager: 'We should replace a number of our oldest machine tools (which have nil book value) at a cost of £320,000. The new equipment will have a life of eight years and generate cost savings of £76,000 per year. The new equipment can be on site and operational by 31 December 20X1.'

From the financial controller: 'The existing method of performance appraisal is unfair. We should ask head office to adopt residual income (RI) as the key performance indicator, using the company's average 12 per cent cost of money for a finance charge.'

Requirements

(a) Compare and appraise the proposals of the divisional administrator and the works manager, having regard to the achievement of the ROCE performance target in 20X1 and to any longer-term factors you think relevant.
(b) Explain the extent to which you agree or disagree with the financial controller's proposal.

? Question 40

Note: The following two questions (Questions 40 and 41) are scenario-based questions which were of the sort examinable in the previous syllabus. They have been included here as they are excellent revision questions on throughput accounting. The technical ability required in the current syllabus will be of a similar standard but will not be based on such a detailed scenario.

MN Ltd manufactures automated industrial trolleys, known as TRLs. Each TRL sells for £2,000 and the material cost per unit is £600. Labour and variable overhead are £5,500 and £8,000 per week respectively. Fixed production costs are £450,000 per annum and marketing and administrative costs are £265,000 per annum.

The trolleys are made on three different machines. Machine X makes the four frame panels required for each TRL. Its maximum output is 180 frame panels per week. Machine X is old and unreliable and it breaks down from time to time – it is estimated that, on average, between 15 and 20 hours of production are lost per month. Machine Y can manufacture parts for 52 TRLs per week and machine Z, which is old but reasonably reliable, can process and assemble 30 TRLs per week.

The company has recently introduced a just-in-time (JIT) system and it is company policy to hold little work-in-progress and no finished goods stock from week to week. The company operates a 40-hour week, 48 weeks a year (12 months × 4 weeks) but cannot meet demand. The demand for the next year is predicted to be as follows – this is expected to be typical of the demand for the next four years:

	Units per week		*Units per week*
January	30	July	48
February	30	August	45
March	33	September	42
April	36	October	40
May	39	November	33
June	44	December	30

The production manager has suggested that the company replaces machine Z with either machine F or machine G. Machine F can process 36 TRLs per week and costs £330,000. It is expected that labour costs would increase by £2,500 per week if machine F were installed. Machine G can process 45 TRLs per week and costs £550,000. It is estimated that the variable overhead cost per week will increase by £4,500 if TRLs are made on machine G. The maintenance manager is keen to spend £100,000 on a major overhaul of machine X – he says this will make it 100 per cent reliable.

The management of MN Ltd is wondering whether it should now install a full standard costing and variance analysis system. At present, standard costs are calculated only as part of the annual budgeting process. Management is concerned about implementing so many changes in a short space of time, but feels the system could be very useful.

The company's cost of capital is 10 per cent per annum. It evaluates projects over four years and depreciates its assets over five years.

Requirements

Using the case of MN Ltd in the scenario:

(a) Calculate the throughput accounting ratio (defined below) for the key resource for an average hour next year.

$$\text{Throughput accounting ratio} = \frac{\text{Return per factory hour}}{\text{Cost per factory hour}}$$

where

$$\text{Return per factory hour} = \frac{\text{Sales price} - \text{material cost}}{\text{Time on key resource}}$$

(b) Prepare calculations that will help the managers of MN Ltd assess which, if any, of the different machine alternatives should be undertaken. Which alternative appears to be the best from the standpoint of your calculations?
(c) To which, if any, of the estimated figures is your answer in (b) sensitive?

? Question 41

Requirements

Using the case of MN Ltd presented in the scenario where appropriate, and the throughput accounting ratio defined in 40(a), answer the following:

(a) Explain the concept of throughput accounting.
(b) To what uses do advocates of throughput accounting suggest that the ratio be put?
(c) Suggest two other ratios which may be used by a company operating throughput accounting, and explain the use to which they may be put.
(d) Explain how the concept of contribution in throughput accounting differs from that in marginal costing.
(e) If MN Ltd has decided to purchase machine G and spend £100,000 on a major overhaul of machine X, the management accountant and the production manager should collaborate to ensure a new focus for monitoring and reporting production activities. What is the new focus? Explain what should be monitored and reported.

? Question 42

CTD Ltd has two divisions – FD and TM. FD is an iron foundry division which produces mouldings that have a limited external market and are also transferred to TM division. TM division uses the mouldings to produce a piece of agricultural equipment called the 'TX' which is sold externally. Each TX requires one moulding. Both divisions produce only one type of product.

The performance of each Divisional Manager is evaluated individually on the basis of the residual income (RI) of his or her division. The company's average annual 12% cost of capital is used to calculate the finance charges. if their own target residual income is achieved, each Divisional Manager is awarded a bonus equal to 5% of his or her residual income. All bonuses are paid out of Head Office profits.

The following budgeted information is available for the forthcoming year:

	TM division *TX per unit* £	*FD division* *Moulding per unit* £
External selling price	500	80
Variable production cost	366*	40
Fixed production overheads	60	20
Gross profit	74	20
Variable selling and distribution cost	25	4**
Fixed administration overhead	25	4
Net profit	24	12
Normal capacity (units)	15,000	20,000
Maximum production capacity (units)	15,000	25,000
Sales to external customers (unit)	15,000	5,000
Capital employed	£1,500,000	£750,000
Target RI	£105,000	£85,000

*The variable production cost of TX includes the cost of an FD moulding.
** External sales only of the mouldings incur a variable selling and distribution cost of £4 per unit.

FD division currently transfers 15,000 mouldings to TM division at a transfer price equal to the total production cost plus 10%.
Fixed cost are absorbed on the basis of normal capacity.

Requirements

(a) Calculate the bonus each Divisional Manager would receive under the current transfer pricing policy and discuss any implications that the current performance evaluation system may have for each division and for the company as a whole. **(7 marks)**

(b) Both Divisional Managers want to achieve their respective residual income targets. Based on the budgeted figures, calculate
  (i) the *maximum* transfer price per unit that the Divisional Manager of TM division would pay
  (ii) the *minimum* transfer price per unit that the Divisional Manager of FD division would accept. **(6 marks)**

(c) Write a report to the management of CTD Ltd that explains, and recommends, the transfer prices which FD division should set in order to maximise group profits. Your report should also
  consider the implications of actual external customer demand exceeding 5,000 units; and
  explain how alternative transfer pricing systems could overcome any possible conflict that may arise as a result of you recommended transfer prices.
  Note: Your answer must be related to CTD Ltd. You will not earn marks by just describing various methods for setting transfer prices. **(12 marks)**

(Total marks = 25)

Question 43

X Ltd has recently automated its manufacturing plant and has also adopted a Total Quality Management (TQM) philosophy and a Just in Time (JIT) manufacturing system. The company currently uses a standard absorption costing system for the electronic diaries which it manufacturers.

The following information for the last quarter has been extracted from the company records:

	Budget	*Actual*
Fixed production overheads	\$100,000	\$102,300
Labour hours	10,000	11,000
Output (electronic diaries)	100,000	105,000

Fixed production overheads are absorbed on the basis of direct labour hours.
The following fixed production overhead variances have been reported:

	\$	
Expenditure variance	2,300	(A)
Capacity variance	10,000	(F)
Efficiency variance	5,000	(A)
Total	2,700	(F)

If the fixed production overheads had been further analysed and classified under an Activity Based Costing (ABC) system, the above information would then have been presented as follows:

	Budget	*Actual*
Costs		
Material handling	\$30,000	\$30,800
Set up	\$70,000	\$71,500
Output (electronic diaries)	100,000	105,000
Activity		
Material handling (order executed)	5,000	5,500
Set up (production runs)	2,800	2,600

The following variances would have been reported:

		\$	
Overhead expenditure variance	Material handling	2,200	(F)
	Set ups	6,500	(A)
Overhead efficiency variance	Material handling	1,500	(A)
	Set ups	8,500	(F)
Total		2,700	(F)

Requirements

(a) Explain why and how X Ltd may have to adapt its standard costing system now that it has adopted TQM and JIT in its recently automated manufacturing plant. **(9 marks)**

(b) Explain the meaning of the fixed overhead variances calculated under the standard absorption costing system and discuss their usefulness to the management of X Ltd for decision-making. **(6 marks)**

(c) For the variances calculated under the ABC classification:
  (i) explain how they have been calculated;
  (ii) discuss their usefulness to the management of X Ltd for decision-making.

(10 marks)

(Total marks = 25)

This Page Intentionally Left Blank

Solutions to Revision Questions

Section A – Multi-choice solutions

✓ Solution 1

1.1 Answer: (B)

$$\text{Absorption rate per unit} = \frac{£100{,}000}{20{,}000} = £5 \text{ per unit}$$
$$\text{Difference in volume} = 500 \text{ units}$$
$$\text{Volume variance} = 500 \times £5 = £2{,}500 \text{ adverse}$$

1.2 Answer: (B)

Standard contribution per unit = £10.00 − £5.60 = £4.40

	Units
Budget sales volume	5,000
Actual sales volume	4,500
	500

500 units × £4.40 = £2,200 adverse

1.3 Answer: (D)

	£	
Price variance		
8,200 kg should cost @ £0.80/kg	6,560	
Actual cost	6,888	
	328	Adv
	Kg	
Usage variance		
870 units should use 8 kg each	6,960	
Actual usage	7,150	
	190	
190 kg @ £0.80/kg	£152	Adv

1.4 Answer: (D)

Amount to receive in September is:

	£
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

1.5 Answer: (B)

Increase in cost	£1,800
Increase in production	1,000 units
Variable costs: £1,800/1,000	£1.80/unit
	£
Variable cost of 2,000 units	3,600
Total cost of 2,000 units	11,100
Fixed cost	7,500
Variable cost of 4,000 units	7,200
Fixed cost	7,500
	14,700

1.6 Answer: (B)

	£	
Budgeted cost: £120,000/12	10,000	
Actual cost	9,800	
	200	Fav

1.7 Answer: (D)

	£	*Fixed* £	*Variable* *£/unit*
Direct material – the cost per unit is constant so this is a variable cost			4.00
Direct labour – the cost per unit is constant so this is a variable cost			3.50
Production overhead:			
Department 1			
1,000 units, total cost	6,000		
2,000 units, total cost	8,400		
Using high/low method, 1,000 units	2,400		2.40
and, by substitution: (£6,000 − (1,000 × £2.40)		3,600	
Department 2			
Since total cost for 1,000 units is equal to that for 2,000 units, this is a fixed cost	4,000		
		7,600	9.90

1.8 Answer: (D)

	£	
Rate variance		
13,450 hours should cost @ £6/hour	80,700	
Actual cost	79,893	
	807	Fav
	Hours	
Efficiency variance		
3,350 products should use @ 4 hours each	13,400	
Actual time taken	13,450	
Which is an extra	50	
50 hours @ £6/hour	£300	Adv

1.9 Answer: (C)

1.10 Answer: (B)

Solution 2

2.1 Answer: (D)

£6 adverse – standard mix is 70 kg A plus 30 kg B, from which it follows that the mixture variance is 2 kg A @ £5 (favourable) plus 2 kg B @ £8 (adverse).

2.2 Answer: (D)

£1.50, since the variable cost per unit (b) is (£3,100 − £2,800) ÷ (1,700 units − 1,500 units).

2.3 Answer: (A)

£875, since cash flow is £1,000 *less* £50 debtors increase *less* £20 creditors increase *less* £100 stock rise *plus* £45 depreciation.

2.4 Answer: (D)

An increase in quality standards is one of the key factors that allows the other items listed to be reduced.

2.5 Answer: (B)

2.6 Answer: (C)

Answer (A) is the cost of modification.
Answer (B) is the scrap value of the material and is relevant if there is no higher relevant cost.
Answer (D) is the historical cost of material V and is therefore irrelevant.
The correct answer is (C):

	£
Cost of alternative material avoided by using V (2 kg × £4.50)	9.00
Modification cost of V (3 kg × £1)	3.00
NET SAVING (per unit of QX)	6.00
Saving per kg of V (£6.00 ÷ 3)	2.00

2.7 Answer: (A)

Equivalent units table:

		Materials		Conversion cost	
	Total	*%*	*EU*	*%*	*EU*
Output:					
Opening WIP	600	20	120	40	240
Started and finished	13,900	100	13,900	100	13,900
Closing WIP	800	70	560	40	320
			14,580		14,460

2.8 Answer: (D)

$$\frac{\text{Selling price} - \text{material cost}}{\text{Time on bottleneck resource}} = \frac{£24.99 - £8.87}{6.5} \times 60$$
$$= £148.80$$

2.9

	J	*K*	*L*	*M*
	£	£	£	£
Selling Price	2,000	1,500	1,500	1,750
Direct materials	410	200	300	400
Throughput	1,590	1,300	1,200	1,350
Machine X (minutes)	120	100	70	110
Throughput per machine (minutes)	$\frac{£1,590}{120}$	$\frac{£1,300}{100}$	$\frac{£1,200}{70}$	$\frac{£1,350}{110}$
	£13.25	£13.00	£17.14	£12.27
Ranking	2nd	3rd	1st	4th

Therefore the answer is (D)

✓ Solution 3

3.1 Answer: (A)

$A = ((10 \times 33) + 420) \times 0.7 = 525$

3.2 Answer: (B)

$$\begin{aligned} B &= (48{,}000 \times 20\%) + (55{,}000 \times 50\% \times 80\%) \\ &\quad + (60{,}000 \times 25\% \times 80\%) + (45{,}000 \times 20\% \times 80\%) \\ &= £50{,}800 \end{aligned}$$

3.3 Answer: (D)

3.4 Answer: (D)

Variable cost per unit:	$V = ((8{,}000 \times 2.60) - (5{,}000 \times 2.78))/(8{,}000 - 5{,}000)$
	$= £2.30$
Fixed cost	$F = (8{,}000 \times 2.60) - 8{,}000V$
	$= £2{,}400$
For 6,250 units:	$6{,}250V + F$
	$= (6{,}250 \times 2.30) + 2{,}400$
	$= £16{,}775$

3.5 Answer: (A)

3.6 Answer: (A)

3.7 Answer: (A)

✓ Solution 4

4.1 Answer: (A)

100% capacity gives £21,000 contribution – hence 1 per cent capacity gives £210 contribution and 66.66% capacity (that is £14,000/£210) is needed to achieve breakeven.

4.2 Answer: (C)

Algebraic manipulation of the constraints indicates that profit will be maximised where all labour/machine hours are fully utilised – at output 420P and 120Q. This gives a contribution of £1,110 (that is, £840 from P and £270 from Q).

4.3 Answer: (D)

4.4 Answer: (B)

4.5 Answer: (A)

£15k (opening balance) + £60k (profit) − £5k (stock increase) + £10k (debtors decrease) + £3k (creditors increase) + £5k (depreciation) − £40k (equipment purchase) = £48k.

