For the second month in a row, profits at our Bayou Division are down and I don't know why. We budgeted $190,000 in profit for August, but the actual result was only $114,500. We thought we had developed realistic monthly budgets. I know sales were down some, but I'm not sure that is the only problem there is.

I am not one who believes that favorable variances are always "good" and unfavorable variances are always "bad." [See the *In Action* item, "When a Favorable Variance Might Not Mean 'Good' News."] I need more information from the analysis if I am going to turn things around.

What I need to know is whether we should focus on improving the marketing of the division or if we need to take a look at our manufacturing operations. We don't have a lot of extra resources here at Corporate, so I have asked Philippe [Broussard, the president of Bayou] to identify the primary cause of the shortfall—revenues or costs—and report back to me next week. If Bayou can't improve, we may have to dispose of it.

Meera Patel, the CFO of Newfoundland Enterprises, was discussing her concern about the performance of the company's Bayou Division, which is located in the southern United States. The Bayou Division makes a single product, a metal frame, which it sells regionally to other manufacturing firms. The division operates as a profit center. Newfoundland acquired Bayou several years ago, and Bayou management has been under considerable pressure to improve profitability.

Using Budgets for Performance Evaluation

L.O. 1
Use budgets for performance evaluation.

In Chapter 13 we described the development of the master budget as a first step in the budgetary planning and control cycle. The budgeting process provides a means to coordinate activities among units of the organization, to communicate the organization's goals to individual units, and to ensure that adequate resources are available to carry out the planned activities. Typically, the budget is set prior to the beginning of the accounting period although it is common for budgets to be revised during the accounting period as major changes in operations are encountered (e.g., large changes in expected sales).

While this planning aspect of budgets is important, it is not the only role that budgets can play. In the control and evaluation activity, the performance of units and managers is evaluated and actions are taken in an attempt to improve performance. As we discussed in Chapter 14, evaluation requires a benchmark against which to measure performance. When evaluating a firm's performance, it is common to select other firms in the same industry as benchmarks. Financial performance, as reported in publicly available accounting records, is one measure of performance. For units of the firm or for organizations that don't routinely prepare public reports (for example, government organizations and not-for-profit firms), these benchmarks are much more difficult to collect. One obvious alternative is the budget; this is management's plan for financial performance.

The master budget includes **operating budgets** (for example, the budgeted income statement, the production budget, the budgeted cost of goods sold) and **financial budgets** (for example, the cash budget, the budgeted balance sheet). When management uses the master budget for control purposes, it focuses on the key items that must be controlled to ensure the company's success. Most of these items are in the operating budgets, although some also appear in the financial budgets. In this chapter, we focus on the income statement because it is the most important financial statement that managers use to control operations.

When actual results are compared to budgeted, or planned, results, there is almost always a difference, or **variance.** Variance analysis uses the difference between actual performance and budgeted performance to (1) evaluate the performance of individuals and business units and (2) identify possible sources of deviations between budgeted and actual performance. As with all management accounting practices, individual firms and organizations may develop many variances for their own needs. The basic idea, however, is always the same: Calculate the difference between a planned (budgeted) number and actual performance and attempt to explain the causes of the difference.

operating budgets
Budgeted income statement, production budget, budgeted cost of goods sold, and supporting budgets.

financial budgets
Budgets of financial resources, for example, the cash budget and the budgeted balance sheet.

variance
Difference between planned result and actual outcome.

Profit Variance

The simplest measure of performance is the variance, or difference, between actual income and budgeted income. Bayou's profit variance, for example, is $75,500. That is the actual profit of $114,500 less the budgeted profit of $190,000. Because actual income was less than budgeted income, this is typically referred to as an *unfavorable variance*. For evaluation purposes, we could stop here and say that Bayou's performance did not meet expectations because actual income was less than budgeted. However, this does not provide much information about the causes of its actual performance. We want to look more closely at the information available and try to use it to obtain more insight into operations.

See Exhibit 16.1 for Bayou Division's actual income statement and the master budget for August. The master budget represents the financial plan for Bayou for the month and the actual results reflect the performance.

favorable variance
Variance that, taken alone, results in an addition to operating profit.

unfavorable variance
Variance that, taken alone, reduces operating profit.

