

Chapter 22

Standard costs

REAL WORLD CASE

This case study shows a typical situation in which management accounting can be helpful. Read the case study now but only attempt the discussion points after you have finished studying the chapter.

This extract describes the evaluation of a project to explore and develop the production of the precious metal platinum in South Africa.

Anooraq Resources Corporation announces the results of a preliminary economic assessment of the Drenthe and adjacent Overysel North platinum group metals ('PGM') deposits. The Drenthe and Overysel North deposits are being explored and developed under the Boikgantsho Platinum Mine Joint Venture agreement ('Boikgantsho JV') between Anooraq and Anglo American Platinum Corporation Limited ('Anglo Platinum'). Anooraq is the operator of the joint venture. The Boikgantsho JV property is located on the northern limb of the Bushveld Complex, about 250 kilometres north of Johannesburg, South Africa.



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As operator, Anooraq is responsible for exploration and engineering activities. This Preliminary Assessment has been conducted by in-house and external independent qualified persons employed by Anooraq. Anglo Platinum has not been involved in the preparation of the Preliminary Assessment nor in the evaluation of the results thereof. The study uses industry standard costs for all phases of the proposed development including the smelting and refining, and makes assumptions about the concentrate to be produced. Industry standard costs are also used in estimates of the cost for socio-economic activities, i.e. community involvement, relocation and other related issues. However, until there are final agreements on these and related matters there is no assurance that these costs will not change.

Source: *Business Wire*, 9 March 2005, 'Anooraq Resources Corporation: Preliminary Assessment Indicates Strong Returns for Development of Drenthe & Overysel North Platinum Group Metals Deposits'.

Discussion point

- 1 How will the use of standard costs help to reassure potential investors in this project?
- 2 Why will the standards need to be specific to the industry?

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Learning outcomes

After reading this chapter you should be able to:

- Define the terms 'standard cost' and 'variance'.
- Explain the purpose of using standard costs.
- Describe the problems of choosing the level of output for standards.
- Explain how the control process uses standard costs and variances.
- Define and calculate direct materials cost variance and its components.
- Define and calculate direct labour cost variance and its components.
- Define and calculate variable overhead cost variance and its components.
- Define and calculate fixed overhead expenditure variance.
- Combine calculation of all variances in a case study.
- Explain how variances may be investigated.
- Explain the application of flexible budgets in variance analysis.
- Use flexible budgeting to calculate variances in a case study.
- Discuss the usefulness of variance analysis.
- Understand the broader views that exist regarding variance analysis.

22.1 Introduction

Chapter 22 has explained the budgetary process and illustrated in detail a method of preparing budgets for planning purposes. The use of budgets for control purposes was explained in that chapter in terms of comparing the actual outcome with the expected results as shown by the budget.

When actual costs are compared with budgeted costs, the comparison is of the total cost for the line item under consideration (e.g. cost of various types of materials, cost of various categories of labour or cost of a range of categories of overheads). Where there is a significant difference between the budget and the actual outcome, that difference may be investigated. (It has to be remembered, however, that the investigation will itself have a cost and that cost may be minimised by first trying to narrow down the causes of the difference.)

To analyse the difference between what was expected and what actually happened, it is useful to make comparisons in terms of cost per unit rather than total cost of a line item in the budget. Such costs per unit may be estimated in advance and used as a standard against which to compare the actual costs incurred. The cost per unit, measured in advance of the operations to be undertaken, is called a **standard cost**.

Definition

Standard cost is the planned unit cost of the products, components or services produced in a period.¹

Once the standard cost has been decided, the actual cost may be compared with the standard. If it equals the standard then the actual outcome has matched expectations. If the actual cost is greater than, or less than, the standard cost allowed, then there will be a variance to be investigated. This chapter explains how the standard costs may be determined and how the variances may be quantified.

Definition

A **variance** is the difference between a planned, budgeted or standard cost and the actual cost incurred.²

22.2 Purpose of using standard costs

It has already been shown (in Chapter 17) that calculation of the cost of an item of input or output may be analysed in terms of two measurements:

- 1 a physical quantity measurement multiplied by
- 2 a price measurement.

Actual costs are measured after the event by reference to the quantity of the resource used and its price. When the actual cost is measured there is no doubt as to the quantity and price.

Standard costs are measured in advance of the period of time to which they relate, so that estimation is necessary. This requires estimation of physical inputs and outputs, and monetary estimates of prices of inputs and outputs. In order to determine useful standards it is necessary first of all to consider the purpose for which the standards will be used. The purpose could cover any or all of the following:

- 1 to provide product costs for stock valuation;
- 2 to increase control within a budgeting system;

- 3 to gauge performance of a business unit by use of variance analysis;
- 4 to integrate costs in the planning and pricing structure of a business;
- 5 to reduce record-keeping costs when transactions take place at different prices.

This chapter will concentrate on items 2, 3 and 4 of the foregoing list, showing how variance analysis may be used for purposes of control, performance evaluation and planning. First, the standard cost is explained. The control process is then outlined by means of a flow diagram. Most of the chapter deals with the calculation and interpretation of variances in the cost of direct materials, direct labour and production overhead. That provides information to management for use in making judgements and carrying out performance evaluations. The final section discusses the usefulness of variance analysis based on standard costing in planning the efficient operation of the business.

22.3 The level of output to be used in setting standards

Calculation of the standard cost requires a view to be taken on the most appropriate physical measurement to incorporate in the cost calculation. Three approaches are instanced here. The first uses a basic level of output, the second looks to an ideal level of output and the third uses a currently attainable level of output.

The **basic standard** is one which never changes and consequently remains a permanent basis for comparison. This gives a base line against which to make long-term comparisons. It has the disadvantage of becoming increasingly unrealistic as circumstances change.

The **ideal standard** is one which applies in dream conditions where nothing ever goes wrong. It represents the cost incurred under the most efficient operating conditions. It is an almost unattainable target towards which an organisation may constantly aim, but it may also cause a lowering of morale in the organisation if staff can never reach the target.

Currently attainable standards lie between these two extremes, defined as standards which should normally equal expectations under 'normally efficient operating conditions'. They may represent quite stiff targets to reach, but they are not beyond possibility. Currently attainable standards are the most frequently used because they give a fair base for comparisons, they set a standard which ought to be achieved and they give staff a sense of achievement when the attainable target is reached. Thus they contribute to all the management functions of planning and control which were explained in Chapter 16.

Setting standards also relates to performance. A standard may be set by estimating in advance the expected performance of a work unit. This sometimes is called an *ex ante* standard (where 'ex ante' means 'before the event takes place'). Alternatively a standard may be set by observing performance and estimating what is realistically attainable. Because this method learns from the past performance it is sometimes called an *ex post* standard (where 'ex post' means 'after the event has taken place').

Although the standard cost may be quantified as a single figure, it may in practice represent a whole range of possible figures because it is an estimate from a range of possible outcomes. This chapter will apply a single-figure standard in illustrative case studies, without questioning further the basis on which the standard was created.

Activity 22.1

These first three sections of the chapter have explained the meaning of a standard and the various different approaches to the creation of a standard. Read the sections again and satisfy yourself that you are aware of the differences. That awareness will help you in thinking about the interpretation of variances.