4.6 Answer: (D)

4.7

Planning variance		£	
Ex-ante Standard	7 kg × £4.10 × 1,000	28,700	
Ex-post Standard	7 kg × £4.50 × 1,000	31,500	
Variance		2,800	(A)

Therefore the answer is (B)

4.8

Material usage variance		*kg*
Ex-post standard	7 kg × 1,000	7,000
Actual		7,700
Variance		700 × £4.50/kg = £3,150 (A)

Therefore the answer is (C)

4.9 Division A − loss in contribution = 2,500 × (£40 − £22) = £45,000 decrease
X plc will be paying (£35 − £22) = £13 per unit extra and therefore profits will reduce by £13 × 2,500 = £32,500.

Therefore the answer is (D)

Solution 5

5.1

	£
521 television @ standard selling price of £300	156,300
Actual revenue (521 @ £287)	149,527
	6,773

Therefore the answer is (A)

5.2

	£	
Budgeted sales units	500	
Actual sales units	521	
	21	
21 units × standard contribution		
21 units × £300 × 30% =	£1,890	(F)

Therefore the answer is (A)

5.3

Cost driver rate	
Budgeted cost	
Budgeted number of orders	$\frac{£94,690}{2,785}$ = £34 each order
Actual costs incurred	£7,318
Costs recovered:	
202 orders × £34	£6,868
Under recovery	450

Therefore the answer is (D)

5.4

Product	*M1* *£/unit*	*M2* *£/unit*	*M3* *£/unit*	*M4* *£/unit*
Conversion costs:				
Total	39	52	57	43
Fixed	(16)	(16)	(15)	(18)
Variable	23	36	42	25
Materials	16	22	34	20
Total variable cost	39	58	76	45
Selling Price	70	92	113	83
Contribution	31	34	37	38
Materials each unit	£16.00	£22.00	£34.00	£20.00
Contribution each £1 of material	£1.94	£1.55	£1.09	£1.90
Ranking	1st	3rd	4th	2nd

Therefore the answer is (A)

Solution 6

6.1

Margin of safety = 19.575%
So breakeven units = 5,200 − (19.575% × 5,220) = 4,198 units
Fixed costs = Contribution at breakeven activity
4,198 × £42 × 40% = £70,526

Therefore the answer is (B)

6.2 Statements (ii) and (iii) are incorrect. The thrust of incremental budgeting is that current budgets can be produced by blanket additions to or subtractions from past budgets. That of participative budgeting is the production of budgets through negotiation and consensus – the direct opposite of a top-down approach. Therefore the right answer is (D) – only statement (i) is true.

6.3 Machine hours = (100,000 + (30 × 240)) × 1.08
= 115,776
Overhead cost = £10,000 + (0.25 × 115,776)
= £38,944

Therefore the answer is (C)

6.4

Budgeted number of batches:	
Product D (100,000/100)	= 1,000
Product R (100,000/50)	= 2,000
Product P (50,000/25)	= 2,000
	5,000
Budgeted machine set-ups:	
Product D (1,000 × 3)	= 3,000
Product R (2,000 × 4)	= 8,000
Product P (2,000 × 6)	= 12,000
	23,000

$$\text{Budgeted cost /set-up:} = \frac{£150{,}000}{23{,}000} = £6.52$$

$$\text{Budgeted cost/set-up of R:} = \frac{£6.52 \times 4}{50} = £0.52$$

Therefore the answer is (A)

6.5 Use high/low method to separate fixed and variable budgeted overhead cost:

	Hours	*£*
High	18,000	16,242
Low	10,000	13,468
Difference	8,000	2,774

$$\text{Variable cost/machine hour} = \frac{£2.774}{8{,}000} = £0.34675$$

By substitution fixed cost $= £13{,}468 - (10{,}000 \times £0.34675) = £10{,}000$

Budget cost allowance	*£*	
$= £10{,}000 + (13{,}780 \times £0.34675) =$	14,778	
Actual cost =	14,521	
	257	(F)

Therefore the answer is (B)

6.6 and 6.7

Total variable costs (year ended March 2002) $= 924{,}400 \times 70\% = £647{,}080$
Analysed by cause:

	Passengers	*Parcels*	
60%/40%	£388,248	£258,832	
Activity for year	1,024	24,250	kgs
£/passenger	£379.148		
£/kg		£10.674	
Cost adjusted to include 3% price increases	£390.52	£10.994	
Activity for 3 month period	209	7,200	kg
Budgeted cost	£81,619	£79,157	

Therefore the answer to 6.6 is (A)
Therefore the answer to 6.7 is (C)

Section A – Non-multi-choice questions

☑ Solution 7

(i) Actual production/sales volume

$$\frac{(£30{,}000 - £5{,}250)}{£3} = 8{,}250 \text{ units}$$

(ii) Actual hours worked

	Hours	
Standard hours for output achieved (8,250 × 4)	33,000	
Labour efficiency variance in hours	1,000	Adv
	34,000	

(iii) Actual quantity of materials purchased

	Litres	
Standard material content of output: (8,250 × 5 litres)	41,250	
Material usage variance: 400/0.2	2,000	Fav
Actual usage	39,250	
Less: stock reduction	800	
	38,450	

(iv) Actual variable overhead cost incurred

	£	
Standard variable overhead cost of output	49,500	
Cost variance	500	A
	50,000	

(v) Actual fixed overhead cost incurred

	£	
Budgeted fixed overhead (10,000 × £14)	140,000	
Expenditure variance	500	Fav
	139,500	

Solution 8

(a) **Workings**

From an inspection of the figures it is possible to determine the variable costs relating to a change in activity of 10 per cent of capacity for the production overhead and the selling and distribution overhead and then, by deduction, determine the fixed costs for each of these costs.

						Therefore
	5,400		*6,300*		*7,200*	*4,500*
	60%		*70%*		*80%*	*90%*
Units	£	£	£	£	£	£
Direct materials	37,800	+6,300	44,100	+6,300	50,400	31,500
Direct wages	16,200	+2,700	18,900	+2,700	21,600	13,500
Production overhead	37,600	+3,600	41,200	+3,600	44,800	34,000
Administration overhead	31,500		31,500		31,500	31,500
Selling and distribution	42,300	+1,800	44,100	+1,800	45,900	40,500
Total						151,000
20% profit on sales = 25% on cost						37,750
Sales						188,750

Budget for 50 per cent level of activity

	£	£
Sales		188,750
Direct materials	31,500	
Direct wages	13,500	
Variable production overhead	18,000	
Variable selling and distribution	9,000	
Total variable costs		72,000
Contribution		116,750
Less: fixed costs		
Production overhead	16,000	
Administration	31,500	
Selling and distribution	31,500	
		79,000
		37,750

(b) The following are representative of problems that may arise from working at the 50 per cent level of capacity:
1. Unutilised capacity will probably result in underabsorption of fixed production overhead unless, as in (a) above, it wa expected that 50 per cent level of working would arise, in which case the overhead absorption rate would be based on the expected level of working.
2. Direct and indirect labour, including administrative staff, may have to be made redundant: this would almost certainly be accompanied by trade union oppositon – possibly to obtain better severance payments.
3. Cash-flow problems may arise that would make it necessary to obtain bank support, on a temporary basis, while the recession lasts.

✓ Solution 9

(a) A *rolling budget* may be defined as a budget continuously updated at the end of each control period (e.g. quarter). At the end of each period a comparison is made between the actual results and the original budget. Where circumstances are felt to have changed on a permanent basis, the budget for the remaining quarters is revised to reflect the new conditions expected. A budget for an additional quarter is also prepared, hence reinstating an annual forecast from the present time period forwards. It may be argued that this approach assists planning, in that budgets are more realistic and achievable since they are continuously revised. It may also result in more realistic planning by management who recognised that rolling budgets will allow for contingency and innovation in the planning process. Rolling budgets should also provide a more relevant control base against which to monitor actual results on an ongoing basis. This should allow more meaningful feedback control information and provide more appropriate feed-forward control.

A *flexible budget* is one that recognises the distinction between fixed, variable and semi-variable costs. In this way it may be prepared to show the planned results at each of a number of activity levels. This may be a useful planning tool, for example in recognising and highlighting where step function costs will have a significant impact on the plan. Step function changes may result in a fall in the level of profit forecast that will not be compensated for until activity rises to a higher level.

A flexible budget is useful as a control aid. Where actual results are at an activity level that differs from the original budget, the budget may be adjusted or 'flexed' to show the allowed figures for the level of activity that actually occurred. This means that the planned *v.* actual comparison and the resulting variances provide more meaningful control information.

(b) *Budgetary slack* may result from the process whereby managers bargain for a share of available resources. The slack represents a reduction in efficiency due to the budget request for a resource being greater than necessary. This phenomenon may be linked to the performance measurement system in force. This may put pressure on managers to provide themselves with a 'safety valve' or 'cushion' to ensure that approved targets will be met.

Rolling budgets may reduce the incidence of budgetary slack. Managers may recognise that rolling budgets provide the facility for continuous updating of benchmarks. This may reduce the feeling of the need to build in slack to the original budget. On the other hand, it may encourage budgetary slack in that the continuous improvement impact of the rolling budget may be seen as an additional short-term threat.

Flexible budgets are prepared at the planning and control stage based on an agreed set of planning standards. The use of flexible budgets should not, therefore, in themselves cause budgetary slack to be built into the planning and control system. It may be argued that the incidence of budgetary slack would be unaffected whether a fixed or flexible budgeting system was in operation.

✓ Solution 10

Financial Statement

(a) Cost Structure

	10% VC	*FC*
Labour	4,000	0
Materials	3,000	
Prodn o/h	600	9,000
Admin o/h	200	5,000
Sales o/h	300	5,000
Total	8,100	19,000

(b) Operation at 50%

Revenues	49,500
50% VC	40,500
FC	19,000
Net Profit	−10,000

(c) Costs of 1 year closure

FC	11,000
Close Down	7,500
Maintenance	1,000
Re-opening	4,000
Total	23,500

(d) Operation at 75%

Revenues	90,000
75% VC	60,750
FC	19,000
Net Profit	10,250

Analysis of the cost structure of the operation (a) allows the financial implications of operating at 50% and 75% capacity to be forecast. At 50% capacity it makes a loss of £10,000 and at 75% capacity a profit of £10,250. Provided operations can be maintained at 75% capacity for an extended period then the factory should be kept open on a permanent basis.

A temporary shut-down would avoid a £10,000 operating loss but would also incur £23,500 of unavoidable costs. So, the temporary shut down option should not be adopted.

✓ Solution 11

(a) The current period production cost per unit is:

	£
Inputs	4.10
Labour	4.90
Overheads	5.90
Total	14.90

Using the FIFO convention this gives the following valuations:

	£
Completions	43,113
Closing WIP	3,057
Total	46,170

Note: Closing WIP is based wholly on current period production costs and hence Completions is Opening WIP plus current period costs minus Closing WIP.

(b) The average production cost for work in the period is:

	£
Inputs	4.09375
Labour	4.88410
Overheads	5.89068
Total	14.86853

Using the Average convention this gives the following valuations:

	£
Completions	43,119
Closing WIP	3,051
Total	46,170

Note: Completions is based on the Average production cost per unit for the period and hence Closing WIP is Opening WIP plus current period costs minus Completions.

✓ Solution 12

(a) This involves use of an OAR of £12 per hour, giving product costs as follows:

	£ *R*	*S*
Direct	12.00	18.00
Indirect	4.80	3.60
Total	16.80	21.60

(b) This involves the use of two cost pools and driver costs of £960 per set-up and £120 per dispatch. Applied to the two products this gives costs as follows:

	£ *R*	*S*
Set-ups	24,000	3,840
Dispatches	4,200	720
Total	28,200	4,560
Overhead Cost per unit	56.40	0.38
Direct cost	12.00	18.00
Total	68.40	18.38

Section B

✓ Solution 13

(a) Standard costing based on absorbed overheads is a tried and tested budgeting method. Similarly, variance analysis is a widely used control mechanism to investigate variations in costs from the standard previously set. However, the author of the article quoted appears to think that standard costing has to be rooted in arbitrary overhead apportionments.

In an advanced manufacturing technology (AMT) situation there will be:

constant and low levels of materials and products due to the implementation of just-in-time (JIT) principles;

constant and low direct labour costs due to the high level of automation and a multi-skilling and teamworking approach;

high capital investment costs, driving up overheads;

many production set-ups to provide a wide range of customer-specific products while keeping low product inventory – this will influence the production overhead costs;

more paperwork and progress expediting is required to ensure supply of materials and delivery of product – this also drives production overheads;

common components will be used where possible to cut down overhead costs due to product diversity and production set-ups.

These changes from the traditional labour-intensive approach to manufacturing may cause the standard costing/variance analysis methods to induce inconsistent behaviour. For example, absorption costing encourages stockbuilding of product, but this incurs non-value-adding storage costs. Variance analysis is mainly concerned with direct labour and direct material costs, which are a small part of the AMT production costs. In addition, these variances will be driven down by large production runs, which again is contrary to the JIT philosophy. However, standard costing may still be applied in AMT and flexible manufacturing processes, where standard contribution is likely to be the best way to evaluate output and, when expressed as a rate per standard hour, can be a vital element in financial control.

(b) The appropriateness of standard costing and variance analysis (SCVA) depends on both the environment in which it is used and the manner in which it is interpreted. SCVA is still appropriate in an environment where:

significant levels of inventory are kept because of seasonal or unpredictable demand;

direct labour is a variable and significant cost;

only moderate or low capital investment is required;

moderately long production runs take place.

Even in an AMT environment, SCVA may still be used with modification: for example, excluding set-up times from the production labour hours in order to calculate meaningful labour cost variances. If the variances are insignificant then they will not need to be investigated. Variance analysis of overheads is more important in an AMT environment, but the method needs to be refined to take account of the support activities that generate these costs.

Although the method may be adapted to the AMT situation it will also need to be augmented with physical parameters that can direct the workforce into immediate corrective action, as part of the quality assurance approach used in such an environment.

Thus SCVA may still be relevant in many instances and may be expanded and augmented in AMT situations. So long as the management accountant understands its proper role and its limitations it remains a valid method in many circumstances.

(c) Methods that might replace or augment SCVA to control costs and evaluate efficiency include the following:

Life cycle costing. This recognises the high capital costs in AMT products and emphasises designing products and production lines to reduce costs over the whole life of a product. This leads to simpler products and increased commonality of parts or subassemblies, which in turn reduces inventory, ordering and set-up costs.

Qualitative or non-financial indicators of performance, such as set-up times, tolerances, quality failures (defects), and stock levels, are available as a continuous (real-time) flow of information that allows a rapid response on the shop floor. Thus problems may be identified very quickly as may opportunities for improvement.

Activity-based costing/management is a development using SCVA principles to identify what actions drive overhead costs in an organisation. This is very relevant in an AMT environment with high capital investment. This understanding of how costs are incurred should allow management to set realistic targets/budgets and to strive for efficiency gains.

Standard marginal costing avoids the problems of arbitrary overhead absorption, but cannot tackle overhead expenditure.

Which method or combination of methods should be used depends upon the environment in which the organisation finds itself.