Before we analyze the variances in more detail, it is important to understand what the labels "favorable" and "unfavorable" mean. Traditionally, they are used to indicate how actual income differs from budgeted income. A **favorable variance** increases operating profits, holding all other things constant. An **unfavorable variance** decreases operating profits, holding all other things constant. Thus, when discussing revenue, income, or contribution margin, a favorable variance means the actual result is greater than the budgeted result. When discussing costs, a favorable variance indicates that actual costs are less than budgeted costs. The labels "favorable" and "unfavorable" should not be considered as indications of good or bad performance without additional investigation. That is, a favorable variance is *not necessarily good,* and an unfavorable variance is *not necessarily bad*.

In Action When a Favorable Variance Might Not Mean "Good" News

Although it is common to consider favorable variances as good news, we should recognize that any variance represents a difference from what we expected (the budget or standard). Suppose you were a for-profit health care corporation and one of your medical centers was generating twice the revenue per patient per day as the average unit. Or suppose that same unit had pretax income that grew 31 percent from one year to the next.[1] Would this be a favorable variance? (Most likely it would.) Would this be good news?

In the case of Tenet Healthcare Corp., the answer to the latter question became, "definitely not." After an investigation by the FBI, the company's Redding Medical Center was found to have performed unnecessary tests and surgeries, which were billed to patients' insurance carriers (including Medicare). Tenet later paid the federal government $54 million (without admitting it had done anything wrong) and had to sell the hospital.[2]

Ironically, other variance analyses might have indicated to Tenet management the nature of the problem. Patients at the Redding Medical Center "were twice as likely to have open-heart surgery as patients in San Francisco and other California cities."[3]

Sources:
[1] "Open-Heart Nightmare," *BusinessWeek* online, January 22, 2007.
[2] Ibid.
[3] "At California Hospital, Red Flags and an FBI Raid," washingtonpost.com, July 25, 2005, A09.

Although the fact that profit is $75,500 below budget provides some information, it does not indicate where the managers at Bayou should look for improvement. At a more detailed level, we can compute the variance of each income statement line item (see Exhibit 16.2). Notice that the data in the Variance column of Exhibit 16.2 provides information useful for understanding the source of the difference between planned and realized profit performance. Although a simple comparison of planned and actual profit suggests that performance was worse than planned, the additional data in Exhibit 16.2 provide information on the impact on profit performance of each of the revenue and cost categories.

This information can be useful for two reasons. First, it allows the manager to investigate more efficiently the causes of off-budget performance. That is, the manager

	A	B	C	D
1		Actual	Master Budget	
2	Sales (units)	80,000	100,000	
3				
4	Sales revenue	$ 840,000	$ 1,000,000[a]	
5	Less			
6	Variable costs			
7	Variable manufacturing costs	329,680	380,000[b]	
8	Variable selling and administrative	68,000	90,000[c]	
9	Total variable costs	$ 397,680	$ 470,000	
10	Contribution margin	$ 442,320	$ 530,000	
11	Fixed costs			
12	Fixed manufacturing overhead	195,500	200,000	
13	Fixed selling and administrative costs	132,320	140,000	
14	Total fixed costs	$ 327,820	$ 340,000	
15	Profit	$ 114,500	$ 190,000	
16				
17	Calculation for master budget:			
18	[a]100,000 units at $ 10.00 per unit.			
19	[b]100,000 units at $ 3.80 per unit.			
20	[c]100,000 units at $ 0.90 per unit.			
21				

Exhibit 16.1
Budget and Actual Results, August—Bayou Division

	A	B	C	D	E
1		Actual	Variance		Master Budget
2	Sales (units)	80,000	20,000	U	100,000
3					
4	Sales revenue	$ 840,000	$ 160,000	U	$ 1,000,000
5	Less				
6	Variable costs				
7	Variable manufacturing costs	329,680	50,320	F	380,000
8	Variable selling and administrative	68,000	22,000	F	90,000
9	Total variable costs	$ 397,680	$ 72,320	F	$ 470,000
10	Contribution margin	$ 442,320	$ 87,680	U	$ 530,000
11	Fixed costs				
12	Fixed manufacturing overhead	195,500	4,500	F	200,000
13	Fixed selling and administrative costs	132,320	7,680	F	140,000
14	Total fixed costs	$ 327,820	$ 12,180	F	$ 340,000
15	Profit	$ 114,500	$ 75,500	U	$ 190,000
16					
17	U = Unfavorable variance.				
18	F = Favorable variance.				
19					

Exhibit 16.2
Budget and Actual Results, August—Bayou Division

can analyze those areas with a relatively large variance and, if the investigation identifies the problem and it can be corrected, the organization will be more likely to improve its performance in the following period. Second, the information allows the manager to evaluate subordinate managers responsible for various aspects of the firm's operations (for example, marketing and production).