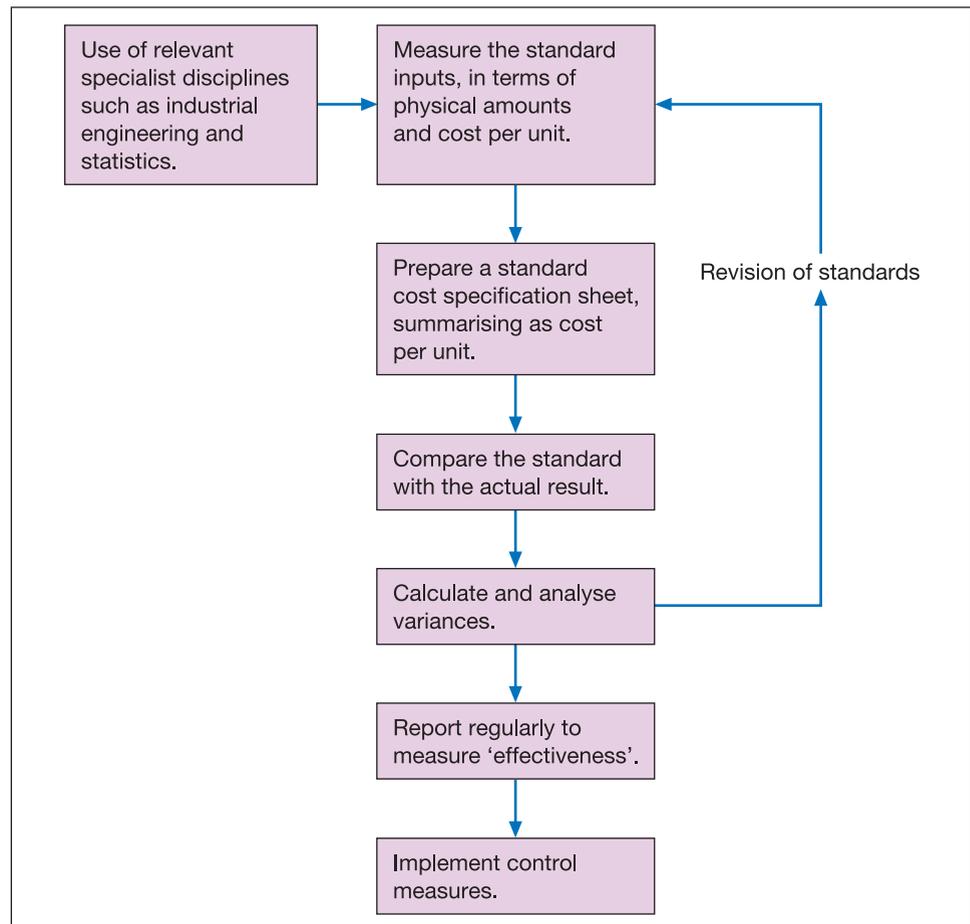
We now turn to an explanation of how standards are used in the control process.

22.4 The control process

Exhibit 22.1 shows the process of calculating and using standard costs for control purposes. The calculation of standards involves asking technical specialists, who are probably not management accountants, to specify the standard inputs of resources. The management accountant takes this information and prepares a standard cost specification, usually converting that to a cost per unit of input or output. Actual costs are then measured and compared with the standard. Variances which emerge are quantified, analysed and reported. This may lead to control actions in relation to eliminating variances. It may also lead to revision of the standard costs if they are no longer relevant.

Exhibit 22.1

Use of standards in the control process



The presence of a standard cost provides a benchmark against which to evaluate the actual cost. The technical term for this process is **variance analysis**. Cost variances may be described as **adverse** or **favourable**, depending on how the standard and the actual costs compare. If the actual cost is greater than the standard expected, then the variance is said to be 'adverse'. If the actual cost is less than the standard expected, then the variance is said to be 'favourable'. The existence of either type of variance could lead to investigation of the cause. The component costs must be investigated separately so that they may be separately analysed and interpreted. We now move on

to give more detail on the process of calculating and analysing variances for direct materials cost and direct labour cost.

Definitions

An **adverse variance** arises when the actual cost is greater than the standard cost.
 A **favourable variance** arises when the actual cost is less than the standard cost.

Activity 22.2

Suggest three situations in which a business organisation might decide to revise standards, as indicated in Exhibit 22.1, following calculation and analysis of variances. Is revision equally likely for adverse and for favourable variances? Make sure that you know the definitions of adverse and favourable variances. They will appear frequently in the following sections.

22.5 Direct materials cost variance

Take as a starting point one of the ingredients of prime cost: direct materials. If the actual cost differs from the standard cost, then the cause may lie in the materials usage, or in the price of the materials, or in a mixture of both. An adverse cost variance could indicate that the price paid was higher than expected when the standard was set, or it could indicate that the amount of materials used was greater than that expected.

In diagrammatic form:

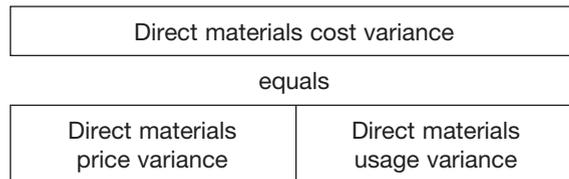


Exhibit 22.2 sets out in words the calculation of variances. Alongside there are abbreviated symbols for readers who are comfortable with an algebraic representation.

Exhibit 22.2

Calculation and formulae for direct materials variances

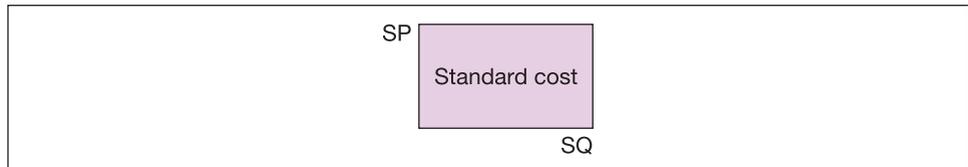
Variance	Calculation	Formula
Total cost variance	Standard cost of materials (SC) minus actual cost of materials (AC) This may be shown in more detail as: Standard cost (SC) = standard price per unit (SP) multiplied by standard quantity allowed (SQ) minus Actual cost (AC) = actual price per unit (AP) multiplied by actual quantity used (AQ)	SC – AC SC = (SP × SQ) minus AC = (AP × AQ)
Direct material price variance	Actual quantity used (AQ), multiplied by the difference between the standard price per unit (SP) and the actual price per unit (AP)	AQ (SP – AP)
Direct material usage variance	Standard price per unit of materials (SP) multiplied by the difference between the standard quantity (SQ) allowed and the actual quantity used (AQ)	SP (SQ – AQ)

At this point in learning about variance analysis, some students will ask: 'Why are the formulae in this form? I can see other combinations of symbols which could break the cost variance down into two components.' The answer is that there are other combinations but one of the aims of management accounting is to present relevant information. In the form given in the exhibit, these variances produce relevant information.

To understand the relevance of the variances, it may help to think of the standard cost as a rectangle whose area is measured by multiplying the standard price of materials by the standard quantity of materials used (Exhibit 22.3).

Exhibit 22.3

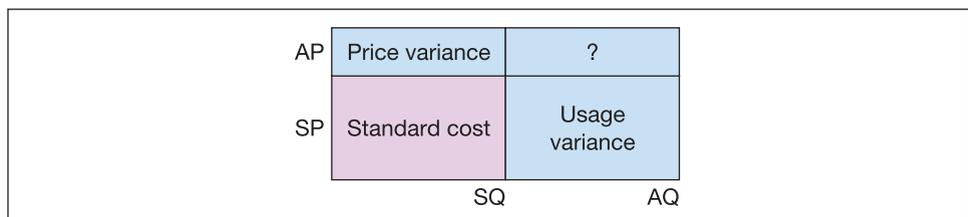
Representing standard cost as a rectangular area



Now imagine that the actual cost is greater than standard cost so that a rectangle representing actual cost will fit around the outside of the standard cost rectangle. Exhibit 22.4 shows the two rectangles together. The total cost variance is represented by the shaded area in the shape of an 'inverted L' to the top and right-hand side of the diagram. The top part of the blue shaded area represents variance caused by actual price being greater than standard price. The right-hand side represents variance caused by the actual quantity used being greater than the standard quantity allowed. In terms of management responsibility, the price variance will be in the hands of the purchasing department, while the usage variance will be in the hands of the production department. But who should be held accountable for the top right-hand corner where a question mark appears? This is a mixture of price variation and usage variation. The production manager will disclaim any responsibility for the price aspect and the buying department will say it has no control over quantity.

Exhibit 22.4

Representing actual cost and standard cost as two areas superimposed



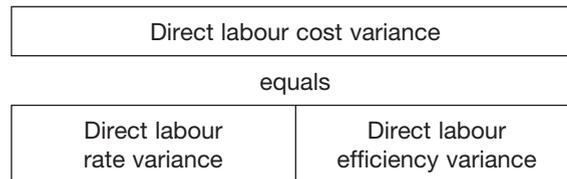
Management accounting is full of hard decisions and as far as possible tries to be fair. For the top right-hand corner of the diagram, that is almost impossible; however, there is a view that usage is within the organisation's control to a greater extent than the price of inputs taken from an external supplier. Management accounting therefore takes the view that the production manager's responsibility for usage should be limited in order to leave out the area containing the question mark. By default, therefore, that area at the top right-hand corner is allowed to fall entirely into the price variance.

Activity 22.3

Read this section again to ensure that you understand fully the method of calculating direct materials cost variance. Compare the formulae in Exhibit 22.2 and the diagram in Exhibit 22.4. If there is any step which you do not understand, seek help at this stage from your tutor or a fellow student.

22.6 Direct labour cost variance

The starting point in analysis of direct labour cost variances resembles closely that used for direct materials, except that the price variance changes its name to labour rate variance and the usage variance changes to labour efficiency variance.