✓ Solution 14

(a) For the sake of convenience, it is common practice for all the variable elements in the budget to be flexed according to the same activity indicator. This technique assumes the same linear relationship between the activity indicator, and all the variable elements that are being flexed. This can result in inaccuracies in the flexed budget. In the case of raw materials, for example, this technique would assume that there were no economies of scale such as bulk discounts, etc. Furthermore, this technique ignores external factors, which can also have an effect on the actual costs.

In flexible budgeting, we also assume that fixed costs remain unchanged. This assumption too has to be questioned, since fixed costs usually rise in steps as output increases and are rarely constant in the longer term.

Because of the above inaccuracies, a flexible budget may not indicate the actual total costs.

(b) For reasons indicated in (a) above, since a flexed budget may not necessarily indicate the actual total costs, it would have limitations in its application as a control tool. For example, inaccurate figures in the flexed budget that result in significant variances could waste a lot of management time and expense in investigating what is in fact an incorrect figure. By the same token, variances that do not appear to be significant may, in fact, be significant and management would be misled into not investigating such variances.

✓ Solution 15

(a) The traditional management accounting performance measures are best suited to a stable environment, which is programmable. These measures include budgetary control and standard costing which relies upon the ability to be able to predict the future with some accuracy. Standards are frequently set based upon past performance, the assumption being that the past is a good predictor of the future.

With the increase in competition in world markets and the ever-increasing rate of change of technology the manufacturing environment has had to become more flexible in order to meet customer needs. Rather than being able to have long batch runs of the same product the emphasis is on small batches and constant product innovation and a requirement to improve and monitor quality.

Traditional management accounting techniques to monitor performance, such as standard costing, are unable to provide the information required because of the need to constantly revise standards. The move to more mechanised and computerised processes has also made the traditional labour variances obsolete because of the insignificant proportion of direct labour in total product cost. Taking the specific example of small batch manufacture, traditional standard costing spreads the set-up costs across the batch so that each item within the batch has a share. With small batch manufacture this cost becomes a much larger proportion of total cost. The traditional costing system also lays little emphasis on the cost of quality and hence the system is not able to provide the information required by management to control this important aspect of modern manufacture. It is therefore true to say that traditional management accounting performance measures are at best irrelevant and at worst misleading in the new manufacturing environment.

(b) There are a number of ways management accounting can adapt to the new environment. Traditional standard costing systems can be modified to allow for the flexibility required. If the industrial engineering schemes are mechanised so that standard times can be calculated for each batch these can be multiplied by the standard cost rate to give the standard cost against which actual costs can be measured. The standard cost rate would not have labour as a separate part, but would consider it as part of variable overhead.

An alternative is to move to a system of actual costing using statistical control charts to monitor costs. This is where a confidence interval is set about the mean and any deviations outside this are investigated.

In both standard and actual costing the move away from labour as the cost driver has meant that other bases of charging costs to products have had to be found. Although such methods have been used for many years, particularly in the metals industry, it has been recently formalised into activity-based costing.

Non-financial performance measures are also being developed to complement or replace the traditional measures. This is particularly true in the area of quality where control is essential for long-term survival.

✓ Solution 16

(a) The main changes in the global business environment, over the last 25 years, have been:

- the rapid development of information technology (IT) and its use in the production process;
- the movement from highly-unionised, single-skilled and passive workers to single-union, multi-skilled and empowered workers;
- increased competitiveness and customer expectations regarding price, quality, choice, and speed and reliability of delivery;
- world trade has opened up following the reduction of political and economic barriers to trade, coupled with the growth of world-wide manufacturing industries.

Businesses have used IT to automate their production systems. MRP was one of the earliest examples of this trend. In essence, MRP is a production management computer system used to plan and control raw material and component part inventories. 'State-of-the-art' production processes use FMS, which controls a cell of CNC machines within an automated production line. FMS not only automates the production process, but also the changeovers between different batches and the monitoring of quality.

Organisations have adopted to a greater or lesser extent the JIT philosophy, including:

quality assurance rather than quality control;
tight inventory control and simple production runs;
common components and fast set-up times.

These new working practices have required a complete change in company culture; managers had to devolve power to the shop floor and workers needed to feel empowered to plan their own work and solve their own problems as part of a campaign of continuous improvement.

The Far-Eastern manufacturers attacked markets using price, quality, reliability of delivery and technical innovation using technology as a competitive weapon. This has produced greater product diversity and shorter product life cycles. Manufacturers have responded to this challenge by efficiently producing smaller batches of production and by buying-in more components and sub-assemblies from suppliers. These approaches have allowed organisations to simultaneously drive costs down, improve quality, provide a flexible response to customers and increase the range of products offered. Such organisations have been termed 'world-class manufacturers': the drive to world-class manufacturing originated in Japan.

(b) MRP is a computer model of the materials flow in the production process that enables inventory levels to be minimised for a given method of production. JIT is a management philosophy that requires an MRP model, but encompasses the principle of continuous improvement of the production process. This is achieved by removing all non-value-adding activities, for example, material movements to and from stores. This has necessitated a close relationship with suppliers and long-term single-source contracts.

FMS is a powerful combination of computer management system and automated production process that facilitates rapid set-up times and continuous quality control. CIM is an ideal production system that is totally automated, running under computer control to optimise output, ensure reliability and availability of FMS cells and provide total quality assurance.

The differences in these practices are twofold. First, there is the degree to which each practice attempts to improve the production process; for example, MRP has been criticised for modeling existing deficiencies in the production process, whereas JIT strives for continuous improvement in all aspects of production. The second difference – the form of the practices: MRP is a computer simulation, JIT a philosophy and FMS and CIM are combinations of computer and mechanical production facilities.

All of these approaches have a common set of objectives, that is, to increase efficiency, effectiveness and economy of the production process. Thus, their relationships are complementary in nature. Some managers (such as the one quoted in the question) regard the ideas incorporated within these techniques as being mere common sense – and hence discussion of the techniques seems an exchange of irritating platitudes.

While it is possible to sympathise with this view, such sympathy in no way diminishes the significance of the techniques in modern manufacturing.

(c) The developments in management accounting that have taken place due to the introduction of these four practices as a result of the changes in the business environment include:

activity-based costing (ABC);
throughput accounting (TA);
backflush accounting (BA).

ABC attempts to define relevant cost drivers when direct costs, especially direct labour, are only a small part of the production cost. This is so in computerised and automated production facilities because of their high capital costs. Typical cost drivers are set-up time and the number of components used in a product. These should be minimised by using FMS and better product design. ABC is also required to allocate accurately common costs in modern multi-product factories.

TA focuses management attention on four areas: unit sales price, sales volume, materials purchase price and materials usage. This development treats all other costs as fixed. It is in line with the JIT approach of continuous improvement, but seeks to determine bottlenecks in the production line so as to concentrate on improvements in that area.

BA is an attempt to reduce the amount of accounting data handling and hence the time and expense consumed in traditional management accounting methods. This reduction is permissible only in production environments that have minimal stocks of materials, WIP and finished product, and have little variation in these stock levels. This method does not enable variance analysis to be carried out. Thus, operational control is achieved using real-time monitoring of physical measures such as set-up times, amount of rework, etc.

✓ Solution 17

Incremental budgeting uses the previous year's budget as its base. The assumption is made that the budget model will remain in force and that the next year's budget will be prepared by adjusting the existing budget to allow for changes in activity, price levels and efficiency. This procedure is unlikely to assist in an energy cost-reduction strategy since it will not examine in a critical way the activities that cause energy costs to occur.

(a) Zero-based budgeting requires that all expenditure is justified. A series of decision packages is created for each department or segment of the business. The packages must be ranked and must compete with each other for a share of available financial resources. In creating the series of decision packages, consideration must be given to the relevant costs of each package.

The organisation is committed to expenditure on some costs. An example in the question is the energy cost of maintaining a statutory minimum temperature or the operation of the specially humidified material store. Zero-based budgeting can, however, facilitate examination of ways of reducing the cost of providing such requirements.

Some costs will vary according to activity level. Power costs per unit of output will vary with production level. Power costs in the movement of raw materials and work in progress are driven by the degree of movement which is required. Zero-based budgeting will assist in focusing on such costs and on ways in which they may be reduced.

In some circumstances, management judgement may be applied in the level and direction of expenditure where resources are limited. The energy losses from steam pipelines and steam valves may be reduced through the insulation of the steam pipes to reduce heat loss and through increased maintenance of the valves to reduce steam losses. Such proposals will incur costs and a cost – benefit analysis must be carried out in order to determine the net cost saving (if any) from procedures to reduce energy costs.

(b) Total quality management is a business philosophy that has a number of features including:

- an environment of zero defects at minimum cost;
- awareness by all employees of ways of minimising the cost at which products of agreed design specification reach the customer;
- the elimination of waste of all types;
- embracing all aspects of the operation of the business;
- recognition of the need to minimize non-value-added activities.

In the context of energy costs, total quality management principles may be applied to the energy cost examples given in the question.

- Can the minimum temperature be maintained in a more cost-effective way?
- Would a just-in-time delivery system of materials be cheaper than operating the humidified store?
- Can power costs per unit of output be reduced by the elimination of the need for rework and minimising defective units?
- Movement of materials is a non-value-added activity. Can such movements be reduced, hence reducing energy costs of movement?
- Losses from steam pipelines and valves and heat losses from windows are waste that can be eliminated after considering the cost–benefit implications of actions to eliminate such losses.

✓ Solution 18

The essential behavioural issue to be addressed in the establishment of standard costs is 'legitimacy'. That term relates to the acceptance by all parties that the standard cost is a meaningful and realistic figure which relates to things which are under the responsibility/control of the manager to whom it is attributed. A meaningful standard cost is one which has been arrived at through a proper allocation, apportionment and absorption of costs (or ABC equivalent) and where costs not under the control of the manager are either excluded or identified as such. It should be associated with realistic levels of planned activity and attainable levels of efficiency. A meaningful standard acts as a positive motivator and a proper measure of performance.

✓ Solution 19

The feedback of information relates to the reporting of things that have happened in the past. For example, a financial control report may state what costs have been incurred over the past quarter – this is feedback. The feed-forward of information relates to the reporting of things which are expected or forecast to happen in the future. For example, a financial control report may state what costs are currently forecast to be 'from now to year end' – this is feed-forward.

✓ Solution 20

Budget flexing is the practice of referencing actual results achieved to a version of the budget that has been adjusted to allow for the levels of activity that have actually been attained rather than those that were envisaged at the time the budget was prepared. Thus, reported deviations from budget are more likely to relate to efficiency or performance factors than would otherwise be the case. An original budget may be quickly outdated by events if, for example, actual levels of activity depart significantly from those budgeted for. Hence, a flexed budget may be of considerable use for financial control purposes.

✓ Solution 21

The information reporting requirements of the four different types of business unit relate to the purpose that each serves within the organisation. A cost centre is typically a segment of the organisation where costs are incurred but to which it is not possible to attribute revenues. A workshop or assembly line may be a cost centre – and only costs incurred therein need be reported. A sales centre is a segment which is responsible for achieving sales but which does not itself incur significant costs. A regional sales office may be a sales centre – and only the sales achieved by that office need be reported regularly. Profit and investment centers tend to function more as small independent businesses and a full range of financial reporting may be required in these cases.

✓ Solution 22

RI is an absolute measure of performance whereas ROI is a relative measure. Key considerations in performance evaluation relate to absolute things. Take the case of Division A (capital 100 and profit 30) and Division B (capital 500 and profit 100). In terms of ROI A appears to perform better than B (30% vs 20%) – but does it? If 'cost of money' is 5% then A gives an RI of 25 and B an RI of 75. Many companies contain small areas of high yield business, but those areas may be so small that they do not matter all that much to company results. It is total profit after finance charges have been paid that really matters. If a project involving capital of 100 and profit of 25 (hence ROI of 25%) were considered, then A might reject it on the grounds that it would reduce divisional ROI. But, the project gives a positive RI of 20 – so it should be accepted.

Section C

✓ Solution 23

(a) Variances are significant if they materially affect the performance of a company. They may be positive, in which case the company performance is significantly better than planned; or negative, in which case the company's performance is significantly worse than expected. The level of significance will therefore depend upon the size of the company or department being considered.

There are a number of factors that determine whether a variance is significant or not. Its size relative to the budget is one measure of significance usually expressed as a percentage. This, however, is not sufficient on its own, as the size of the budget may be so small that a relatively large percentage may be insignificant in absolute terms. Also, a variance that always has the same sign, that is, positive or negative, is more significant that one that varies randomly. It is therefore necessary to monitor the cumulative variance, in addition to that for the current period.

(b) Significant variances can be identified in a number of ways. The simplest and most widely used method is that already described in (a) above where a percentage level is set, say 10 per cent, outside of which all variances are investigated. A refinement of this is to only investigate those variances that are also above a predetermined level, say £100. This is so that the cost of investigation does not outweigh the benefit, that is:

Cost of investigation < future cost saving × probability of successful investigation

As noted in (a), such criteria should be applied to both the period and cumulative variances. A refinement of the above is to set control limits using statistical techniques. Previous data is analysed, assuming normal distribution, and the standard deviation calculated. A control chart is then drawn showing results against control intervals of one, two, or even three standard deviations from the expected value, in effect confidence intervals for the actual results against budget.

✓ Solution 24

(a) (i) Standard cost of materials

$$0.65 \times £4 + 0.3 \times £6 + 0.2 \times £2.50 = £490 \text{ kg of FDN}$$

(ii) Standard cost of overheads

£3 kg of FDN

(iii) Standard cost of actual output

	£
Materials: 4,200 × 4.90	20,580
Overheads: 4,200 × 3	12,600
	33,180

(iv) Actual cost of actual output

	£
Materials	20,380
Overheads	12,600
	32,980

(v) Variance analysis

	£	
Cost variances		
Materials	200	Fav
Overheads	–	

	kg	*£*	*£*	
Materials price variance				
2,840 × 4 + 1,210 × 6 + 860 × 2.50		20,770		
Less; actual cost		20,380		
			390	Fav
Material yield variance				
Total materials consumed	4,910.00			
Standard production (4,910 ÷ 1.15)	4,269.56			
Actual production	4,200.00			
	(69.56)			
Valued at standard material cost (× £4.90)			341	Adv
Material mix variance				
Component F				
Standard usage: 4,910 × 0.65 ÷ 1.15	2,775.22			
Actual usage	2,840.00			
	(64.78)			
At standard cost (× £4)			259	Adv
Component D				
Standard usage: 4,910 × 0.3 ÷ 1.15	1,280.87			
Actual usage	1,210.00			
	70.87			
At standard cost (× £6)			425	Fav
Component N				
Standard usage: 4,910 × 0.2 ÷ 1.15	853.91			
Actual usage	860.00			
	(6.09)			
At standard cost (× £2.5)			15	Adv
Total material mix variance			151	Fav
Total material variance			200	Fav
Standard overhead cost per kg of F consumed £12,000 ÷ 4,000 ÷ 0.65 = £4.6154/kg of F				
		£	£	
Overhead expenditure variance				
Standard overhead		12,000		
Actual overhead		12,600		
			600	Adv
Overhead volume variance				
Budget overhead 12,000			1,108	Fav
Standard overhead 12,600			600	Fav
Total overhead variance			–	

(b)

Standard number of deliveries	4,000 × 1.15 ÷ 460 = 10
Standard cost per supplier delivery	4,000 ÷ 10 = £400
Standard number of custormer consignments	4,000 ÷ 100 = 40
Standard cost per customer despatch	8,000 ÷ 40 = £200

Standard overhead cost of output

	£	
Deliveries: (4,200 ÷ 4,000) × 10 × 400 = 10.5 × 400	4,200	
Despatches: (4,200 ÷ 4,000) × 40 × 200 = 42 × 200	8,400	
	12,600	
	£	
Activity variances		
Deliveries: (12 − 10.5) × 400	600	Adv
Despatches: (38 − 42) × 200	800	Fav
Expenditure variances		
Deliveries: 4,800 −(12 × 400)	–	
Despatches: 7,800 − (200 × 38)	200	Adv
Total	–	

(c) The main characteristic of an ABC system is that it is structured around the outputs of the operation, rather than the inputs. In designing an ABC system, one is not concerned primarily with the nature of the costs, but rather with their purpose. The information given in the question suggests that overhead costs are associated with the activities of receiving consignments and sending out orders. The cost drivers in this case appear to be the number of deliveries received and orders despatched.