Why Are Actual and Budgeted Results Different?

The decomposition of the profit variance into revenue and cost components is more informative than the simple profit variance itself, but it does not give information that would be useful for control purposes. Bayou wants to know how it should change its marketing or production operations to improve results. In other words, managers want to know *why* the individual line items in Exhibit 16.2 differ. An important part of variance analysis is

understanding, first, what might cause a difference between actual and budgeted results and, second, what portion of the total profit variance is due to each cause.

Flexible Budgeting

L.O. 2
Develop and use flexible budgets.

static budget
Budget for a single activity level; usually the master budget.

flexible budget
Budget that indicates revenues, costs, and profits for different levels of activity, including the ex post actual activity level.

flexible budget line
Expected monthly costs at different output levels.

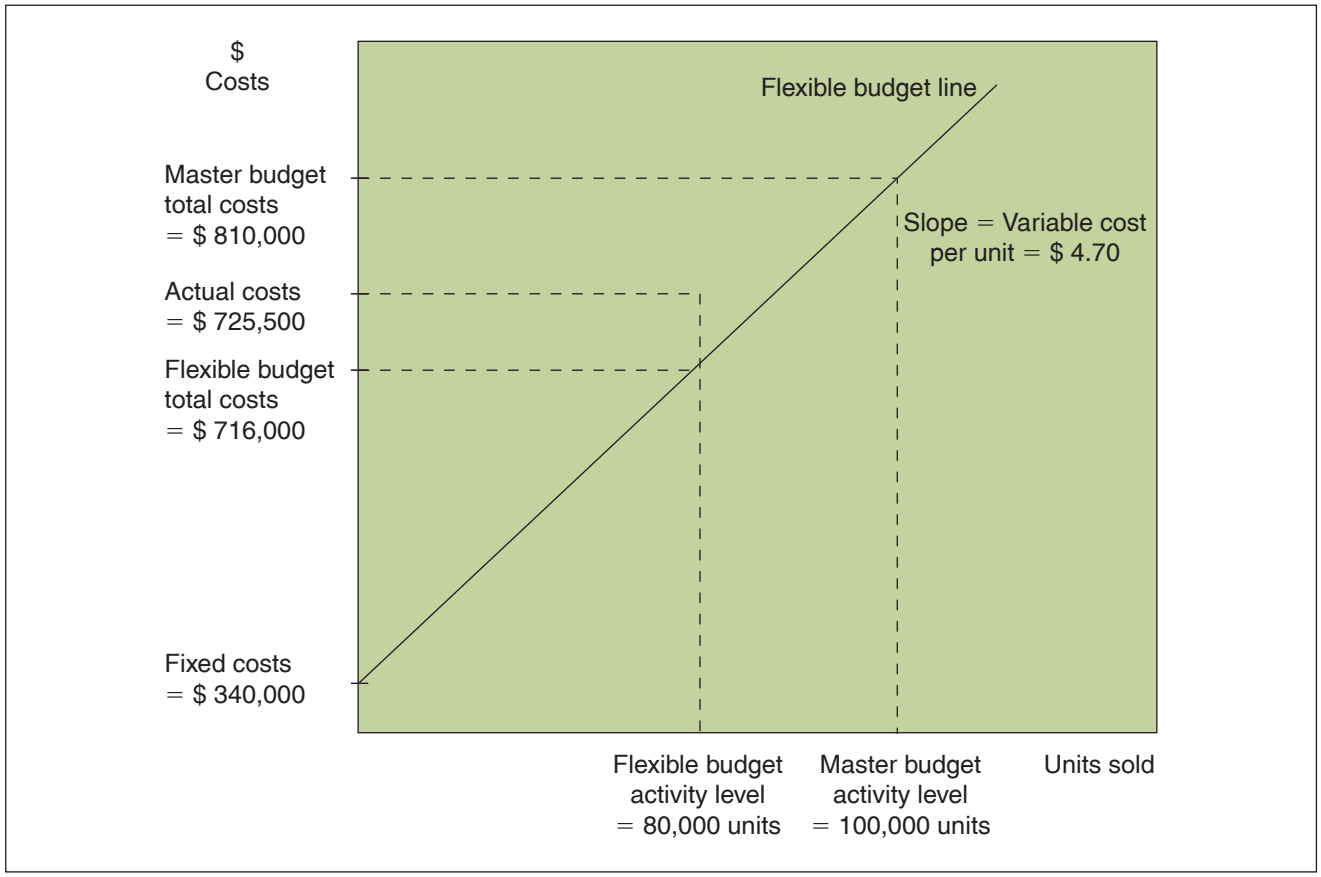
One obvious reason that actual results might differ from budgeted results is that the actual activity itself sometimes differs from the budgeted or expected activity. A master budget presents a comprehensive view of anticipated operations. Such a budget is typically a **static budget;** that is, it is developed in detail for one level of anticipated activity. A **flexible budget,** in contrast, indicates budgeted revenues, costs, and profits for virtually all feasible levels of activities. Because variable costs and revenues change with changes in activity levels, these amounts are budgeted to be different at each activity level in the flexible budget.