The formulae for calculating direct labour variances are similar to those used for direct materials. They are shown in Exhibit 22.5.

Exhibit 22.5
Calculation and formulae for direct labour variances

Variance	Calculation	Formula
Total cost variance	Standard cost of labour (SC) minus actual cost of labour (AC) This may be shown in more detail as: Standard cost (SC) = standard labour rate (SR) multiplied by standard hours allowed (SH) minus Actual cost (AC) = actual labour rate (AR) multiplied by actual hours worked (AH)	SC – AC SC = (SR × SH) minus AC = (AR × AH)
Direct labour rate variance	Actual hours worked (AH), multiplied by the difference between the standard labour rate (SR) and the actual labour rate (AR)	AH (SR – AR)
Direct labour efficiency variance	Standard labour rate (SR) multiplied by the difference between the standard hours allowed (SH) and the actual hours worked (AH)	SR (SH – AH)

At this point you meet a new idea, that of the **standard hour**. A standard hour is defined as the amount of work achievable, at standard efficiency levels, in one hour.³ Suppose that a study has been carried out of work patterns at standard efficiency. It has been estimated that one employee can assemble 10 computer boxes in one hour. That defines the standard hour for that particular work. If 100 computer boxes are produced then the standard hours allowed are 10 hours. If the employee takes 11 hours to produce the 100 boxes, that is more than the standard allowed. Investigation will be required to find the cause. It could be the case that the employee worked too slowly. On the other hand, it could be the case that the employee worked at normal efficiency

but the components supplied were not of the usual specification and there were difficulties with the assembly process.

Definition

A **standard hour** is defined as the amount of work achievable, at standard efficiency levels, in one hour.⁴

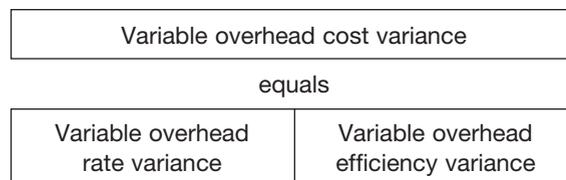
If you try to draw a diagram for direct labour variances, superimposing the actual cost on the standard cost as shown for direct materials in Exhibit 22.4, you will find that the area labelled with a question mark in Exhibit 22.4 has all been allocated to the rate variance. It is argued in management accounting that the organisation is more likely to have control over efficiency than it has over labour rate, which may well be determined by the labour market in general. The efficiency variance should therefore not include any element of variation in labour rate, and the top right-hand corner of the diagram is all taken into the rate variance.

Activity 22.4

Read this section again to make sure that you understand fully the formulae in Exhibit 22.5. Try to produce a diagram for direct labour similar to that drawn in Exhibit 22.4 for direct materials. Note down the similarities and the differences between the formulae for direct materials variances and the formulae for direct labour variances.

22.7 Variable overhead cost variance

It was explained in Chapter 17 that the most effective method of calculating an overhead cost rate is to calculate the overhead cost per direct labour hour. This is because labour working usually causes most of the overhead costs to be incurred (unless the business is highly machine-intensive). It will be assumed throughout this chapter that a standard cost of variable overheads can be expressed as a cost per direct labour hour. As well as being the preferred choice from Chapter 17, it also makes the calculation of variable overhead variances look very similar to the calculation of direct labour variances.



The variances are expressed in words and formulae in Exhibit 22.6.

Activity 22.5

Read this section again and make sure that you understand fully the formulae for calculating variable overhead cost variances. Compare these formulae with those used for direct labour cost variances. What are the points of similarity? What are the points of difference? Can you see consistent patterns in the variances for direct materials costs, direct labour costs and variable overhead costs?

Exhibit 22.6**Calculations and formulae for variable overhead variances**

Variance	Calculation	Formula
Total cost variance	Standard cost of variable overhead (SC) minus actual cost of variable overhead (AC) This may be shown in more detail as: Standard cost (SC) = standard variable overhead rate (SR) multiplied by standard hours allowed (SH) minus Actual cost (AC) = actual variable overhead rate (AR) multiplied by actual hours worked (AH)	SC – AC SC = (SR × SH) minus AC = (AR × AH)
Variable overhead rate variance	Actual hours worked (AH), multiplied by the difference between the standard variable overhead cost rate (SR) and the actual variable overhead cost rate (AR)	AH (SR – AR)
Variable overhead efficiency variance	Standard variable overhead cost rate (SR) multiplied by the difference between the standard hours allowed (SH) and the actual hours worked (AH)	SR (SH – AH)

22.8 Fixed overhead expenditure variance

Although a fixed overhead cost per unit may be calculated for purposes of valuing stock, it leads to all manner of problems because, by definition, fixed overhead costs do not vary with volume. For the purposes of control, it is more important to know whether the total amount of actual expenditure equals or exceeds the budgeted amount. Thus no attempt will be made here to deal with fixed overhead cost variances on the basis of a standard cost per unit. The variance which is most important is the *fixed overhead expenditure variance*, found by subtracting the actual fixed overhead incurred from the amount of fixed overhead budgeted (see Exhibit 22.7). If the actual fixed overhead is greater than the budget, there is an adverse variance. If the actual fixed overhead is less than the budget, there is a favourable variance.

Exhibit 22.7**Calculation and formula for fixed overhead variance**

Fixed overhead expenditure variance = Budgeted fixed overhead (BFO) minus actual fixed overhead (AFO)
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Activity 22.6

As a final check, go back to the start of the chapter and satisfy yourself that you understand everything presented up to this point. The rest of the chapter introduces no new technical material but it applies the formulae to a full example.

22.9 Case study: Allerdale Ltd

The chapter now moves into a case study as a means of providing an illustration of the calculation and interpretation of variances. Allerdale Ltd uses a manufacturing

process which involves fastening laminated surfaces on to workbenches. The material for the laminated plastic surface is purchased in large sheets and cut to size at the start of the process. The sheets of laminated plastic represent the direct materials cost of the process. Employees work on cutting and fastening the laminated surfaces and trimming them to fit. This work is classed as direct labour cost. Overhead costs are incurred in using indirect materials such as glues and staples, indirect labour such as cleaners for the production area, and the costs of heating, lighting and maintaining the factory premises. The overheads are partly variable (such as the indirect materials and power) and partly fixed (such as insurance, rent and business rates).

The variances in respect of direct materials, direct labour, variable overhead and fixed overhead are now explained in turn, using data provided by the accounting records.

22.9.1 Direct materials variances

Data for direct materials

The standard amount of laminated material allowed is two square metres per workbench. The standard price of the material is £0.90 per square metre. During the month of June, 200 workbenches were laminated. The amount of material used was 430 square metres and the price paid was £0.95 per square metre.

Calculations of direct materials variances are shown in Exhibits 22.8 and 22.9, using the formulae set out in Exhibit 22.2.

Exhibit 22.8

Calculation of direct materials total variance

The standard allowance is 2 square metres each for 200 workbenches, which is 400 square metres standard quantity (SQ) in total. Standard price per unit (SP) is £0.90 per square metre. Actual quantity used (AQ) is 430 square metres and actual price per unit (AP) is £0.95 per square metre.

$$\begin{aligned}
 \text{Total cost variance} &= \text{standard cost minus actual cost (SC - AC)} \\
 &= (\text{SP} \times \text{SQ}) \text{ minus } (\text{AP} \times \text{AQ}) \\
 &= (£0.90 \times 400 \text{ sq metres}) \text{ minus } (£0.95 \times 430 \text{ sq metres}) \\
 &= £360 \text{ minus } £408.50 \\
 &= £48.50 \text{ adverse variance}
 \end{aligned}$$

In Exhibit 22.8, the variance is **adverse** because the actual cost is greater than the standard cost set for the direct materials to be used. The total variance may be subdivided into direct materials price and usage variances, using the formulae from Exhibit 22.2 to give the analysis shown in Exhibit 22.9. The data for this calculation have already been set out in words and in symbols at the start of Exhibit 22.8. The same symbols and figures are used in Exhibit 22.9.

Exhibit 22.9

Calculation of direct materials price and usage variances

Price variance = AQ (SP - AP) = 430 sq metres (£0.90 - £0.95) = £21.50 adverse variance	Usage variance = SP (SQ - AQ) = £0.90 (400 - 430) = £27.00 adverse variance
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You will see that the actual price per unit of materials is 95 pence, which is greater than the 90 pence per unit set as a standard cost. The price variance of £21.50 is therefore adverse. The actual amount of direct materials used is 430 square metres, which is

greater than the 400 square metres set as a standard. The usage variance is therefore also adverse. The two variances, added together, equal the total adverse variance of £48.50 calculated in Exhibit 22.8. We now know that the overall variance is caused by both price and usage effects but that the usage problem is the greater of the two.