The best approach to identifying appropriate activities and cost drivers is to interview a representative sample of employees, carrying out the support services at all levels in the organisation, and invite them to identify the relevant factors. If a clear and consistent view emerges, then this may be adopted; if not, a detailed analysis of the activity patterns of these employees may be required.

☑ Solution 25

Operating budget for the forthcoming year

		5-ton vans	*20-ton lorries*	*Total*
	£	£	£	£
Cost of drivers' wages				
Basic and guaranteed pay		33,000	19,500	52,500
Variable overtime and bonus		1,650	7,800	9,450
Pension and fringe benefits		3,630	2,145	5,775
Subsistence		–	1,950	1,950
Total wage cost		38,280	31,395	69,675
Vehicle standing costs				
Vehicle licence		2,160	4,200	6,360
Vehicle insurance		600	600	1,200
Depreciation		14,400	16,200	30,600
Interest on capital		5,040	5,670	10,710
Total standing cost		22,200	26,670	48,870

		5-ton vans	*20-ton lorries*	*Total*
Vehicle running costs				
Fuel		12,800	24,000	36,800
Tyre replacement		1,200	3,600	4,800
Repairs and maintenance				
Wages	14,400			
Materials	30,000	14,800	29,600	44,400
Total running costs		28,800	57,200	86,000
Total annual cost		89,280	115,265	204,545
Sales revenue		110,000	180,000	290,000
Net contribution		20,720	64,735	85,455
Administration costs				70,000
Operating profit				15,455
Add back notional interest charge				10,710
Net profit				26,165

Operating statistics

	5-ton vans	*20-ton lorries*
Total annual mileage	240,000	240,000
Costs per mile (pence)		
Vehicle running costs	12.00	23.83
Total vehicle costs	21.25	34.95
Vehicles plus drivers	37.20	48.03

Solution 26

(a) (i) Sales budget in quantity and value

	July	*August*	*September*	*Total*
Sales, units	400	300	600	1,300
Sales, value, £	100,00	75,000	150,000	325,000

(ii) Production budget in units

Sales	1,300
Closing stock (50% × 450)	225
	1,525
Opening stock (50% × 400)	(200)
Good output required	1,325
Normal loss (1,325 × 1/9)	147
Production required	1,472

(iii) Raw material usage budget

Production, units	1,472	
	kg per unit	*kg*
Material A	3	4,416
Material B	2	2,944
Material C	4	5,888

(iv) Raw material purchases budget

	A	*B*	*C*	*Total*
	kg	*kg*	*kg*	*£*
Weight used	4,416	2,944	5,888	
Stock increase (20%)	200	80	120	
Purchases	4,616	3,024	6,008	
	£	£	£	
Unit cost	3.50	5.00	4.50	
Purchases cost	16,156	15,120	27,036	58,312

(v) Labour requirements budget

Production in units	1,472
Unit labour hours	10
Total hours	14,720
Cost per hour	£8.00
Total cost	£117,760

(b) The 'principal budget factor' is the limiting factor, which is viewed as constraining or limiting the activities of an organisation during a budget period. In budgeting, the principal budget factor is therefore the foundation upon which the budget is based. As activity cannot exceed the limits imposed by the principal budget factor, the values incorporated into the budget are all constrained by this element of the budget.

Thus, if production hours is the principal budget factor, sales prices and volumes will be dictated by the requirement to sell no more than the maximum production capability, and purchasing activity will be similarly tied to production requirements. Without the identification of this constraint, it is difficult to see how functional budgets can be controlled and co-ordinated.

(c)

Labour requirements budget	
Product	X
Production in units	= C19
Unit labour hours	= A4
Total hours	= C19 * A4
Cost per hour (£)	= C6
Total cost	= C6 * E40

The above labour requirements budget would be drawn from a spreadsheet containing basic input information (cells A4, C6, etc.) and a working area into which information is drawn, and in which it cascades through the spreadsheet, one level of information feeding into the next level. A change in any of the input information (or in any of the relationships within the model itself) can immediately be reflected in output information throughout the entire spreadsheet. A separate output area may be created, in which the managerially useful outputs from the spreadsheet are presented, with appropriate emphasis.

☑ Solution 27

(a) (i) Production budget for December

		Equivalent units	
	Physical units	*Material*	*Labour and overhead*
Budgeted orders for December	1,400		
Less: opening stock	(420)		
Add: closing stock (maximum)	1,000		
Production ignoring WIP	1,980	1,980	1,980
Less: opening WIP	(100)	(40)	(20)
Add: closing WIP	200	120	80
Budgeted production	2,080	2,060	2,040

(ii) Purchasing budget for December

	Material C *kg*	*Material D* *kg*
Material to be used		
2,060 units × 5 kg	10,300	
2,060 units × 10 kg		20,600
Less: opening stock	(6,000)	(8,000)
Less: deliveries from previous orders	(2,000)	(4,000)
Add: closing stock (calculated maximum)*	10,000	18,000
Deliveries required from new orders	12,300	26,600
Reorder quantity	5,000	10,000

Therefore, to ensure December requirements, three orders of each of materials C and D should be placed.
* Using the formulae:

Reorder level = maximum usage in maximum lead time
Maximum level = reorder level − (minimum usage in minimum lead time) + reorder quantity

	Material C	*Material D*
Reorder levels		
1,500 × 6	9,000	
3,000 × 4		12,000
Maximum levels		
9,000 − 4,000 + 5000	10,000	
12,000 − 4,000 + 10,000		18,000

(b) Optimal reorder quantity $= \sqrt{\dfrac{2C_oD}{C_h}}$

where D is the annual consumption; C_o is the cost of one purchase order; and C_h is the stock cost of one unit for one year.

$$\text{Optimal reorder quantity} = \sqrt{\frac{2 \times (1{,}200 \times 50) \times £5}{0.25 \times £0.60}}$$

$$= 2{,}000 \text{ kg of material C}$$

☑ Solution 28

Workings

Standard product cost

	Quantity	*Price*		
	kg	*£*	*£*	*£*
DM1	10	3	30	
DM2	5	2	10	
				40
	Hours			
DW1	5	4	20	
DW2	20	5	10	
				30
Production overhead 1	5	12	60	
Production overhead 2	2	10	20	
				80
Production cost				150
Administration and selling over head (20% production cost)				30
				180
Profit (10% of selling price)				20
Selling price (180/90 × 100)				200

	£	
Sales		
Jan	60,000	
Feb	360,000	
Mar	240,000	
	660,000	÷ £200 = 3,300 units

(a) Production budget – in quantity only, for January to March

	Units	*Units*
Sales		3,300
+Closing stocks		
Maximum Division 1	150	
Maximum Division 2	500	
Maximum Division 3	350	
		1,000
		4,300
−Opening stocks		
Division 1	100	
Division 2	350	
Division 3	250	
		700
Production units		3,600

(b) Purchasing budget to include maximum stock levels

Maximum level = reorder level + reorder quantity
− minimum usage in reorder period

But, first, it is necessary to calculate the reorder level because this is not given in the question.

Reorder level = maximum usage × maximum delivery period – i.e.

for DM1: 3,600 × 6 weeks =	21,600
for DM2: 1,800 × 5 weeks =	9,000
Minimum usage in reorder period is:	
for DM1: 2,400 × 4 weeks =	9,600
for DM2: 1,200 × 3 weeks =	3,600

Maximum levels, therefore, following formula given above:

DM1: 21,600 + 20,000 − 9,600 =	32,000
DM2: 9,000 + 12,000 − 3,600 =	17,400

	DM1	*DM2*	
	kg	*kg*	£
Desired closing stock	32,000	17,400	
Production: 3,600 × 10; 3,600 × 5	36,000	18,000	
	68,000	35,400	
Less: opening stocks	23,000	14,400	
	45,000	21,000	
DM1 45,000 × £3/kg			135,000
DM2 21,000 × £2/kg			42,000
Total purchases budget			177,000

(c) Production cost budget

	Per unit	*3,600 units*		
	£	£	£	
DM1	30	108,000		
DM2	10	36,000		
			144,000	materials
DW1	20	72,000		
DW2	10	36,000		
			108,000	labour
PO1	60	216,000		
PO2	20	72,000		
			288,000	overhead
			540,000	

(d) Cash budget

	Jan	*Feb*	*March*
	£	£	£
Balances brought forward	(18,000)	(21,000)	26,000
Received from sales			
⅓ × £624,000	208,000		
⅓ × £660,000		220,000	
⅓ × £660,000			220,000
	190,000	199,000	246,000
Payments			
Direct materials (note 1)	41,000	41,000	59,000
Direct wages ⅓ × £108,000	36,000	36,000	36,000
Production overhead (note 2)	84,000	96,000	96,000
Corporation tax	50,000		
Special advertising			60,000
	211,000	173,000	251,000
Balances carried forward	(21,000)	26,000	(5,000)

Notes:

1. *Production in December quarter*

	£		
Sales			
Division 1	54,000		
Division 2	342,000		£624,000 ÷ £200 = 3,120 units
Division 3	228,000		
		Units	
Sales		3,120	
+Closing stock		700	
−Opening stocks			
Division 1	90		
Division 2	320		
Division 3	260		
		(670)	
Production units		3,150	

	DM1 Units	*DM2 Units*	£	
3,150 units × 10	31,500			
3,150 units × 5		15,750		
+closing stocks	23,000	14,400		
−opening stocks	(24,500)	(13,650)		
	30,000	16,500		
DM1: 30,000 units × £3			90,000	
DM2: 16,500 units × £2			33,000	
			123,000	for quarter

£123,000 divided by 3 gives £41,000 for January and February.

Purchases budget for March quarter shown as answer to (b) = £177,000; divided by 3 this gives £59,000 for March.

2. *Production overhead*

3,150 units × £80 = £252,000; divided by 3 this gives £84,000 for January.

Production overhead budget for March quarter shown in answer to (c) = 288,000; divided by 3 this gives £96,000 for February and March.

Solution 29

Initial workings

	April £000	*May £000*	*June £000*	*July £000*	*August £000*
Sales receipts		401.70	450.28	425.88	
Variable cost of sales (60%)	240.00	270.00	312.00	252.00	288.00
Variable production cost					
In month of sale (60%)	144.00	162.00	187.20	151.20	
In prior month (40%)	108.00	124.80	100.80	115.20	
	252.00	286.80	288.00	266.40	
Materials cost (60%)	151.20	172.08	172.80	159.84	
Purchases					
In month of production (50%)	75.60	86.04	86.40	79.92	
In prior month (50%)	86.04	86.40	79.92		

Payment to suppliers		161.64	172.44	166.32
Labour cost				
(Variable production cost × 0.3)		86.04	86.40	79.92
Variable overhead	25.20	28.68	28.80	26.64
Paid in month incurred (40%)		11.47	11.52	10.66
Paid in following month (60%)		15.12	17.21	17.28
Variable overhead expenditure		26.59	28.73	27.94

Cash budget for the months of May to July 20X7

	May £000	*June* £000	*July* £000
Receipts from sales	401.70	450.28	425.88
Payments			
Materials	161.64	172.44	166.32
Labour	86.04	86.40	79.92
Variable overhead	26.59	28.73	27.94
Fixed costs	75.00	75.00	75.00
Capital expenditure		190.00	
Total payments	349.27	552.57	349.18
Net inflow (outflow)	52.43	(102.29)	76.70
Balance b/f	40.00	92.43	(9.86)
Balance c/f	92.43	(9.86)	66.84

✓ Solution 30

(a) DL Hospital Trust: Unit H budget – actual reconciliation – November 20X3

	£	£	£	
Original budgeted cost				
Direct labour (20 × £2,000)			40,000	
Variable overhead			25,000	
Budgeted variable cost			65,000	
Fixed overhead			35,000	
			100,000	
Flexed to actual activity level (£65,000 × 2/20)			6,500	
Flexed budget cost (see note below)			106,500	
	Fav	*Adv*		
Surgical team fees rate variance	2,600			
Surgical team efficiency variance		3,000		
Variable overhead expenditure variance	725			
Variable overhead efficiency variance		1,875		
Fixed overhead expenditure variance		1,950		
	3,325	6,825	3,500	Adv
Actual cost			110,000	

Note: A solution might alternatively show an activity adjustment to budgeted cost of £10,000 combined with a fixed overhead volume variance of £3,500 (Fav).

Surgical team fees rate variance

Actual cost − actual hours at standard cost per hour
£44,400 − (235 × £200) = £2,600 (Fav)

Efficiency variable

Actual hours at standard cost per hour − standard cost of operations performed
£47,000 − (£2,000 × 22) = £3,000 (Adv)

Variable overhead – expenditure variance

Actual cost − budgeted cost
£28,650 − (£200 × 235 × 0.625) = £725 (Fav)

Efficiency variance

Budgeted cost − standard cost of operations performed
£29,375 − (£2,000 × 0.625 × 22) = £1,875 (Adv)

Fixed overhead expenditure variance

Actual fixed overhead − budgeted fixed overhead
£36,950 − (£2,000 × 0.875 × 20) = £1,950 (Adv)

(b) *To:* Finance director
From: Management account
Date:
Subject: Absorbing overheads on a labour base

Overheads, in the context of the hospital, can be attributed to surgical operations on a labour cost basis on the grounds that it is an economic method to operate, it is a widely understood method of dealing with overheads cost, and as long as the mix of staff involved in sturgical procedures does not vary too much, a labour cost-based system may be acceptable. There are, however, some potentially serious problems associated with this system.

It assumes that labour cost behaviour is reasonably closely related to overhead behaviour. In reality, there may be a number of 'drivers' of different elements of overhead cost.

As indicated above, if the mix of specialisms (with different levels of remuneration) change, there will be an impact upon the overhead charge to particular operations.

The use of labour cost as a basis for attributing overhead cost to operations therefore begs the question, why? If all that is required is a system that is both easy and cheap to operate, it may prove adequate, but if there is to be any managerial use made of the information assembled, then it is unlikely that this method will provide an acceptable quality of information, and therefore a study of the alternatives (focusing, in particular, on the identification of the causes of different elements of cost and on the possibility of using multiple absorption bases) should be considered.