22.9.2 Adverse or favourable variances?

If you have followed these calculations yourself you will have obtained negative signs in each calculation. The negative sign corresponds to an adverse variance because in each case the actual outcome is worse than the predetermined standard. However, it is risky to rely on plus and minus signs, because it is easy to make careless errors in calculations and to turn the formula round accidentally. It is always safer to look at each calculation on a commonsense basis. The total cost variance will be adverse where the actual outcome is worse than the standard cost allowed. The price variance will be adverse where the actual unit price is greater than the standard price allowed. The usage variance will be adverse where the actual quantity used is greater than the standard quantity allowed.

22.9.3 What caused the variance?

It is often impossible to be definite about the cause of a particular variance but suggestions may be made as a basis for further investigation. A variance in the *price* of materials indicates that the actual price paid per unit differs from that expected when the standard was set. That could be because the price has changed, in which case the standard should be revised. The variance could be due to purchasing a more expensive quality of material, in which case there will need to be an investigation as to whether this was due to the production department requesting a higher quality than that permitted when the standard was set, or whether it was a procedural error in the buying department. Perhaps the higher quality was found to be necessary because the previous quality of materials was causing too much labour time to be wasted on substandard products. Variances may interact, which means it is important to look at the cost control picture as a whole.

A variance in the *usage* of materials may be an indication that lack of quality in the materials is causing too much wastage. It may be that employees have not received sufficient training in the best way of using the material. Perhaps a new machine has been installed which operates much faster to meet expanding demand levels but has a naturally higher wastage rate.

Once the calculation of two variances has been mastered, the mathematically minded student soon realises that the subdivisions could be taken further. The usage variance may be split into a yield variance, comparing what goes in with what comes out of the process, and a mix variance, looking at the effect of having a different mix of input materials than was planned when the standard was set. That level of detailed analysis will not be taken further here, but you should be aware that there is a world of detail, to explore at another time, in relation to variance analysis.

Some of the foregoing causes of variance may lead to remedial action. Others may lead to a decision that it is in the interests of the organisation to accept the difference and revise the standard accordingly. Fiona McTaggart gives her views.



FIONA: *I see my job as reporting the variances accurately and in good time. The decisions on how to use those variances are for those who manage the operations of the business. If they tell me that a variance has become an accepted part of the operation, I will discuss with them whether the new data should be incorporated in a revised standard, or whether there is a continuing control aspect of identifying that variance to ensure that it stays within acceptable limits.*

The case study now continues to illustrate the calculation of direct labour cost variances.

22.9.4 Direct labour variances

Data for direct labour

Allerdale Ltd has set a standard labour rate of £4 per direct labour hour. Actual hours worked in June were 9,820 at an actual cost of £37,316. The standard allowance of direct labour hours, for the output achieved, was 10,000 hours.

Calculations of variances are shown in Exhibits 22.10 and 22.11, using the formulae set out in Exhibit 22.5. In Exhibit 22.10, the variance is favourable because the actual cost is less than the standard cost set for the direct labour to be used. The total variance may be subdivided into direct labour rate and efficiency variances, using the formulae from Exhibit 22.5, to give the analysis shown in Exhibit 22.11. The symbols and the relevant figures needed for these variances are set out at the start of Exhibit 22.10.

The actual rate of pay per hour is less than the standard rate and the rate variance is therefore favourable. The actual hours worked are less than the standard hours allowed which means that the efficiency variance is also favourable. The total favourable variance of £2,684 has, therefore, two components of which the rate variance of £1,964 is the more important.

Exhibit 22.10

Calculation of direct labour total variance

The standard allowance of direct labour time is 10,000 standard hours (SH). The standard labour rate set (SR) is £4 per hour. Actual hours worked (AH) are stated to be 9,820. The actual labour rate (AR) is not stated but can be calculated by dividing the actual cost (AC) of £37,316 by the actual hours of 9,820, to give £3.80 per hour.

$$\begin{aligned}
 \text{Total cost variance} &= \text{standard cost minus actual cost (SC - AC)} \\
 &= (\text{SR} \times \text{SH}) \text{ minus } (\text{AR} \times \text{AH}) \\
 &= (£4 \times 10,000) \text{ minus } (£3.80 \times 9,820) \\
 &= £40,000 \text{ minus } £37,316 \\
 &= £2,684 \text{ favourable variance}
 \end{aligned}$$

Exhibit 22.11

Calculation of direct labour rate and efficiency variances

Rate variance = AH (SR - AR) = 9,820 hours (£4.00 - £3.80) = £1,964 favourable variance	Efficiency variance = SR (SH - AH) = £4.00 (10,000 - 9,820) = £720 favourable variance
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22.9.5 What caused the variance?

With direct labour, as with direct materials, it is easier to apply conjecture than to find sure and certain explanations. A favourable variance in the *labour rate* is an indication that the actual wage rate per employee was lower than that which was expected when the standard was set. That could be due to an anticipated pay increase having failed to materialise. Alternatively, it could suggest that the mix of employees is different from that intended when the standard was set, so that the average wage paid is lower than planned. A variance in labour efficiency means that fewer hours were worked than were expected when the standard was set. This could be due to a new training scheme, or less than the expected amount of enforced idle time when machinery is not operating. Perhaps better-quality material was purchased, giving a higher purchase price, but this caused less wastage and allowed employees to work more efficiently in producing the finished goods.

As with direct materials, there is no particular reason to stop with analysing only two variances. A change in the mix of employees could be a cause for variance within the overall efficiency variance. The number of subdivisions depends only on the ingenuity of those devising the variance analysis. This book will, however, be content with analysing only two causes of direct labour cost variance.

Fiona McTaggart has discovered that often there are interlocking effects in variances on direct materials and direct labour. She was recently in discussion with the plant manager:



FIONA: *It is the management accountant's job to produce the variance report and it is the plant manager's job to interpret the result, but naturally I am always interested in the explanation. Last month we had a favourable variance on direct materials price but unexpected adverse variances on direct materials usage and direct labour efficiency. On investigation, it was found that the buying department had seen a special offer on metal sheeting which dramatically cut the unit cost of material, so they bought six months' supply. What they didn't know was that the machinery on the factory floor can't deal with that particular type of metal sheeting because it slips intermittently in the rollers. The result was far more wastage of materials than expected, labour time lost through having to process materials twice, and some very irate operatives who lost bonuses because so much time was wasted. The problem was so bad that after one month the remaining unused material was sold for scrap and the correct specification was purchased. It was a very expensive lesson in the need for interdepartmental communication.*

22.9.6

Variable overhead cost variance

Data for variable overhead

Allerdale Ltd has set a standard variable overhead cost rate of £2 per direct labour hour. Actual hours worked in June were 9,820 and the actual variable overhead cost incurred was £22,586. The standard allowance of direct labour hours, for the output achieved, was 10,000 hours.

Calculations of variances are set out in Exhibits 22.12 and 22.13, using the formulae set out in Exhibit 22.6. The standard allowance of direct labour time is 10,000 standard hours (SH). The standard variable overhead cost rate set is £2 per direct labour hour. The actual variable overhead cost rate (AR) is not stated but can be calculated by dividing the actual cost (AC) of £22,586 by the actual direct labour hours of 9,820, to give £2.30 per direct labour hour.

Exhibit 22.12

Calculation of variable overhead cost variance

$$\begin{aligned}
 \text{Total cost variance} &= \text{standard cost minus actual cost (SC - AC)} \\
 &= (\text{SR} \times \text{SH}) \text{ minus } (\text{AR} \times \text{AH}) \\
 &= (£2 \times 10,000) \text{ minus } (£2.30 \times 9,820) \\
 &= £20,000 \text{ minus } £22,586 \\
 &= £2,586 \text{ adverse variance}
 \end{aligned}$$

Exhibit 22.13

Calculation of variable overhead rate and efficiency variances

Rate variance
 = AH (SR - AR)
 = 9,820 hours (£2.00 - £2.30)
 = £2,946 adverse variance

Efficiency variance
 = SR (SH - AH)
 = £2.00 (10,000 - 9,820)
 = £360 favourable variance

The symbols and the relevant figures needed in order to calculate the variable overhead rate and efficiency variances are set out at the start of Exhibit 22.12. The actual variable overhead cost rate of £2.30 per direct labour hour is greater than the standard rate of £2 and there is an adverse variance of £2,946. This is offset to some extent by a favourable efficiency variance due to the actual hours worked being less than the standard allowed, but this gives a favourable variance of only £360 so that the combination of the two explains the overall adverse variance of £2,586.

22.9.7 What caused the variance?

The adverse rate variance means that some item of variable overhead has cost more than expected. There is not sufficient detail available here for an answer to emerge but in practice the management accountant would now look at the unit cost of each item, such as glues, staples, paint, cleaning costs and any other variable cost items, to find which had risen above the standard set. The favourable efficiency variance is directly due to labour hours being less than expected when the standard was set. The explanation will be the same as that given for the favourable efficiency variance on direct labour.

22.9.8 Fixed overhead expenditure variance

Data for fixed overhead

Allerdale Ltd budgeted fixed overhead expenditure at £10,000 for the month of June. The actual amount of fixed overhead expenditure was £11,000.

The most important question to answer here is, 'Why did we spend more than expected?' This is quantified in the fixed overhead expenditure variance, calculated as budgeted fixed overhead minus actual fixed overhead. In this example, the result is an adverse variance of £1,000. Causes could include an increase in the cost of fixed overhead or an extra category of fixed overhead, neither of which was expected when the budget was set.

Activity 22.7

Copy out the data for the case study, then close the book and test yourself by producing the calculations and analyses. That exercise will establish your confidence in knowing the technical material of the chapter.

22.10 Investigating variances

Once the variances have been calculated, those who manage the business have to decide which variances should be investigated. Should every adverse variance be investigated? Such an investigation takes time and so itself involves a further cost in searching for a cause. Is it worth incurring this further cost to find out what happened to the costs under investigation? Such an investigation might unearth some unwelcome facts about the world beyond accounting. It has been suggested that the accountant feels 'safe' in a separate accountant's world. Perhaps no one, other than the management accountant, believes in the system in any event. These radical thoughts have been expressed in various parts of the academic literature. One extreme conclusion which might be drawn is that it is safer to avoid any type of investigation.

It is fairly obvious that a reasonable answer lies between the two extremes of investigating everything and investigating nothing. Nevertheless, it may be useful to think about the extreme cases in order to justify the middle ground. Many who take a

traditional approach prefer to use judgement in deciding which variance to investigate. Such persons would run their eye down the variance report, item by item, using their knowledge and experience to identify variances for further investigation. That approach is called 'intuition' and is fine for the experienced manager but risky when applied by a trainee manager or someone not familiar with the operational factors behind the variances. It is also difficult to write a computer program for the intuitive approach. If the accounting information is being processed by computer, it is often convenient to let the computer do the work of highlighting the variances for investigation. So some systematic approach is needed.

This may be achieved by setting a *filter rule* which filters out the unimportant but draws attention to the matters regarded as significant. This might be, 'Investigate all variances which are more than 10% of the total standard cost of this cost centre'. It might be, 'Investigate all variances which are more than £10,000 in amount each month'. Establishing filters is a matter of experience and judgement in order to ensure that no significant difference by amount is overlooked.

Using filters may not always be the perfect approach. The choice of what is important may vary depending on the nature of the variance or the nature of the cost item. Using the filter does not take into account the costs and benefits of variance investigation. It does not incorporate the past history of performance in that item, where inefficiencies are persisting through lack of remedial action. The item may be one where the variance has suddenly worsened dramatically but still falls within the filter limits. (For example, where a cost item has habitually shown a variance within 2% of standard cost but then suddenly increases to 15%, that could be highly significant even though the predetermined filter is set at 20%.)

The selection of variances for investigation is therefore very much dependent on circumstances and on the person making the selection. Fiona McTaggart gives her description of the management accountant's role in deciding on which variances to investigate.



FIONA: *In my work I keep in close contact with each of the production supervisors. We have informal meetings once each month to look at the specifications for the standards. They give me their views on the type and level of variance which they regard as significant to their part of the business. From that list I create a set of filters which I apply to the monthly report on how actual costs measure up against standards. I also add some filters based on company policy as to what is material to the overall production operations. My choice of filters has regard to existing pricing policy and a need for management of working capital. These filters produce a variance exception report. The production supervisors are expected to make a comment to the production director on the action to be taken in respect of the variances highlighted by the filter process. Every six months I meet with the production director to review the effectiveness of the filters being applied.*

We now move on to consider the practical problems of calculating variances when the level of output is different from that expected at the time the budget was set.

22.11 Flexible budgets and variance analysis

One of the most commonly occurring problems in variance analysis is deciding which benchmark to use as a basis for comparison. When the standard costs are set at the beginning of a reporting period, they will be presented in the form of a budget based on activity levels expected at that point. Suppose activity levels subsequently fall because of a downturn in demand? Is it preferable to base the variance analysis on the standard set for the original level of output, or to introduce some flexibility and

compare actual outcome with the standard expected for the new lower level of activity? Putting the question in that form leads to an almost inescapable conclusion that flexibility is required, but it is surprising how that obvious need for flexibility may be overlooked when a table of figures appears on a page. A case study is now used to show the application of a flexible budget.

22.12 Case study: Brackendale Ltd

Case study description

When the standards for the year ahead were set, it was expected that monthly output of units manufactured would be 10,000 units. By the time July was reached, output had fallen to 8,000 units per month because of a fall in market share of sales. Exhibit 22.14 reports the original budget and the actual outcome for the month of July.

The original budget is based on a standard direct material cost of £4 per kg of raw material, a standard direct labour cost of £5 per hour and a standard variable cost rate of £3 per direct labour hour. Each unit of output requires 0.5 kg of raw materials and 12 minutes of labour time. The actual cost of direct materials was found to be £4.40 per kg, the actual cost of direct labour was found to be £5.50 per hour and the actual variable overhead cost rate was £2.80 per direct labour hour. 3,800 kg of materials were used and the actual labour hours worked were 2,000.

Data relevant to the month of July are set out in Exhibit 22.14, as follows:

Exhibit 22.14

Original budget and actual costs for July

	<i>Original budget</i>	<i>Actual for July</i>
Units manufactured	10,000	8,000
	£	£
Direct material	20,000	16,720
Direct labour	10,000	11,000
Variable overhead	6,000	5,600
Fixed overhead	<u>7,000</u>	<u>7,500</u>
Total direct costs	<u>43,000</u>	<u>40,820</u>

Fiona McTaggart now talks through the problem.



FIONA: *It is quite tempting to compare these two columns of figures directly and call the difference the cost variance. But that would be totally misleading because the budget is based on 10,000 units of output and the actual output was down to 8,000 units. Direct materials, direct labour and variable overhead are all variable costs which depend on the level of output. The first step I would take is to introduce a new column headed 'flexible budget' which shows the expected cost of all variable costs if the standard costs per unit are applied to the new output level. Then I would prepare a data analysis sheet so that I am clear in my own mind what the materials and labour quantities are for the new output level. From there, I would analyse the direct materials cost variance into a price variance and a usage variance based on the new output level. Similarly I would analyse both direct labour cost and variable overhead cost variance into rate variance and efficiency variance based on the new output level. Fixed overhead would be analysed in terms of an expenditure variance only. Finally I would write a brief report setting out some guide to the figures so that the production supervisor can give some thought to possible causes.*

Fiona's working notes are now set out in detail. Italics are used in each exhibit to show where she has calculated a new figure using the data already provided. You should follow her workings through the exhibits and check that you understand how the figures in italics have been calculated.

22.12.1 Summary statement of variances

The summary statement of variances (see Exhibit 22.15) takes the information for original budget and actual costs contained in the case study description. The flexible budget is created by taking 8/10ths of the original budget costs (because the units manufactured are 8/10ths of the volume originally budgeted). The variances are then calculated by deducting the actual costs from the flexible budget figures. Italics are used to show the flexible budget figures which have been calculated as 8/10ths of the original budget. The only exception is fixed overhead cost, where it would not be expected that the cost was variable. Accordingly there is no flexibility with regard to fixed overhead.