Singed: Management accountant

✓ Solution 31

Report

To: The board
From: Management account
Date: 26 November 20X9
Re: Proposed changes in budget preparation

I have prepared the following report, which you requested, in the temporary absence of the group finance director and on his behalf.

Discussion and recommendation

In preparing a budget for the following year, there are two issues that tend to pull in opposite directions: having a budget that is as up to date as possible while, at the same time, creating enough space for adequate manager involvement and negotiation. Because the budget is an important planning tool, in terms of target-setting and resource allocation, it is important that it should be accurate. It is also a management control technique, in terms of tracking financial performance, and therefore needs to be realistic.

Realistic budgets infer that the budget preparation process should probably be left as late as possible in the year preceding the new budget in order that information is as up to date as possible.

On the other hand, if budget preparation is left too late, then problems are likely to occur such as:

insufficient time allowed to evaluate the current position and gather relevant data;
insufficient time for managers to be involved in budget planning and resource allocation negotiations.

The danger is then that budgeting may be perceived by operating managers as a rushed exercise, primarily for financial planning purposes, and the use of budgets as a motivational device will be lessened.

Accordingly, the group finance director's proposal to commence budget preparation after the half-year results are available has the merit of allowing a broader discussion of issues than may be feasible with a tight time constraint. Managers are likely to feel more involved in managing their parts of the business, leading to greater accountability and hopefully more realistic budgets (subject to senior managers' efforts to minimise the impact of budget padding!).

Specific Problems

Division A. The difficulty here is that if the group finance director's proposal is accepted, then the budget for Division A will in effect be negotiated by the divisional finance director, who is acting managing director. There could be some conflict of interest – who is the divisional finance director's line manager? The new divisional managing director will inherit a plan over which he/she has had no input. On this basis, it may appear better to wait as long as possible before starting budget preparation. On the other hand, and in support of the group finance director's proposal, the budget for the next year could be agreed using the current year's budget and longer-term plans, despite the first quarter's disappointing results. Some form of contingency planning should be made in the event of continuing poor performance in the division, reviewed after the second-quarter results are available. The new managing director should not be held accountable for the divisional budget if he/she is appointed after the group has approved it.

Division B. It would appear a little early to judge the impact of the new product/market strategy on next year's budget. The significance will depend upon the importance of the new market strategy in terms of the overall volume of activity and profitability in the division. If budget preparation is to be started earlier (after the half-year results), then some form of contingency planning should be considered for planning purposes. For example, if the new marketing strategy could have a significant impact on both divisional and group profits, then budgets based on pessimistic and optimistic forecasts could be prepared as well as for realistic forecasts. At the end of the day, Division B is accountable for its performance and has to make informed judgement. Presumably, for control purposes, the budget for next year can be flexed for actual activity in the division to separate out the impact of planning and operating variances.

Division C. This is a tougher issue than for the other two divisions discussed. The timescale for successful operation of the new plant is the third quarter of the current year, and this may well slip back. Product costings appear uncertain and there appears to be doubt as to whether customer quality can be achieved. A review of the situation after the second-quarter results are out should be undertaken. As with Division B, there is an issue of materiality in terms of the impact of the new plant on Division C's financial performance. If it is expected to be significant, then budget planning halfway through the current financial year is rather difficult. The budget for next year will, therefore, have to be prepared on assumptions agreed between divisional and group managers. As with Division B, contingency plans should be prepared for worse than expected performance next year that could affect group cash flows and profitability, and that may be harmful to the longer-term plans of the group. However, unless definite changes become necessary before the group budget is agreed, it may be better to budget for the new plant in line with its original capital investment justification proposal.

Other anticipated difficulties

Operating managers may not want the change in planning timetables and may have to be convinced of the benefits. The implication is that managers will be expected to put more effort (and time) into the budget-planning process and they may resent this.

As budget performance may well affect divisional managers' bonuses, then they may argue that more realistic budgets will be achieved by leaving preparation until later in the year, as is current practice. One way around this is to demonstrate that the current year's budgets are not that useful (according to the group finance director) and, possibly, to change the emphasis in divisional performance to a broader range of measures of which budget performance is only one element.

Signed: Management accountant

✓ Solution 32

(a) The role of the divisional management accountant

The divisional management accountant (DMA) will have responsibility for accounting for the costs incurred in the division. The DMA should therefore be in a position to advise management of the costs and benefits of alternative proposals. As well as making recommendations, the DMA could also comment on the feasibility of any options that management may propose. As the excess capacity problem is so severe, it is likely that the management of EF will either require a cost-reduction programme or a plan to utilise the spare capacity. The role of the DMA is to be involved in the early discussions to assist management in formulating all the feasible options. Cost-reduction programmes could be achieved by reducing processing capacity, either by decommissioning a number of plants or by cutting back capacity across all the plants. Accurate cost information would be required in order to determine which of these alternatives would be the most cost-effective. The DMA's role would be to forecast the cash-flow implications and present the findings to the EF management. If management's preferred solution is to utilise the spare capacity, the DMA can assist management by ascertaining the marginal costs for each plant as a guide to establishing minimum prices for subcontract work. However, time scales need to be carefully considered. Fixed costs need to be recovered in the longer term and the DMA can provide guidance on longer-term unit costs.

Reporting

Budgetary control reports are a major feedback process for both planning and control. The reports therefore need to reflect the revised forecast in order to maintain control over operating performance. Differences between the revised forecast and the original budget should be reported as planning variances as an aid to current and future cash- and profit-planning reviews. For control purposes, any exceptional costs arising from a reduction in capacity, or lower gross margins arising from any subcontract work, should be highlighted. This is necessary in order to separate out the impact of policy decisions from operating variances. Planning in the short term is likely to be difficult as future closure or plant rationalisation costs that need to be provided for in the current year will have to be estimated.

(b) Head office review

The senior management accountant (SMA) in head office would require a detailed report from the divisional management of EF in support of all options proposed, together with the specific solution recommended. In particular, the accuracy of the costings for each alternative would require a careful review. The direct costs of each plant should be easily verifiable. However, the allocation of the group's overhead costs to the EF division, and the allocation of EF division's administration costs to each plant, should both be carefully reviewed if significant. The feasibility of proposals needs to be carefully considered, particularly if divisional management is recommending maintaining production capacity. The SMA should seek evidence from EF that subcontract work is likely to be sustainable in the longer term. The SMA should also ascertain whether EF has any contingency plans if capacity cannot be maintained as planned. If, however, the management of EF is recommending a significant reduction in capacity, then the SMA should consider the potential impact on the group as a whole. A large reduction in capacity will inevitably mean redundancies, which will create problems in the isolated rural areas in which EF operates. Any adverse criticisms of EF may well have a knock-on effect on the group. If this was likely to be the case, then the SMA may well suggest that the possibility of selling off division EF as a going concern 9 (although on a reduced basis) be considered.

☑ Solution 33

(a) Production Planning and Development: operating statement for period ended 30 November 20X1 (traditional expense-based analysis)

	Budget	*Actual*	*Variance*	
	£000	*£000*	*£000*	
Salaries	600	667.8	67.8	Adv
Supplies	60	53.0	7.0	Fav
Travel cost	120	127.2	7.2	Adv
Technology cost	100	74.2	25.8	Fav
Occupancy cost	120	137.8	17.8	Adv
Total	1,000	1,060.0	60.0	Adv

Production planning and Development: operating statement for period ended 30 November 20X1 (activity-based analysis)

	Budget	*Actual*	*Variance*	
	£000	*£000*	*£000*	
Routeing/scheduling – new products	200	169.6	30.4	Fav

Routeing/scheduling – existing products	400	360.4	39.6	Fav
Remedial rerouteing/scheduling	50	127.2	77.2	Adv
Special studies – specific orders	100	84.8	15.2	Fav
Training	100	159.0	59.0	Adv
Management and administration	150	159.0	9.0	Adv
Total	1,000	1,060.0	60.0	Adv

(b) Advantages claimed for the use of activity-based budgeting may include the following:

Resource allocation is linked to a strategic plan for the future, prepared after considering alternative strategies.

Traditional budgets tend to focus on resources an inputs rather than on objectives and alternatives. In the question, the traditional budget focuses on overall expenditure on resources such as salaries and the overall expenditure variance.

New high-priority activities are encouraged rather than focusing on the existing planning model. Activity-based budgeting focuses on activities. This allows the identification of the cost of each activity, for example, special studies. It facilitates focus on control of the resources required to provide the activity. It will also help where financial constraints exist in that activities may be ranked and their importance considered, rather than arbitrary cuts being made in areas such as production planning and development.

There is more focus on efficiency and effectiveness and the alternative methods by which they may be achieved. Activity-based budgeting assists in the operation of a total quality philosophy. Focus within individual activities can be on areas such as waste reduction, inefficiency removal, innovation in methods.

It avoids arbitrary cuts in specific budget areas in order to meet overall financial targets. Activities, 1, 2 and 4 in the budget in (i) are primary activities that add value to products. Activity 3 (remedial rescheduling) is a non-value-added activity that should be eliminated. Activities 5 and 6 (training and management) are secondary activities that support the primary activities. Efforts should be made to ensure that their objectives are achieved in an efficient manner at minimum cost.

It tends to lead to increased management commitment to the budget process. This should be achieved since the activity analysis enables management to focus on the objectives of each activity. Identification of primary, secondary and non-value-added activities should also help in motivating management in activity planning control.

(c) The statement in (i) shows the budget *v.* actual cost comparison for each activity. This indicates that cost has fallen in all three primary activities – development of routeing, existing routeing and special studies. Remedial rerouteing is double the budget level, which must be investigated since it is a non-value-added activity. Training cost has increased by 50 per cent from budget. This may be related to the high level of remedial rerouteing where staff under training have not been performing efficiently.

For each activity it is also possible to prepare a cost analysis that compares budget *v.* actual resources for salaries, etc., in a similar way to the overall traditional budget statement given in the question. This will enable investigation of factors such as why salary costs for the activity exceed budget by £x or why supplies are below budget by £*y*.

The cost information does not specify the cost driver for each activity and the budget *v.* actual comparison of these. For example, staff hours are likely to be the cost driver for an activity such as routeing/scheduling, whereas for training the cost driver may be number of staff trained. It is also necessary to determine the efficient cost-driver level, for example, staff hours per individual route development for a new product. How does this compare with the actual staff hours per individual route development? Again, a comparison of budget cost *v.* actual cost per staff member trained will give an indication of efficiency of provision of the activity.

A further aspect of performance measurement is to determine the 'root cause' of each cost driver. For example, the staff hours required per route designed may be linked to the level of technology and software systems used. The root cause of employee training may be high labour turnover due to poor career prospects or a stressful work environment. It is important that such root causes are identified, since continuous improvement of the provision of an activity will only be achieved through improvement in the factors that influence its incidence.

Solution 34

(a) Material Handling Department: budget v. actual cost statement period ended 28 November 20X1

	Flexed	*Actual*	*Variance*	
Total forklift truck running hours	15,360	15,360		
	£	£	£	
Variable costs				
Drivers' bonus	7,680	7,400	1,280	Fav
Battery power cost	23,040	21,800	1,240	Fav
Fixed costs				
Drivers' salaries	80,000	81,600	1,600	Adv
Maintenance	4,800	6,000	1,200	Adv
Depreciation	16,000	16,000	–	
	131,520	132,800	1,280	Adv
Charge to user departments:		135,905		
Overabsorption of cost		3,105		

Workings

Forklift truck running hours

$$40 \times 120 \times 4 \times 80\% = 15{,}360$$

Flexed budget costs

Drivers' bonus 15,360 hours × 10 cu.m. × 5p = £7,680

Drivers' salaries $\dfrac{40 \times £26{,}000}{13} = £80{,}000$

Power 15,360 × £1.50 = £23,040

Maintenance 40 × £120 = £4,800

Depreciation $\dfrac{40 \times £26{,}000}{5 \times 13} = £16{,}000$

Charge to user departments

For fixed costs this is based on the original budgeted running hours:

$$40 \times 115 \times 4 \times 80\% = 14{,}720 \text{ hours}$$

Charge per forklift truck running hours

$$\text{For variable costs} = \frac{£7{,}680 + £23{,}040}{15{,}360} = £2.00$$

$$\text{For fixed costs} = \frac{£80{,}000 + £4{,}800 + £16{,}000}{14{,}720} = £6.848$$

Hence total charge per forklift truck hour = £2 + £6.848 = £8.848

Total charge to user departments = 15,360 hours × £8.848 = £135,905

(b) Various advantages may be claimed for the use of a budgeted charge rate both at the point of provision of the service and at the point of use. These follow on logically from the use of predetermined overhead absorption rates.

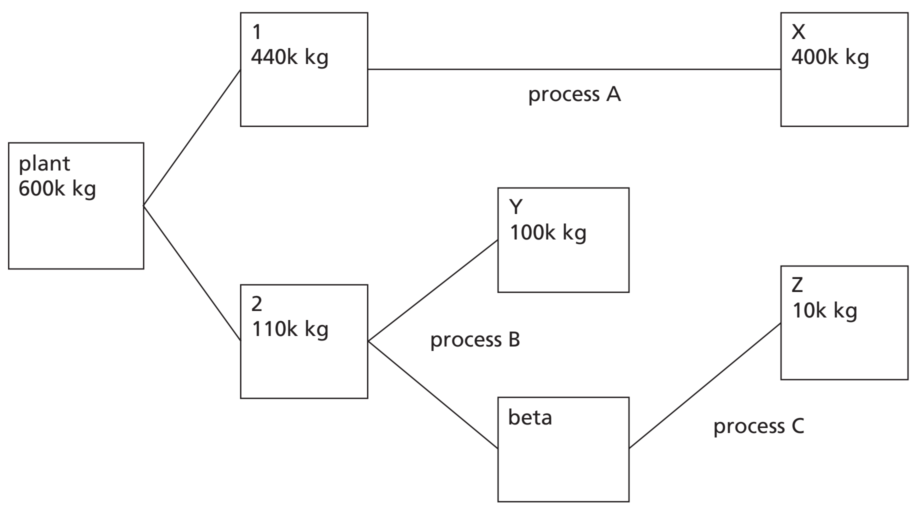
It should assist in the control of the provision of the service. Any excess costs caused by expenditure in excess of that budgeted for the materials handling department or caused by a reduction in the efficiency of operation of the trucks will be reported at the point of incidence, that is, in the materials handling department. Excess cost or reduced efficiency of operation cannot simply be passed on to the user departments by charging an increased charge rate based on actual expenditure.

It should also assist in control at the point of use. The user department will be charged for the number of hours of handling work that it requests, charged at the predetermined rate per forklift truck hour. This means that any variance reported in the operating statement of the user department will reflect any change in the quantity of forklift truck time used. The manager of the user department can investigate possible reasons for any increased level of requirement. It will not include any cost increases in the provision of the forklift truck service. Such cost increases will be monitored and explained at the point of provision, that is, in the materials handling department.

It also facilitates an equitable distribution of costs between departments. The transfer price charged will not reflect random variations in activity and usage throughout the whole organisation. A temporary shutdown due to a stock-out in department A will not impact on the level of transfer charges made to departments B and C.

☑ Solution 35

(a)



(b) (i) Units allocation

	Product X	*Product Y*			*Notes*
£	*Total*	*CPU*	*Total*	*CPU*	
Joint costs	440,000	1.100	110,000	1.100	(a)
Processing costs	410,000	1.025	135,000	1.350	
By-product net revs.			−5,000	−0.050	(b)
Total	850,000	2.125	240,000	2.400	
Revenues	970,000		450,000		
Profit	120,000		210,000		

Notes:
(a) Joint costs to X £550,000/(400 × 500)kg
(b) Net revs from Z £15,000– £10,000

(ii) NRV allocation

	Product X		*Product Y*		*Notes*
£	*Total*	*CPU*	*Total*	*CPU*	
Joint costs	350,000	0.875	200,000	2.000	(a)
Processing costs	410,000	1.025	135,000	1.350	
By-product net revs.			−5,000	−0.050	(b)
Total	760,000	1.9	330,000	3.300	
Revenues	970,000		450,000		
Profit	210,000		120,000		

Notes:
(a) Joint costs to X £550,000/£(560/880).
(b) Net revs from Z £15,000 − £10,000.
(c) In isolation, the impact of the extra sales of Y would be:

Incremental impact	*£*
10% variable plant costs	50,000
10% B variable costs	13,000
10% Z net revenues	800
Sales of extra Y	40,000
Total	−22,200

The proposed sale is not viable. However, stepping up production in the plant by 10% would allow a 10% increase in sales of X. If it is possible to sell the extra X at the usual price then the impact would be:

Incremental impact	*£*
10% A variable costs	38,500
Sales of extra X	97,000
Total	58,500

Provided the extra X can be sold at the usual price then the proposed extra sale of Y is viable. However, it all depends on circumstances. One can manipulate the data to provide a variety of breakeven points relating to volume sales or unit selling prices. The general point is that a business decision can only be made with an understanding of the full context in which it is posed.

✓ Solution 36

When you are calculating the standard allowances for the actual production in part (b) you will need to use the concept of equivalent units for job 109. Since the job is 60 per cent complete as regards labour, the standard labour hours for variance calculations will be 60 per centof the original standard hours forecast for the job.

(a) Most organisations are required to set the price of their goods or services in advance of manufacturing and/or supplying them. The pricing policy for a product must be developed taking full account of the anticipated market conditions. As part of this decision-making process it is necessary to estimate all the costs involved to determine the profit generated by the forecast sales. This requires the use of a predetermined overhead absorption rate (OAR).

The timeframe used for calculating the OAR is usually the next budget year. Taking such a timescale will tend to even out seasonal or market fluctuations in demand. For example, a gas supply company making monthly calculations of OAR would have a much lower OAR in the winter months than in the summer. These short-term OARs send the wrong pricing signals, suggesting that one might reduce price when demand is high and increase price when demand is low. Alternatively, if the price is held constant, the profit per unit will fluctuate with the seasons. The use of predetermined OARs will almost certainly result in over- or under-absorption. This is shown in variance analysis as the fixed overhead volume variance.

(b)

PSA Ltd – Cost control report for April

	Standard cost	*Actual cost*	*Variance*	
	£	£	£	
Labour	21,714	24,500	2,786	Adv
Hardwood	26,180	28,600	2,420	Adv
Softwood	8,640	9,200	560	Adv
Fixed overhead	8,272	7,800	472	Fav
Variable overheads	6,204	6,900	696	Adv
	71,010	77,000	5,990	Adv

Labour variances

	£		£
Operational efficiency (W1)	483	Adv	
Operational rate (W2)	1,400	Adv	
Planning (W3)	903	Adv	
	2,786	Adv	2,786

Hardwood variances

	£		
Operational usage (W4)	1,045	Adv	
Price (W5)	0		
Planning (W6)	1,375	Adv	
	2,420	Adv	5,206

Softwood variances

	£		£
Operational usage (W7)	1,120	Adv	
Price (W8)	400	Adv	
Planning (W9)	960	Fav	
	560	Adv	5,766

Overhead variances

	£		
Variable overhead (W10)	696	Adv	
Fixed overhead volume (W11)	272	Fav	
Fixed overhead expenditure (W12)	200	Fav	
	224	Adv	5,990

Workings:

Labour

Std hours = 1,000 + 600 + (780 × 60%) = 2,068, actual hours = 2,200
Actual cost per hour £11.136
Revised std hours 2,068/0.96 = 2,154

(W1)	(2,154 − 2,200) × 10.5	=	483	Adv
(W2)	2,200 × (11.136−10.5)	=	1,400	Adv
(W3)	(2,068 − 2,154) × 10.5	=	903	Adv

Hardwood

Std volume = 200 + 180 + (120 × 80%) = 476, actual volume = 520
Actual price 28,600/520 = £55 per cu.m.
Revised std volume 476/0.95 = 501

(W4)	(501 − 520) × 55	=	1,045	Adv
(W5)	(55 − 55) × 520	=	0	
(W6)	(476 − 501) × 55	=	1,375	Adv

Softwood

Std use = 320 + 400 + (300 × 80%) = 960 cu. m., actual use = 1,100 cu. m.
Actual price 9,200/1,100 = £8.364 cu. m.

(W7)	(960 − 1,100) × 8	=	1,120	Adv
(W8)	(8.00 − 8.364) × 1,100	=	400	Adv
(W9)	960 × (9 − 8)	=	960	Fav

Overheads

"The OARs are £3 per hour for variable O/Hs (that is, £72,000 / 24,000 hours) and £4 per hour for fixed O/Hs (that is £96,000 / 24,000 hours). Consequently :
(W10) Variable O/H variance is (2,068 hours x £3) - £6,900 = £696 Adv
(W11) Fixed O/H volume variance is (2,068 x £4) - £8,000 = £272 Fav
(W12) Fixed O/H expenditure variance is £8,000 - £7,800 = £200 Fav

Note : it is possible to undertake more detailed analysis on both the variable O/H variance and the fixed O/H volume variance – but the requirement does not specify this."

(c) The traditional accounting system presently used by PSA Ltd follows all the costs as they are incurred for each product type, job or unit produced. These costs are classified and recorded forming an extensive database, which allows tight financial control to be exercised on the production process.

Specifically, PSA Ltd prepares a detailed monthly variance analysis as part of its control procedures. Its existing system is both flexible and powerful in that it incorporates adjustable standards to cater for external influences outside the control of PSA Ltd, for example, the quality of labour or materials. The disadvantage of this system is that it is time-consuming and expensive to enter and manipulate the vast amount of data involved. In a modern AMT/JIT environment it may not be necessary to use such a complex system if:

all forms of stock inventory (raw materials, WIP and finished products) are kept at very low levels;

production is highly automated and reliable, leading to low labour costs and efficient use of labour time;

long-term relationships with suppliers ensure reliable delivery and fixed price and quality specifications.

Under these conditions, there will be little variation of input prices or efficiencies and therefore insignificant cost variations. Thus, there would be no need to use the traditional accounting technique, and backflush accounting may be used instead. The CIMA *Official Terminology* defines backflush accounting as 'a method of costing, associated with a JIT production system, which applies cost to the output of a process. Costs do not mirror the flow of products through the production process, but are attached to output produced (finished goods stock and cost of sales), on the assumption that such backflushed costs are a realistic measure of the actual costs incurred'. Thus, conversion costs are only attached to products when they are completed. This system only uses raw, in process and finished goods accounts, which saves costs by reducing the amount of data required and the frequency of data entry, for example data on materials used only enters the system when a piece of work is completed. However, this system does not enable the valuation of WIP nor any variance analysis.

The variances for PSA Ltd are significant for efficiency of inputs (labour and materials) and there is also a noticeable change in WIP, and the price of inputs. If this is typical, then the proposal should be rejected, as backflush accounting is unsuitable. Rapier, like many consultants, may be too concerned with selling its services than with truly serving its customers.

☑ Solution 37

When calculating your absorption rates, do not forget to include the data for 'other products' in your total figures.

(a) (i) Unit costs using traditional absorption costing

Material related overhead cost (40% of £1.5m) = £600,000

Overhead absorption rate $\frac{£600,000}{£2,400,000} \times 100 = 25\%$ of direct material cost

Labour related overhead cost (60% of £1.5m) = £900,000

Overhead absorption rate $\frac{£900,000}{£800,000} \times 100 = 112.5\%$ of direct labour cost

	Alpha	*Beta*
	£	£
Direct materials	16	30
Direct labour	8	10
Prime cost	24	40
Material related overhead (25%)	4	7.5
Labour related overheads (112.5%)	9	11.25
Total variable costs	37	58.75

(ii) Unit costs based on activity-based costing

	Alpha	*Beta*	*Other*
Production units	5,000	10,000	40,000
Weight of direct material (kg)	4	1	1.5
Total weight of material (kg)	20,000	10,000	60,000

$$\text{Mat. related overhead/kg} \quad \frac{£600,000}{20,000 + 10,000 + 60,000} = £6.67/\text{kg}$$

	Alpha	*Beta*	*Other*
Production units	5,000	10,000	40,000
Labour operations/unit	6	1	2
Total operations	30,000	10,000	80,000

$$\text{Lab. related overheads/op} \quad \frac{£900,000}{30,000 + 10,000 + 80,000} = £7.50 \text{ per operation}$$

Unit costs based on ABC	*Alpha*	*Beta*
	£	£
Direct materials	16	30
Direct labour	8	10
Prime cost	24	40
Material related overhead	26.68	6.67
Labour related overheads	45	7.50
Total variable costs	95.68	54.17

(b)

	Alpha		*Beta*	
	Traditional	*ABC*	*Traditional*	*ABC*
	£	£	£	£
Direct material	16	16	30	30
Direct labour	8	8	10	10
Material related overhead	4	26.68	7.50	6.67
Labour related overhead	9	45	11.25	7.50
Total variable cost	37	95.68	58.75	54.17
Selling price	75	75.00	95.00	95.00
Contribution/unit	38	(20.68)	36.25	40.83
C/S ratio	51%	(28)%	38%	43%

Apollo plc require a minimum C/S ratio of 40 per cent. If product costs are determined using the traditional methods Apollo would decide to proceed with the production of Alpha (C/S ratio of 51 per cent) and reject Beta which has a C/S just below the required 40 per cent.

If ABC is used the decision will be reversed. Alpha will be rejected on the basis of a negative C/S ratio and Apollo will proceed with Beta which has a C/S ratio of 43 per cent.

ABC provides a more accurate cost of products unlike the traditional method used, which is a broad-based averaging of costs. ABC attempts to reflect the true consumption of resources.

(c) The use of target costing in conjunction with ABC will enable Apollo to find ways of reducing the costs of Alpha to arrive at a target cost. Cost reduction methods such as value analysis and value engineering could be used to achieve this. Though Beta just meets the required 40 per cent C/S ratio, Apollo could decide to increase margins further by carrying out a similar exercise on Beta. Target costing should also be used to identify selling prices for specific markets.

✓ Solution 38

(a) Overheads absorbed on machine hour basis

Machine hour absorption rate = Total overheads/Total machine hours

$$= \frac{£10,430 + £5,520 + £3,600 + £2,100 + £4,620}{(120 \times 4) + (100 \times 3) + (80 \times 2) + (120 \times 3)}$$

$$= \frac{£26,000}{1,300} = £20 \text{ per machine hour}$$

Total costs based on machine hour basis

	A	*B*	*C*	*D*
	£	£	£	£
Direct materials	40	50	30	60
Direct labour	28	21	14	21
Production overhead	80	60	40	60
Production cost/unit	148	131	84	141
Output in units	120	100	80	120
Total production cost	£17,760	£13,100	£6,720	£16,920

(b) Overheads absorbed based on ABC

	Overhead costs £	*Level of activity*	*Cost/activity*
Machine department cost	10,430	1,300	£8.02/hour
Set-up costs	5,250	21*	£250.00/run
Stores receiving costs	3,600	80**	£45.00/requisition
Inspection/quality costs	2,100	21*	£100.00/run
Material handling and despatch	4,620	42	£110.00/order

Workings

$$\begin{aligned} \text{*No. of production runs} &= \text{output in units}/20 \\ &= \frac{120 + 100 + 80 + 120}{20} \\ &= \frac{420}{20} = 21 \\ \text{*No. of requisitions raised} &= \text{No. of products} \times 20 \\ &= 4 \times 20 = 80 \end{aligned}$$

Total costs based on ABC

	A	*B*	*C*	*D*
	£	£	£	£
Direct materials	40.00	50.00	30.00	60.00
Direct labour	28.00	21.00	14.00	21.00
Machine dept costs	32.09	24.07	16.05	24.07
Set-up costs	12.50	12.50	12.50	12.50
Stores receving	7.50	9.00	11.25	7.50
Inspection	5.00	5.00	5.00	5.00
Material handling	11.00	11.00	11.00	11.00
Production cost/unit	136.09	132.57	99.80	141.07
Output in units	120	100	80	120
Total production costs	£16,331	£13,257	£7,984	£16,928

(c) Comparison of the two unit costs calculated in (a) and (b) above.

	A	*B*	*C*	*D*
Product	£	£	£	£
Based on machine hour rate	148.00	131.00	84.00	141.00
ABC method	136.09	132.57	99.80	141.07
Difference	11.91	(1.57)	(15.80)	(0.07)

Products A and C have the largest differences. The ABC approach in theory, attributes the cost of resources to each product which uses those resources on a more appropriate basis than the traditional method. The implication is that product A is more profitable than the traditional approach implies, whereas C is less profitable. If selling prices were determined on costs based on the traditional absorption method, the organisation might consider increasing the price of C and reducing that of A.

✓ Solution 39

For each proposal, calculate a revised operating profit figure and a revised figure for year-end assets. In part (b) the finance charge for the residual income is calculated as 12 per cent of the net assets figure.

(a) The proposal to defer payment would have the following effects:

20X1 Net assets at year end will be reduced to £4,310,000 and operating profit will be reduced by the late payment penalty of £2,000. Therefore:

$$\text{ROCE} = \frac{647{,}000}{4{,}310{,}000} \times 100 = 15.01\%$$

This meets the target so management will adopt this proposal and receive their bonuses.

20X2 No effect. The proposal to delay payment incurs expensive finance costs:

$$\frac{2{,}000}{90{,}000} \times 100 = 12.2\% \text{ for 12 days (or 1/30.4 of a year)}$$

which is an annual rate of $((1.022)^{30.4} - 1) \times 100$: that is approximately 94 per cent.

The proposal to replace the oldest machine tools would have the following effects.

20X1 Net assets at year end increased by £320,000 and no effect upon operating profit. Therefore:

$$\text{ROCE} = \frac{649{,}000}{4{,}720{,}000} \times 100 = 13.75\%$$

20X2 Extra depreciation charges £40,000 and operation saving £76,000. Therefore:

$$\text{The ROCE for the proposed is } \frac{36{,}000}{280{,}000} \times 100 = 12.9\%$$

This will not help to achieve an overall divisional ROCE of 15 per cent.