Exhibit 22.15

Calculation of variances using a flexible budget: summary statement of variances

	Original budget (1)	Flexible budget (2)	Actual for July (3)	Variance (2) – (3)
Units manufactured	10,000	8,000	8,000	
	£	£	£	£
Direct materials	20,000	<i>16,000</i>	16,720	720 (A)
Direct labour	10,000	<i>8,000</i>	11,000	3,000 (A)
Variable overhead	6,000	<i>4,800</i>	5,600	800 (A)
Fixed overhead	<u>7,000</u>	<u>7,000</u>	<u>7,500</u>	<u>500</u> (A)
Total product costs	<u>43,000</u>	<u>35,800</u>	<u>40,820</u>	<u>5,020</u> (A)

22.12.2 Data analysis sheet

The data analysis sheet (see Exhibit 22.16) uses the information contained in the case study description or in Exhibit 22.14 and fills in the gaps by calculation. Italics show the calculated figures in Exhibit 22.16, and the workings are at the foot of Tables (a) and (b). Note that fixed overheads are not flexible and are therefore excluded from Tables (a) and (b). The output level for the period is 8,000 units.

Exhibit 22.16

Calculation of variances using a flexible budget: data analysis sheet

(a) Analysis of standard cost				
Item	Standard cost of item	Standard amount of item per unit of output	Standard quantity for output level 8,000 units ¹	Standard cost for output level 8,000 units ²
	£			£
Direct material	4.00 per kg	0.5 kg	<i>4,000 kg</i>	<i>16,000</i>
Direct labour	10.00 per hour	6 mins	<i>800 hours</i>	<i>8,000</i>
Variable overhead	6.00 per dlh ³	6 mins dlh	<i>800 dlh</i>	<i>4,800</i>

Notes: ¹ [8,000 × 0.5 kg = 4,000 kg] and [8,000 × 6 mins = 800 hours].
² [4,000 kg × £4 = £16,000]; [800 hours × £10 = £8,000]; [800 hours × £6 = £4,800].
³ dlh = direct labour hours.

Exhibit 22.16 continued

(b) Analysis of actual cost				
<i>Item</i>	<i>Actual cost of item</i>	<i>Actual amount of item per unit of output¹</i>	<i>Actual quantity for output level 8,000 units</i>	<i>Actual cost for output level 8,000 units</i>
	£			£
Direct material	4.40 per kg	0.475 kg	3,800 kg	16,720
Direct labour	11.00 per hour	7.5 mins	1,000 hours	11,000
Variable overhead	5.60 per dlh	7.5 mins	1,000 hours	5,600

Note: ¹ [3,800 kg/8,000 = 0.475 kg] and [1,000 hours/8,000 = 7.5 mins].

22.12.3 Direct materials variance

Total cost variance = standard cost minus actual cost (all based on the new output level)
 = £16,000 minus £16,720
 = £720 adverse variance

The variance is adverse because the actual cost is greater than the standard allowed by the flexible budget for the output of 8,000 units.

Price variance
 = AQ (SP – AP)
 = 3,800 kg (£4.00 – £4.40)
 = £1,520 adverse variance

Usage variance
 = SP (SQ – AQ)
 = £4.00 (4,000 – 3,800)
 = £800 favourable variance

The price variance is adverse because the actual price per kg is greater than the standard price per kg. The usage variance is favourable because the actual quantity used, 3,800 kg, is less than the standard allowed, 4,000 kg, for the actual level of output.

22.12.4 Direct labour variance

Total cost variance = standard cost minus actual cost
 = £8,000 minus £11,000
 = £3,000 adverse variance

The variance is adverse because the actual cost is greater than the standard allowed by the flexible budget for the output of 8,000 units.

Rate variance
 = AH (SR – AR)
 = 1,000 hours (£10.00 – £11.00)
 = £1,000 adverse variance

Efficiency variance
 = SR (SH – AH)
 = £10.00 (800 – 1,000)
 = £2,000 adverse variance

The direct labour rate variance is adverse because the actual rate is higher than the standard rate per hour. The direct labour efficiency variance is adverse because the actual hours worked (1,000) were greater than the standard allowed (800) for the output achieved.

22.12.5 Variable overhead variance

Total cost variance = standard cost minus actual cost = £4,800 minus £5,600 = £800 adverse variance

The variance is adverse because the actual cost is greater than the standard allowed by the flexible budget for the output of 8,000 units.

Rate variance = AH (SR – AR) = 1,000 hours (£6.00 – £5.60) = £400 favourable variance	Efficiency variance = SR (SH – AH) = £6.00 (800 – 1,000) = £1,200 adverse variance
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The variable overhead rate variance is favourable because the actual rate is less than the standard rate per hour. The variable overhead efficiency variance is adverse because the actual hours worked (1,000) were greater than the standard allowed (800) for the output achieved.

22.12.6 Fixed overhead variance

The fixed overhead expenditure variance is equal to the budgeted fixed overhead minus the actual fixed overhead. That has already been shown to be £500 adverse due to overspending compared with the budget.

22.12.7 Variance report

From the foregoing calculations a variance report may be prepared. This brings to the attention of the production manager the main items highlighted by the process of variance analysis, as shown in Exhibit 22.17.

Exhibit 22.17

Brackendale Ltd: variance report

BRACKENDALE LTD Variance report
To: Production manager From: Management accountant Subject: Variance report for July
During the month of July there were 8,000 units manufactured, as compared with 10,000 expected when the budget was set. Allowing flexibility for the lower level of output, there was nevertheless an adverse variance of £5,020 for the month, of which £720 related to direct material, £3,000 related to direct labour, £800 related to variable overhead and £500 related to fixed overhead.
The most serious of these is clearly the direct labour variance, where adverse changes in labour rate contributed £1,000 and less efficient working contributed £2,000 to the total £3,000. The direct materials cost variance of £720 looks worse when decomposed into an adverse price variance of £1,520 offset partially by a favourable usage variance of £800. The variable overhead cost variance of £800 adverse also looks worse when decomposed into an adverse efficiency variance of £1,200, partly offset by a favourable rate variance of £400. Overspending on fixed overheads was £500 for the month.

Exhibit 22.17 continued

While the investigation of these problems is a matter for yourself, I might venture to suggest that from past experience we have noticed that a favourable materials usage variance may arise when employees are instructed to work more carefully and, as a consequence, take longer time, which leads to an adverse labour efficiency variance. If that is the case, then the more careful working has had an overall negative effect because the £800 favourable materials usage variance must be compared with the £2,000 adverse labour efficiency variance and the £1,200 adverse variable overhead efficiency variance.

The variance in materials price is almost certainly due to the recent increase in the price of goods supplied. That is not a matter we can control from within the company and the standard cost will be revised next month.

The variance in labour rate is due partly to a recent pay award not included in the original budget, but it is also due to employees being paid at overtime rates because of the extra time spent on working more carefully with materials. There may need to be a major review of how this part of the business is operating, with a view to minimising total variance rather than taking items piecemeal.

Although the variable overhead rate variance is favourable, the categories of variable overhead will be reviewed to see whether any of the standard costs are out of date. Overspending on fixed overhead was due to a change in the depreciation rate of equipment due to revised asset lives. The budget will be revised at the half-yearly review which is coming up next month.

Activity 22.8

Copy out the data for the foregoing case study, close the book and attempt the variance analysis yourself. This will test your understanding of the technical material. Make a note of any problems or difficulties and consult your tutor about these.

22.13 Is variance analysis, based on standard costs, a useful exercise?

Academic opinion is divided on the usefulness of variance analysis. Solomons⁵ has claimed that standard costing probably represents the greatest advance in accounting since the development of bookkeeping. There is another view that perhaps this historical leap forward has given standard costing more importance than it deserves. In this chapter the standard has been portrayed as a single figure, but it is actually an estimate based on the best expectations of the future conditions envisaged in the organisation. If the organisation has a stable technology and works within safely attainable levels of productivity, then there is relatively little likelihood of finding that the expected cost is far away from the true cost. But if the organisation is much riskier in the nature of its operations, perhaps using a less stable technology and working at the upper limits of productivity, then the expected standard cost may be an average measure of a wide range of possible outcomes.

Anthony⁶ has questioned whether any scientific enquiry into variance analysis is in reality carried out and has questioned further whether such enquiry is worth doing in any event. He has identified, in practice, a strong intuitive approach to variance analysis.

It may be that accountants tend to overemphasise their own importance. The causes and control of variances lie with those managing and operating the technical aspects of the business. Management accountants only present the information which, if in a relevant and useful form, may help in identifying cause and establishing better

control. Setting standards is first and foremost an industrial engineering problem. It might be safer to leave the variance analysis to the engineers and forget about the cost aspects.

Chapter 16 instanced the management functions of planning and control, and the importance of communication and motivation. Well-planned variance reports, based on up-to-date and realistic standards, will provide information for the planning process, encourage control and communicate the effects of operational actions on the costs of the organisation. Motivation will be enhanced if the variance report is seen to be specific to the information needs of each level of management and if the standard costs are seen to be a fair measure of expected achievement. Motivation could be reduced by a badly designed or carelessly implemented variance report.