The proposal to replace old assets will not increase the divisional ROCE in the short term. However, as the asset value of this new machinery declines then eventually the ROCE for this project will rise and assist in meeting the division's target. This illustrates the major weakness of ROCE as a measure of performance in that the ROCE increases over the life of the asset and the initial low values may discourage divisional managers from making necessary profitable investments.

This proposal has an internal rate of return of 17 per cent (see working) which denotes a relatively attractive proposal. However, with the emphasis on short-term ROCE figures, this proposal is likely to be rejected.

(b) Both performance indicators compare the profit generated with the assets used to produce them. ROCE is a ratio which may be used to compare operations irrespective of the scale of operations. Residual income (RI) is an absolute value that is dependent upon the scale of operation.

If the two divisions are reassessed using RI, we have:

Division	*Operating profit* £	*Finance charge* £	*RI* £
K	649,000	528,000	121,000
D	120,000	58,000	62,000

In this analysis, Division K has a better residual income, twice that of Division D, but this has required nine times the assets to achieve this result. Thus, it would not be appropriate to set the same target RI for divisions that have significantly different asset values.

Residual income, like ROCE, tends to increase over the life of an asset. That is, as the asset is depreciated, the finance charge decreases. However, so long as a new investment generates profit at a rate above the company's cost of capital it will increase the total RI of the division. Thus, it is less likely to discourage new investment.

The advantage of the ROCE ratio is that one year's one company's result is comparable with another result. The RI may vary from year to year, or from company to company, as the market interest rate or company cost of capital varies.

Both performance indicators value the assets at net book value, but this may not reflect technological obsolescence compared with the organisation's competitors. Many other factors may affect the division's profitability, for example, calibre of management, degree of competition in the market place, etc. Thus, neither ROCE nor RI can be used on its own to measure how successfully a division has performed.

Thus, I disagree with the financial controller's proposal to merely replace one key indicator with another; a mixture of indicators is required.

Working

$$\text{IRR, investment inflow ratio } \frac{£320{,}000}{£76{,}000} = 4.21$$

From annuity tables the sum of discount factors over eight years that equals 4.208 is for 17 per cent. Therefore IRR = 17 per cent.

☑ Solution 40

Do not get carried away with the extra capacity available in part (b)! Remember that the output may also be constrained by the weekly demand.

(a)

Key source	*Machine Z time*
Time on key resource	$\frac{40}{30} = 1.3333$ hr/unit
Return per factory hour	$\frac{£2{,}000 - £600}{1.3333} = £1.050$
Cost per factory hour	$\frac{£13{,}500 + £(450{,}000/48)}{40} = £571.88$
Throughout accounting ratio	$\frac{£1{,}050}{£571.88} = 1.84$

(b) The reliability of machine X is $(160 - 17.5) \times 100/160 = 89\%$

The existing output capacities per week are:

Machine X	*Machine Y*	*Machine Z*
40	52	30

The output may be increased to 36 if machine F replaces machine Z or to 40 (machine X limiting) if machine G is purchased or to 45 (180 ÷ 4) if machine X is overhauled. The output may also be constrained by demand.

		Production		
Month	*Present machinery*	*Machine F*	*Machine G*	*Machine G and overhaul*
Jan	120	120	120	120
Feb	120	120	120	120
Mar	120	132	132	132
Apr	120	144	144	144
May	120	144	156	156
Jun	120	144	160	176
Jul	120	144	160	180
Aug	120	144	160	180
Sep	120	144	160	168
Oct	120	144	160	160
Nov	120	132	132	132
Dec	1,120	1,120	1,120	1,120
	1,440	1,632	1,724	1,788
Additional units each year	192	284	348	

Value added per unit	£
Selling price	2,000
Less: Materials	600
	1,400

	Machine F	*Machine G*	*Machine G and overhaul*
	£000	*£000*	*£000*
Additional value added	268.8	397.6	487.2
Less: Additional costs	120.0	216.0	216.0
Net gain each year	148.8	181.6	271.2

Cash flows	*Discount Factor*	*Machine F* £	*Machine G* £	*Machine G and Overhaul* £
Year 0				
Machine cost	1	(330,000)	(550,000)	(550,000)
Overhaul	1			(100,000)
Years 1–4				
£148,800	3.170	471,696		
£181,600	3.170		575,672	
£271,200	3.170	141,696	125,672	859,704
NPV		141,696	25,672	209,704

The combination of machine G and overhauling machine X has the greatest NPV and should be undertaken. The lowest cost option to overhaul machine X is not worthwhile on its own, as machine X is not presently limiting output.

If the overhaul is not possible for any reason then machine F should be purchased.

(c) The analysis is very sensitive to the output figures, that is, sales demand and production capacity used.

For the combination machine G and overhaul, an annual reduction of 4 per cent in output from 1,788 to 1,716.5 units would render the proposal quite uneconomic:

Extra units	276.5
Extra added value	£387,100
Net gain each year	£171,100
NPV	= £171,100 × 3.170 − £650,000 = (£107,600)

A 10% reduction in selling price to £1,800 would be required to render the proposal uneconomic, i.e.

Extra added value	$= £487{,}200 \times \dfrac{1{,}200}{1{,}400} = £417{,}600$
Net gain each year	= £201,600
NPV	= £201,600 × 3.170 − £650,000 = (£10,928)

Solution 41

(a) Throughput may be defined as:

The rate of production of a defined process over a stated period of time.
CIMA Official Terminology

Or as:

Sales revenue less direct material cost.
Goldratt and Cox

The concepts underlying throughput accounting are that:

In some organisations all labour costs are fixed costs, as are all overhead costs. Therefore, the only variable cost is the cost of direct materials.

Direct material inventory should be minimised in line with a JIT approach. Therefore the direct material cost used by Goldratt and Cox is the purchase cost for the time period not the cost of direct material used in that time period.

The aim of the 'throughput accounting' approach is to ensure that production schedules maximise the 'throughput' value in each time period. This should focus management attention on:

removing bottlenecks to achieve increased production and hence increased profit;
maximising the effectiveness of the whole system rather than concentrating on specific components within it;
manufacturing the optimum product mix as determined by this approach.

(b) The return per factory hour shows the rae of added value or contribution based on the premise that direct material costs are the only variable cost for the organisation. This ratio is used to rank different products that use the same bottleneck resource in the production process. The product with the highest value of this ratio is given highest ranking.

The throughput accounting ratio compares the rate of added value or contribution compared to the rate at which the organisation incurs production costs. If this ratio is greater than one then the organisation is generating contribution at a greater rate than it is generating production costs. Therefore, products should only be produced if this ratio is greater than one.

The proposal that MN Ltd should replace machine Z with machine G and overhaul machine X generates a sizeable NPV using MN's cost of capital. However, the throughput ratio declines from that generated by the present production process. This shows that for this proposal the relative increase in conversion costs is greater than the relative increase in value added. This is equivalent to a declining ROCE for an attractive (NPV) project.

(c) As throughput accounting strives to maximise production of saleable product two further ratios which may be used are availability of machinery/processes and the level of 'on specification' production produced:

$$\text{Availability} = \frac{\text{Process time}}{\text{Scheduled time}} \times 100$$

For the bottleneck in the process, the scheduled time will be the total production time in the period. An availability of less than 100 per cent for the bottleneck-processing step will reduce the throughput, i.e. the profitability of the operation.

If other process steps have availabilities of less than 100 per cent, then buffer stock may need to be held to ensure that the bottleneck-processing step is not deprived of material flow. For processing steps with poor availabilities, there is likely to be an economic incentive (throughput and stock-holding costs) to improve the situation:

$$\text{The level of 'on specification' output} = \frac{\text{Good production}}{\text{Total production}} \times 100$$

Obviously, production that fails to meet quality standards requires reworking, incurring extra costs. A more critical ratio would be the level of 'on specification' output from the bottleneck-processing step, as below quality material will need to use up bottleneck source time to transform it to saleable product. Hence, throughput capacity is lost as well as incurring rework costs.

These two ratios are sub-ratios of the throughput ratio:

$$\begin{aligned}\text{Throughput ratio} &= \frac{\text{Good production}}{\text{Total schedule time}} \\ &= \frac{\text{Total units}}{\text{Process time}} \times \text{Availability} \times \text{Level of 'onspec' output}\end{aligned}$$

(d) Throughput accounting and contribution (in marginal costing) use the same concept. They both calculate the difference between sales revenue and variable costs to determine a contribution that is used to cover the fixed costs of the organisation. In both approaches, the rate of contribution generated from different products using the same processing sequence can be used to rank the products and determine the optimum production mix.

One of the differences between these two approaches is in what constitutes the variable costs of the organisation. In marginal costing, normally direct labour costs and some overhead production costs are analysed to see if they are variable costs. However, in throughput accounting they are treated as fixed costs.

Furthermore, in throughput accounting there is a disincentive to produce goods unless there is a real demand for them. This disincentive is in the form of deducting the cost of all purchases of direct materials rather than only deducting the cost of direct materials used. The latter is used in marginal costing.

(e) The production manager and the management accountant need to focus on meeting scheduled output and maintaining low levels of inventory. The replacement of machine Z with machine G and the overhaul of machine X will increase capacity by removing existing bottlenecks. The new output constraints are Demand or Capacity, that is,

Machine X	45 units per week
Machine Y	54 units per week
Machine G	45 units per week

Therefore, both machines X and G will become the new bottlenecks during the period June to October. Therefore, the project must be completed and full capacity on these processing steps must be ensured by the first of June. Once the project is completed, the availability and the level of 'on specification' output must be monitored and reported for all the machines, but for these two machines in particular. The return per factory hour based upon these bottlenecks and the throughput ratio will also need to be monitored and reported along with any physical, real-time indicators that aid the workforce in maximising throughput.

Solution 42

(a)

	Division TM		*Division FD*	
Current situation	*£000*	*£000*	*£000*	*£000*
Sales				
Internal				990
External		7,500		400
		7,500		1,390
Less				
Variable costs				
Production	5,490		800	
Selling and distribution	375	5,865	20	820
Contribution		1,635		570
Less				
Fixed costs				
Production overheads		900		400
Administration overheads		375		80
Net profit		360		90
Less				
Imputed interest charge		180		90
Residual income		180		Nil
Target residual income		105		85
Bonus awarded		£9,000		Nil

Comment

The manager of Division TM is happy as he has exceeded the target residual income and earned a bonus of £9,000.

The manager of Division FD is unhappy as he has not achieved the residual income target and therefore has been awarded no bonus.

This situation may result in demotivation in Division FD, which will impart on efficiency levels and the quality of the product. This, in turn, can lead to high staff turnover, dissatisfied customers and so on, which will incur additional costs for the group as a whole.

The current situation is clearly not acceptable and a resolution must be achieved.

(b) (i) The transfer price per unit which Division TM will be willing to pay in order to achieve the 5% bonus is calculated as follows:

	£000
Current residual income	180
Target residual income	105
Decrease acceptable	75

Division TM could suffer a decrease of £75,000 in residual income and the manager could still achieve the bonus. This would be shared over 15,000 units transferred. Therefore, the price of each unit could rise by £5 (£75,000/15,000) to £71.

(ii) The transfer price per unit which Division FD will want to charge in order to achieve the 5% bonus is calculated as follows:

	£000
Current residual income	Nil
Target residual income	85
Increase required	85

Division FD needs an increase of £85,000 in residual income so that the manager can achieve the bonus. This would be gained from the 15,000 units transferred. Therefore, the transfer price of each unit would rise to £71.67 [(£85,000/15,000) + £66].

(c) **Report**

To: Management
From: Management Accountant
Re: Recommended Transfer Prices
Date: 20 November 2002

The transfer price should be set at marginal cost plus the opportunity cost to the company as a whole of supplying the unit internally.

For up to 20,000 mouldings the opportunity cost is zero as FD Division has spare capacity. The transfer price should therefore be set at £40.00, that is, the marginal cost. TM Division would only wish to purchase externally at a price of less than £40.00, which would not be a sub-optimal decision for the group.

Therefore, if FD Division' external customer demand increased from 5,000 mouldings to 10,000 mouldings then the transfer price should be set at £40 per moulding as no opportunity cost arises due to the level of spare capacity. However, if FD Division's external customer demand exceeded 10,000 mouldings, then the transfer price would be set at £80 for each moulding which displaces an external sale. This is because in order to satisfy the internal transfers to TM Division, FD Division would have to forgo external sales.

However, if the price is set at £71.67, a sub-optimal situation could arise if TM Division discovers a source of external supply of mouldings at a price which is between £40.00 and £71.67. Unless TM Division is obliged to purchase internally, a sub-optimal decision would result because TM Division would be paying more for each component than it costs to manufacture internally within the group.

It would be unsatisfactory for Division FD to use a transfer price equal to marginal cost, that is, £40.00, as they would not cover their fixed costs. A transfer price of £40.00 will also not allow the manager to achieve their residual income target and therefore their bonus. Division FD may take the view that they will only sell externally because to transfer internally at variable costs will not rewarded them any profit.

If Division FD took this view and Division TM could not source the mouldings externally they would make no sales. This would be unsatisfactory for the company as a whole, as it would cause a large fall in profit. Division TM would achieve their residual income target if the transfer price were £71, that is, £0.67 less than the desired transfer price for Division FD.

Therefore, a conflict exists between the objectives of the two divisions and a solution will need to be found that rewards both divisions and eliminates this sub-optimal situation. The company could opt for one of the following solutions:

1. *Dual Pricing System*
   This is where the transfer price is at marginal cost, that is, £40 per moulding and at the end of the period a proportion of the overall profit arising from the final sales of the 'TX' is credited to Division FD. The disadvantage of this system is that the proportion of profit to "… be credited to Division FD is determined centrally and this therefore undermines divisional autonomy. A variation of this system is where Division FD transfers at market price, that is £80, and Division TM accounts for the transfers at marginal cost, that is £40, and a discrepancy account is held in head office records. This avoids sub-optimal decision making but it can be administratively cumbersome. However, this method questions the objectivity of residual income as a basis of performance measurement.

2. *Two-Part Tariff System*
   This is where the transfer price is at marginal cost, that is, £40 per moulding and at the end of the period a fixed fee is credited to Division FD which represents an allowance for fixed costs. The disadvantage of this system is that the fixed cost fee to be credited to Division FD is determined centrally and this therefore undermines divisional autonomy.

3. *Negotiated Transfer Price*
   Perhaps Division FD and Division TM can negotiate a transfer price which is acceptable to both. This will depend on the ability of the divisional managers to compromise and also the divisional politics involved. A problem that may be encountered with this method is that if two divisional managers cannot agree, they may then have to seek a decision from central management on what transfer price to charge. If this is the case, then it undermines the main criterion set out for transfer prices, that is, that the divisions should remain as autonomous decision making units.

   If no agreement can be found between Division FD and Division TM, then head office may impose a transfer price which maximises the profit of the company as a whole. If this method is used, then it undermines divisional autonomy and can be demotivating for the managers involved.