Chapter 16 listed three management accounting functions of directing attention, keeping the score and solving problems. Standard costs contribute to all three, when used in conjunction with variance analysis. The variance report, by using predetermined filters, may direct attention to areas of significance. The preparation of the report, on a regular basis, is a vital part of the score-keeping operation. Analysis of the variances, to which the management accountant will make a contribution in deciding on the level of detail, will be a problem-solving exercise requiring logical and systematic analysis of the problem represented by the accounting figures.

22.14 A broader view of applications of variance analysis

At the start of the chapter a list was set out of five ways in which standard costs may be used by an organisation:

- 1 to provide product costs for stock valuation;
- 2 to increase control within a budgeting system;
- 3 to gauge performance of a business unit by use of variance analysis;
- 4 to integrate costs in the planning and pricing structure of a business;
- 5 to reduce record-keeping costs when transactions take place at different prices.

Are these purposes useful? Is it worthwhile to make the effort of developing standard costs? Some brief answers are now provided.

- The objective of providing product costs for purposes such as stock valuation falls within the general heading of 'What should it cost?', a question which in turn leads to more questions about the effective use of resources. It is as important to ask questions about the cost of goods not sold as it is to look at the variance in cost of the goods which have been sold. If stock is valued at actual cost, it will carry with it a share of the problems which led to a cost variance and will burden the next reporting period with those problems. If the stock is valued at standard cost, all variances in price are dealt with in the period when they arose.
- A budgeting system may be based on actual costs, but it will have greater usefulness if it is based on standard costs as a measure of the predetermined targets for a period. A budget relates to an activity or operation as a whole, while a standard cost is a cost per unit which gives a very precise focus to the budgetary planning process. Budgets do not necessarily need to be based on standard cost, but the standard costs bring additional benefits in allowing the organisation to examine more precisely how the budget compares with the actual outcome.
- Performance is gauged by comparing actual costs with standard costs and analysing the differences. The resulting variance may indicate where, in the control of the organisation, future action is required. Performance may be related to responsibility

so that the management accounting information is matched to the management aims of the organisation.

- Planning and pricing are aspects of long-term decision making which require a strategic outlook on business problems. Pricing will usually be a forward-looking activity based on estimated costs and out-turns. Standard costs provide a benchmark against which to plan pricing and, in retrospect, to evaluate the success of a pricing policy in terms of recovering costs incurred.
- If all costs are recorded on a standard basis, then the variations in quantity may be separated analytically from the variations in price. In practice the price variations are isolated as soon as the goods are purchased. Thereafter, the progress of costs, in moving through to finished goods and to output in the form of sales, is all monitored at standard cost so that the emphasis is on quantity and variations in quantity. That reflects the control process in that, once the goods have been purchased, or services paid for, there is no further opportunity to take action over price. Success in cost control thereafter depends entirely on control of usage, which is in the hands of those controlling and carrying out operations.

22.15 Summary

In this chapter we have shown how control through the use of standard costs per unit leads to a more specific analysis than is available where control is through the use of budgets. Budgets give only the total cost of each line item. Standard costing allows decomposition into cost per unit and quantity of units.

Variances have been defined and illustrated for:

- direct materials (total cost variance, analysed into price and usage variances)
- direct labour (total cost variance, analysed into rate and efficiency variances)
- variable overhead (total cost variance, analysed into rate and efficiency variances)
- fixed overhead (expenditure variance only).

Flexible budgeting has also been explained, showing that where the level of output is different from that expected when the budget was prepared, the standard costs should be used to prepare a new flexible budget for the new level of output. All variable costs should be recalculated to reflect the change in output. Fixed overhead costs are independent of activity level and therefore have no flexibility.

The chapter has also given some flavour of the debate on the importance and usefulness of standard costs. They are widely used but, to be effective, must be chosen with care to meet the needs of the business and of the management purposes of planning and control.

QUESTIONS

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

A Test your understanding

Skills outcomes

- A22.1** What is a standard cost? (Section 22.1)
- A22.2** Why are standard costs useful? (Section 22.2)
- A22.3** How are standard costs related to levels of output? (Section 22.3)
- A22.4** How are standard costs used in the control process? (Section 22.4)
- A22.5** How are direct materials price and usage variances calculated? (Section 22.5)
- A22.6** Give three possible causes of an adverse direct materials price variance. (Section 22.5)
- A22.7** Give three possible causes of a favourable direct materials usage variance. (Section 22.5)
- A22.8** How are direct labour rate and efficiency variances calculated? (Section 22.6)
- A22.9** Give three possible causes of a favourable direct labour rate variance. (Section 22.6)
- A22.10** Give three possible causes of an adverse direct labour efficiency variance. (Section 22.6)
- A22.11** Explain how you would identify which variances to investigate. (Section 22.10)
- A22.12** Explain the importance of using a flexible budget with variance analysis. (Section 22.11)
- A22.13** Give three reasons for regarding variance reports as a useful tool of management. (Section 22.13)
- A22.14** [S] It was budgeted that to produce 20,000 concrete building blocks in one month would require 100,000 kg of material. In the month of May, only 16,000 blocks were produced, using 80,080 kg of material. The standard cost of materials is £3 per kg. What is the materials usage variance?
- A22.15** [S] The standard cost of direct labour in the month of August is £36,000. There is a direct labour rate variance of £6,000 adverse and a direct labour efficiency variance of £2,500 favourable. What is the actual cost of direct labour in the month?
- A22.16** [S] Fixed overhead for the month of October has been budgeted at £16,000 with an expectation of 8,000 units of production. The actual fixed overhead cost is £17,500 and the actual production is 7,000 units. What is the variance?

B Application

B22.1 [S]

The monthly budget of Plastics Ltd, manufacturers of specialist containers, was prepared on the following specification:

Production and sales	30,000 units
Selling price	£70 per unit
Direct materials input	5 kg per unit at a cost of £1.20 per kg
Direct labour input	2 hours per unit at a rate of £4 per hour
Variable overhead	£2 per direct labour hour
Fixed overhead	£90,000 per month

The following actual results were recorded for the month of May Year 8:

Stock of finished goods at start of month	8,000 units
Sales	40,000 units
Production	42,800 units
Stock of finished goods at end of month	10,800 units

Actual costs incurred were:

	£
Direct material	267,220 (213,776 kg at £1.25 per kg)
Direct labour	356,577
Variable overhead	165,243
Fixed overhead	95,000

Further information

- Throughout May the price paid for direct materials was £1.25 per kg. Direct material is used as soon as it arrives on site. No stocks of materials were held at the start or end of May.
- The labour rate paid throughout the month was £4.10 per hour.
- The selling price of finished goods was £70 per unit throughout the month.
- Stocks of finished goods are valued at standard cost of production.

Required

- Calculate the budgeted profit for May Year 8, based on the actual sales volume achieved.
- Calculate the cost variances for the month of May.
- Explain how cost variances may be used to identify responsibility for cost control within the company.

B22.2 [S]

The upholstery department of a furniture manufacturing business prepared the following statement of standard costs at the start of the calendar year:

<i>Standard cost per unit</i>	£
Direct material	250
Direct labour	150
Fixed manufacturing overhead	<u>100</u>
	<u>500</u>

In preparing the statement, it was budgeted that 100 units would be completed each month.

During the month of May the following results were reported:

	£
Direct materials cost	31,200
Direct labour cost	16,800
Fixed manufacturing overhead	<u>9,600</u>
	<u>57,600</u>

The actual level of production achieved in May was 120 units.

The budget for direct materials was based on an allowance of 10 kg materials per unit produced. The budgeted cost of materials was £25 per kg. Actual materials used during May amounted to 1,300 kg.

The budget for direct labour was based on an allowance of 15 hours per unit, at a labour rate of £10 per hour. At the start of May, an agreed incentive scheme increased the labour rate to £12 per hour. All employees receive the same rate of pay.

Stocks of finished goods are valued at full standard cost of manufacture.

Required

- Prepare an accounting statement reconciling the budgeted costs for the month of May with the actual costs incurred, including in your answer relevant cost variances.
- Suggest possible causes for the variances you have calculated.

B22.3 [S]

Carrypack Ltd manufactures and sells plastic cases for portable computers. Production each month equals sales orders received.