Signed: Management Accountant"

✓ Solution 43

(a) Increased competition and technology changes like computer-aided design (CAD), flexible-manufacturing systems (FMS) and computer-integrated manufacturing (CIM), along with the TQM philosophy and JIT manufacturing systems, will dramatically change the manufacturing environment for X Ltd.

To respond to these changes, many new costing systems, for example, target costing, have been introduced and other more traditional costing systems have been adapted. One of the more traditional costing systems is standard costing which X Ltd is currently using. This is a control technique which compares standard costs and revenues with actual results to obtain variances which are used to stimulate control action to achieve improved performance.

The use of standard costing in today's manufacturing environment is criticised and as a result X Ltd may have to adapt it to cope with the changing nature of their business.

Such criticisms and how they have been remedied are discussed below:

The changing nature of product cost structures has affected the application of standard costing in that overhead costs have become a more significant element of total cost and direct labour cost has decreased considerably. This is as a result of the large-scale investment made in production equipment. As standard costing is focused on controlling direct costs and therefore variable costs its usefulness is now being questioned where there is a large amount of fixed costs and indirect costs.

However, research shows that variable costs are still a significant proportion of total costs, such as direct material costs and variable overheads and under these circumstances standard costing is an important cost accounting method.

Standard costing in the new manufacturing environment now places less emphasis on direct labour cost variances. This environment has developed other variances which focus on critical inputs to the production process, for example machine hours, direct material costs, variable overhead costs and product quality.

Standard costing is inconsistent with many of the modern management philosophies today. Many of today's manufacturing organisations have adopted techniques like TQM, ABC and ABM which focus on cost control, the elimination of rejects and the maintenance of high quality products which are delivered to the customer at the right price and at the right time.

Standard costing in some ways contradicts these modern techniques, as it requires managers to be responsible for their own variances which, in some cases, motivates managers to achieve favourable variances at the detriment of quality, for example, purchasing poor quality materials at a lower price. The same issues arise in relation to increasing actual volume above budgeted volume leading to favourable volume variances but increasing inventory levels. The emphasis is too much on cost minimisation rather than on the maintenance of product quality and customer care.

Standard costing has been adapted so that the cost driver analysis derived from an activity based management system is now used to calculate variances beyond those traditionally calculated under standard costing. X Ltd's steps in introducing the ABC system will provide them with more useful variance information.

Traditionally, it was quite usual for variances to be reported on a monthly basis and this time delay in reporting is of little use to the control of day-to-day operations. Many manufacturing companies have implemented real time information systems, which calculate the variances on a real time basis and allow for corrective action to be taken sooner. CAD, for example, allows the control of production costs at the pre-production stage and can be used alongside target costing as a way of controlling costs before they are incurred and in a way which reflects market costs.

The variances calculated from a standard costing system are too aggregate, that is they are not normally specific to product lines or production batches and this makes it difficult for managers to determine their cause. Adapting the standard costing system to allow for a broader analysis has been undertaken by many manufacturing organisations.

Traditionally, one of the crucial factors of standard costing was a stable production process. Today's manufacturing environment has less stable production processes in that many different products are produced on the same production lines. It is, therefore, important that standard costing is customised to reflect this.

Shorter product life cycles mean that standard costing information can quickly become out of date and therefore needs to be regularly updated, otherwise its application will be very limited. The modern manufacturing environment has embraced the need to keep the standard cost data up-to-date.

The majority of manufacturing organisations still use standard costing and it is therefore unlikely that it will ever be completely abandoned. It has, however, become an integral part of the cost management systems in today's manufacturing environment and tends to be broadened to provide whatever variance information the organisation may need from time to time. So even if standard costing were to be abandoned for cost control and performance evaluation purposes, it will still have a specific use for inventory valuation, profit measurement and decision-making.

(b) *Fixed overhead expenditure variance – $2,300(A)*

This variance represents the difference between the fixed production overhead that should have been incurred in the period and that which was incurred. The adverse variance indicates that actual fixed production overhead incurred was more than budgeted for the period.

The total fixed overhead expenditure variance does not pinpoint the precise reason for the variance occurring as any difference will be the result of a combination of reasons. Therefore, it would be more appropriate to detail the actual fixed production overhead costs compared to that budgeted for each individual item. Without this level of detail, this variance would be difficult to use for decision-making purposes, for example, the identification of specific fixed costs that would arise as a result of a decision being made.

Fixed overhead capacity variance – $10,000(F)

This variance represents the over or under absorption of fixed production overhead costs, caused by the actual hours worked differing from the hours originally budgeted to be worked. It appears that X Ltd has managed to increase its capacity by 1,000 hours resulting in this favourable variance.

Fixed overhead efficiency variance – $5,000(A)

This variance represents the over or under absorption of fixed production overhead costs caused by actual labour efficiency differing from the standard level of labour efficiency. While the capacity was favourable, this variance indicates that labour did not work efficiently, using 1,000 extra actual hours to produce only 5,000 extra diaries, rather than the standard output of 10,000 diaries.

The purpose of the fixed overhead efficiency and capacity variances is to assist management's understanding of the causes of the variances. The use of these variances is limited in that it is only possible to calculate them under an absorption costing system. With an absorption costing system it is sometimes difficult to decide which costs are really fixed in nature. Also the usefulness of attaching a value for fixed overheads is questionable as fixed overheads often represent sunk costs and such costs are not appropriate for decision-making purposes. Perhaps it would be more appropriate to measure this variance in terms of lost contribution arising from lost sales. Also the use of labour hours as a driver of fixed costs may not be meaningful in the modern manufacturing environment in which X Ltd currently operates.

(c) (i) *Overhead expenditure variances*

These variances measure the difference between the actual production overhead costs and those in a budget flexed on the actual number of orders executed and the number of production runs.

Material handling has a $2,200 favourable variance indicating that the actual production overhead costs were less than the budget flexed on the actual number of orders executed.

This would be calculated as follows:

Material handling	$	
Standard cost ($30,000/5,000 × 5,500)	33,000	
Actual cost	30,800	
Variance	2,200	(F)

The set up cost has a $6,500 adverse variance indicating that the actual production overhead costs were more than the budget flexed on the actual number of production runs.

This would be calculated as follows:

Set ups	$	
Standard cost ($70,000/2,800 × 2,600)	65,000	
Actual cost	71,500	
Variance	6,500	(A)

These variances provide useful information as they compare each individual item of overhead expenditure against the budget.

Overhead efficiency variances

These variances measure the difference between the overhead cost budget flexed on the actual number of orders executed and the actual number of production runs and the overhead cost absorbed by the activity achieved.

Material handling – $1,500(A)

This variance indicates that the actual number of orders executed was more than expected for the output achieved resulting in this adverse variance.

This would be calculated as follows:

Material handling		
Standard orders executed		
(5,000/100,000 × 105,000)	5,250	
Actual orders executed	5,500	
Variance	250 × $6 = $1,500	(A)

Set up – $8,500(F)

This variance indicates that the actual number of production runs was less than expected for the output achieved resulting in this favourable variance.

This would be calculated as follows:

Set ups		
Standard production runs		
(2,800/100,00 × 105,000)	2,940	
Actual production runs	2,600	
Variance	340 × $25 = $8,500	(F)

(ii) When X Ltd implemented ABC the first stage in the process will have been to identify the major activities involved in the manufacturing of the electronic diaries. Examples of such activities are machine related activities, direct labour related activities and various support activities (ordering, receiving and so on). They will have identified the factors that influenced the cost of these activities, that is, the cost drivers and a cost pool will then have been established for each activity and these costs will then have been traced to the electronic diaries based on the consumption estimates of these activities during the manufacturing process.

By implementing the ABC system it has become apparent that the traditional volume based cost variances are replaced with activity based cost driver variances which will provide more useful information as to the cause of such variances as these more accurately reflect the cause of resource consumption. So instead of aggregating all of the overhead costs as in the standard costing system such overhead costs under an ABC system will be broken down based on the resources consuming those costs. The extent to which it leads to more accurate costing will depend on the analysis undertaken when determining the cost drivers.

The more detailed variances reported under the ABC system will allow the managers of X Ltd to gain better control of these areas and will assist in future planning and decision-making.

This Page Intentionally Left Blank

Index

ELSEVIER

CIMA PUBLISHING

Give CIMA Publishing Your Feedback and Win a Prize

Win your choice of 3
further CIMA Official *Study Systems* or an IPOD

Help us to improve our product for next year by telling us of your experience in using this product. All feedback forms returned will be entered into a prize draw. The first three forms drawn on 31 July 2006 will receive either three *Study Systems* of their choice or an IPOD. The winners will be notified by email.

Feedback form:

Management Accounting Performance Evaluation

CIMA Official *Study Systems* 2006 Editions

Name: __________

Address: __________

Email: __________

How did you use your CIMA Official *Study Systems?*

☐ Self-study (book only)

☐ On a full course?

How long was the course? __________

Which college did you attend? __________

☐ On a revision course?

Which college did you attend? __________

☐ Other __________

Additional comments: __________

How did you order your CIMA Official *Study Systems*?

☐ Carrier sheet from CIMA Insider magazine

☐ CIMA Publishing catalogue found in CIMA Insider magazine

☐ Order form from the back of previous *Study System*

☐ www.cimapublishing.com website

☐ Bookshop

Name __________

Branch __________

☐ Other __________

Additional comments: __________

Your ratings and comments would be appreciated on the following aspects. Please circle your response, where one indicates an excellent rating and four a poor rating.

	Excellent			Poor
☐ Topic coverage	1	2	3	4
☐ Accuracy	1	2	3	4
☐ Readings	1	2	3	4
☐ End of chapter questions and solutions	1	2	3	4
☐ Revision section	1	2	3	4
☐ Layout/Presentation	1	2	3	4
☐ Overall opinion of this study system	1	2	3	4

Additional comments:

Would you recommend CIMA Official *Study Systems* to other students?

Please circle: Yes No

Additional comments:

Which CIMA Publishing products have you used?

☐ CIMA Official *Study Systems*
☐ Q&As
☐ CIMA Inter@ctive CD-ROMs
☐ CIMA Revision Cards
☐ CIMA Exam Practice kits

Additional comments:

Are there any related products you would like to see from CIMA Publishing? If so, please elaborate below.

Please note any further comments or errors found in the space below.

Thank you for your time in completing this questionnaire. We wish you good luck in your exam.

Please return to:
Steve Brewster
CIMA Publishing
FREEPOST - SCE 5435
Oxford, OX2 8BR UK

Or Fax: FAO S.Brewster to: +44 (0) 1865 314455

Order Form

for CIMA Official Study Materials for 2006 Exams

ELSEVIER

CIMA PUBLISHING

Qty	Title	Authors	ISBN	Prize	Total
	CIMA Official *Study Systems*		**Available Now**		
	Performance Evaluation	Scarlett	0750667117	£33.00	
	Decision Management	Wilks / Burke	0750667125	£33.00	
	Risk and Control Strategy	Collier / Agyei-Ampomah	0750667168	£33.00	
	Financial Accounting and Tax Principles	Rolfe	0750667133	£33.00	
	Financial Analysis	Gowthorpe	0750667141	£33.00	
	Financial Strategy	Ogilvie	075066715X	£33.00	
	Organisational Management and Information Strategy	Perry	0750667095	£33.00	
	Integrated Management	Harris / Sims	0750667109	£33.00	
	Business Strategy	Botten / Sims	0750667168	£33.00	
	TOPCIMA	Barnwell / Sims	0750667176	£33.00	
	Management Accounting Fundamentals	Walker	0750667087	£33.00	
	Financial Accounting Fundamentals	Lunt / Weaver	0750667044	£33.00	
	Business Mathematics	Peers	0750667052	£33.00	
	Economics for Business	Adams / Periton	0750667060	£33.00	
	Business Law	Sagar / Mead	0750667079	£33.00	
	CIMA Official Revision *Cards*				
	Performance Evaluation	Scarlett	0750664819	£6.99	
	Decision Management	Avis	0750664827	£6.99	
	Risk and Control Strategy	Harris	0750664835	£6.99	
	Financial Accounting and Tax Principles	Rolfe	0750664878	£6.99	
	Financial Analysis	Gowthorpe	0750664886	£6.99	
	Financial Strategy	Ogilvie	0750664894	£6.99	
	Organisational Management and Information Systems	Perry	0750664843	£6.99	
	Integrated Management	Harris	0750664851	£6.99	
	Business Strategy	Botten	075066486X	£6.99	
	Management Accounting Fundamentals	Walker	0750664770	£6.99	
	Financial Accounting Fundamentals	Holland	0750664762	£6.99	
	Business Mathematics	Peers	0750664800	£6.99	
	Economics for Business	Adams	0750664789	£6.99	
	Business Law	Sagar	0750664797	£6.99	
	CIMA Official *Exam Practice Kits*				
	Performance Evaluation	Barnett / Dawkins	0750665882	£14.99	
	Decision Management	Dawkins / Barnett	0750665890	£14.99	
	Risk and Control Strategy	Robertson	0750665920	£14.99	
	Financial Accounting and Tax Principles	Patel / Channer	0750665904	£14.99	
	Financial Analysis	Rodgers	0750665912	£14.99	
	Financial Strategy	Graham	0750665939	£14.99	
	Organisational Management and Information Systems	Robertson	0750665874	£14.99	
	Integrated Management	Best / Dalton	0750665815	£14.99	
	Business Strategy	Graham	0750665823	£14.99	
	Management Accounting Fundamentals	Allan	0750665807	£14.99	
	Financial Accounting Fundamentals	Patel	0750665831	£14.99	
	Business Mathematics	Allan	0750665866	£14.99	
	Economics for Business	Allan	075066584X	£14.99	
	Business Law	Benton	0750665858	£14.99	
	CIMA CPD *Introduction to Business Tax*	Jones	0750666390	£44.99	
	Nov 2004 Q&As *Complete Set – Intermediate*	CIMA	0750667443	£24.99	
	Nov 2004 Q&As *Complete Set – Final Level*	CIMA	0750667451	£24.99	
		Postage and Packing		£2.95	
		TOTAL			

Elsevier retains certain personal information about you in hard copy form and on computer. It will be used to inform you about goods and services from Elsevier and its associated companies in which you may be interested. ☐ Please tick this box if you do not want to receive this information.

Post this form to:

CIMA Publishing Customer Services
Elsevier
FREEPOST (OF 1639)
Linacre House, Jordan Hill
OXFORD, OX2 8DP, UK

Or **FAX** +44 (0) 1865 474 010
Or **PHONE** +44 (0) 1865 474 014
Email: cimaorders@elsevier.com
www.cimapublishing.com

Name: ____________________

Organisation: ____________________

Invoice Address: ____________________

____

____

____

Postcode: ____________________

Phone number: ____________________

Email: ____________________

Delivery Address if different:

FAO ____________________

Address ____________________

____

____

____

Postcode ____________________

Please note that all deliveries must be signed for

1. Cheques payable to Elsevier.

2. Please charge my:

☐ Visa/Barclaycard ☐ Access/Mastercard

☐ American Express ☐ Diners Card

☐ Switch Issue No.______

Card No. ____________________

Expiry Date: ____________________

Cardholder Name: ____________________

Signature: ____________________

Date: ____________________