The following monthly budget was prepared at the start of Year 6, to apply throughout the year:

	Units	£	£
Sales (@ £50 per unit):	12,000		600,000
Production:	12,000		
Production costs:			
Direct materials		132,000	
Direct labour		108,000	
Variable overheads		72,000	
Fixed overheads		<u>48,000</u>	
			<u>360,000</u>
Budgeted profit			<u>240,000</u>

Further information

- (a) Budgeted direct materials used per month were set at 26,400 kg.
 (b) Budgeted direct labour hours per month were set at 36,000 hours.

The following actual report was produced for the month of April Year 6:

	Units	£	£
Sales (@ £50 per unit):	12,300		615,000
Production:	12,300		
Production costs:			
Direct materials		136,220	
Direct labour		129,200	
Variable overheads		72,200	
Fixed overheads		<u>49,400</u>	
			<u>387,020</u>
Actual profit			<u>227,980</u>

Further information

- (a) Actual direct materials used during April were 27,800 kg.
 (b) Actual direct labour hours worked during April were 38,000 hours.

Required

- (a) Prepare an explanation, using variances, of the difference between the budgeted profit and the actual profit for the month of April.
 (b) Comment on possible causes for the variances you have calculated.

B22.4

DEF Products Ltd manufactures and assembles one type of furniture unit. The following information is available for the year ended 31 August Year 7.

The budgeted costs and the actual costs incurred during the year were as follows:

Cost	Budgeted production overhead cost £000s	Actual production overhead cost £000s	Nature of cost
Supervision	100	85	Fixed
Machine power	30	22	Varies with machine hours
Heat and light	30	27	Varies with direct labour hours
Rates and insurance	220	203	Fixed
Lubricants	60	45	Varies with machine hours
Indirect materials	50	38	Varies with units of output
Machine depreciation	180	180	Fixed
Maintenance and repairs	<u>80</u>	<u>60</u>	Varies with machine hours
	<u>750</u>	<u>660</u>	

The budgeted and actual activity for the year was as follows:

	<i>Machine hours</i>	<i>Direct labour hours</i>	<i>Units of output</i>
Budget	255,000	500,000	100,000
Actual	180,000	440,000	80,000

At the end of the year, the production director made the following report to his colleagues on the board of directors: 'We budgeted for £750,000 overhead cost based on 500,000 direct labour hours. We incurred £660,000 actual cost but only worked 440,000 hours. This appears to me to be a satisfactory proportionate reduction in costs and there are consequently no adverse variances from budget to be explained.'

The other directors felt this comment ignored the distinction between fixed overhead cost and variable overhead cost. They were also concerned that the production director referred only to the fall in direct labour hours worked, when it was known that some overheads depended on the number of machine hours worked. They asked for a more detailed analysis of the expected level of overhead costs in relation to the activity levels achieved.

Required

Prepare a memorandum to the production director:

- proposing, with reasons, a suitable method for calculating overhead cost rates;
- setting out a variance analysis which distinguishes fixed overheads from variable overheads.

C Problem solving and evaluation

C22.1 [S]

The following report has been prepared for the production department of Cabinets Ltd in respect of the month of May Year 4:

	<i>Actual costs or quantities recorded</i>	<i>Variance</i> £
Direct materials price	£2.80 per kg	2,240 favourable
Direct materials usage	11,200 kg	4,800 adverse
Direct labour rate	£9 per hour	5,600 adverse
Direct labour efficiency	3.5 hours per unit	6,400 adverse
Fixed overhead expenditure	£39,000	3,000 adverse

The department manufactures storage cabinets. When the budget was prepared, it was expected that 1,800 units would be produced in the month but, due to a machine breakdown, only 1,600 units were produced.

Required

- Reconstruct the original budget, giving as much information as may be derived from the data presented above.
- Provide an interpretation of the performance of the production department during the month of May Year 4.

C22.2 [S]

Fixit Ltd is a manufacturing company which produces a fixed budget for planning purposes. Set out below is the fixed monthly budget of production costs, together with the actual results observed for the month of July Year 7.

	<i>Budget</i>	<i>Actual</i>
Units produced	5,000	5,500
	£	£
Costs:		
Direct materials	20,000	22,764
Direct labour	60,000	75,900
Variable production overhead	14,000	14,950
Fixed production overhead	10,000	9,000
Depreciation	4,000	4,000

In preparing the fixed budget, the following standards were adopted:

Direct material	10 kg of materials per unit produced.
Direct labour	2 hours per unit produced.
Variable production overhead	A cost rate per direct labour hour was calculated.
Fixed production overhead	A cost rate per unit was calculated.
Depreciation	Straight-line method is used for all assets.

The following additional information is available concerning the actual output:

- (a) the actual usage of materials in July was 54,200 kg; and
- (b) the nationally agreed wage rate increased to £6.60 per hour at the start of July.

Required

- (a) Prepare a flexible budget in respect of Fixit Ltd for the month of July Year 7.
- (b) Analyse and comment on cost variances.

C22.3 [S]

Concrete Products Ltd manufactures heavy paving slabs for sale to local authorities and garden paving slabs for domestic use.

The board of directors meets early in each month to review the company's performance during the previous month. In advance of each meeting, the directors are presented with a computer printout summarising the activity of the previous month. The computer printout in respect of the month of December Year 8 is set out below:

	<i>Heavy paving</i>		<i>Garden paving</i>	
	<i>Actual tonnes</i>	<i>Budget tonnes</i>	<i>Actual tonnes</i>	<i>Budget tonnes</i>
Sales volume	29,000	27,500	10,500	8,500
Production volume	29,000	27,500	10,500	8,500
	£000s	£000s	£000s	£000s
Revenue	720	690	430	300
Variable cost of sales	280	270	170	127
Contribution	440	420	260	173

Further information

- (a) The actual fixed costs incurred during the month equalled the budgeted fixed costs of £310,000.
- (b) Stocks are valued at standard cost.

You have recently been appointed a director of Concrete Products Ltd. At an earlier meeting with the finance director you received an explanation of the basis for the company's monthly budget and you are satisfied that the budget has been prepared on a realistic basis.

Required

- (a) Prepare, from the information contained in the computer printout, your analysis and comments on the company's performance during the month of December Year 8, as background for the board meeting.
- (b) List, with reasons, three questions you would ask at the meeting in order to give you a fuller understanding of the company's performance during the month.

C22.4 [S]

Nu-Line Ltd purchases manufactured machine tools for conversion to specialist use. The converted tools are sold to the textile industry. The following information relates to the month of July Year 3.

	<i>Budget (units)</i>	<i>Actual (units)</i>
Purchases of machine tools	180	180
Completed production	180	140
Sales	130	150
Stock of finished goods at 1 July Year 3	15	15
Stock of finished goods at 31 July Year 3	65	5

There was no stock of purchased machine tools or work-in-progress at either the start or the end of the month.

Finished goods are valued at full standard cost of production. The standard cost of one completed production unit is:

	£
Purchased machine tool	600
Direct labour	300
Fixed production overhead	200
Variable production overhead	100
	<u>1,200</u>

The fixed production overhead per unit was determined by reference to the budgeted volume of production per month.

A standard selling price of £2,000 per completed unit was specified in the budget and was achieved in practice.

Actual costs incurred during the month were as follows:

	£
Invoiced price of machine tools purchased	86,800
Direct wages paid	47,500
Fixed production overhead	35,000
Variable production overhead	13,000

Required

- (a) Prepare a statement of the budgeted profit and the actual profit for the month of July.
- (b) Using variances, reconcile the budgeted profit with the actual profit.

Cases for study groups

Case 22.1

You are the Student Union management committee representative in charge of student transport affairs. Members have proposed that the Union should operate a campus bus service to operate between the campus and the nearby shopping precinct (five miles distant and 15 minutes by bus). Prepare a five-minute presentation to the rest of the management committee explaining how you would use standard costing to plan and control the activities of the proposed bus service.

Case 22.2

You are the Student Union management committee representative in charge of academic affairs. Members have proposed that the Union should publish a study guide for sale to incoming students. It is expected that 2,000 new students will register at the start of the academic year. Prepare a five-minute presentation to the rest of the management committee explaining how you would use standard costing to plan and control the publication of the study guide.

Notes and references

1. CIMA (2000), *Management Accounting: Official Terminology*, Chartered Institute of Management Accounting.
2. *Ibid.*
3. *Ibid.*
4. *Ibid.*
5. Solomons, D. (1978) 'Flexible budgets and the analysis of overhead variances', in H. R. Antony, P. A. Firmin and H. D. Grove (eds), *Issues in Cost and Managerial Accounting: A Discipline in Transition*, Houghton Mifflin, Boston.
6. Anthony, R. and Govindarajan, V. (1997) *Managerial Control Systems*, 9th edn, McGraw-Hill, New York.