For example, by reviewing the master budget information in Exhibits 16.1 and 16.2, we see that the total cost of producing and selling 100,000 frames at Bayou is $810,000. This consists of $470,000 in variable costs and $340,000 in fixed costs. In developing the budget, Bayou used the following budgeting formula to determine costs at the master budget level:

$$\text{Total cost} = \$340{,}000 + (\$4.70 \times \text{Units produced and sold})$$

(Total variable costs are $470,000 for 100,000 units, or $4.70 per unit.) See Exhibit 16.3 for a graph of this cost function. This is the same type of cost line used for the cost-volume-profit (CVP) analysis we described in Chapter 3. The expected activity level for the period is budgeted at 100,000 units. From the **flexible budget line** in Exhibit 16.3, we find the budgeted costs at a planned activity of 100,000 units to be $810,000 [= $340,000 + ($4.70 × 100,000 units)].

Exhibit 16.3 Flexible Budget Line Costs—Bayou Division



At first glance, it might appear that the division had done a good job of cost control because actual costs were $84,500 lower than the budget plan (variable costs were $72,320 lower and fixed costs were $12,180 lower). In fact, Bayou actually produced and sold only 80,000 units. According to the flexible budget concept, the master budget must be adjusted for this change in activity. The adjusted budgeted costs for control and performance evaluation purposes would be the flexible budget for actual activity, $716,000 [= $340,000 + ($4.70 × 80,000 units)], which is *less* than the actual costs.

The estimated cost-volume line in Exhibit 16.3 is known as the *flexible budget line* because it shows the budgeted costs allowed for each level of activity. For example, if activity increased to 120,000 units, budgeted costs would be $904,000 [= $340,000 + ($4.70 × 120,000 units)]. If activity dropped to 50,000 units, budgeted costs would drop to $575,000 [= $340,000 + ($4.70 × 50,000 units)].

You can compare the master budget with the flexible budget by thinking of the master budget as an ex-ante (before-the-fact) prediction of the activity (X); the flexible budget is based on ex post (after-the-fact) knowledge of the actual activity.

Comparing Budgets and Results

L.O. 3
Compute and interpret the sales activity variance.

A comparison of the master budget with the flexible budget and with actual results is the basis for analyzing differences between plans and actual performance. The flexible budget (see Exhibit 16.4) is based on *actual* activity. In August, Bayou actually produced and sold 80,000 units. We start by understanding the difference in operating profits that results from the sales activity at Bayou.

Sales Activity Variance

sales activity variance
Difference between operating profit in the master budget and operating profit in the flexible budget that arises because the actual number of units sold is different from the budgeted number; also known as *sales volume variance.*

The difference between operating profits in the master budget and operating profits in the flexible budget is called a **sales activity variance.** The $106,000 unfavorable variance is due to the activity that resulted in a 20,000 unit difference between actual sales and planned sales.

The information in Exhibit 16.4 is useful for management. First, it isolates the decrease in operating profits caused by the decrease in activity from the master budget.

Exhibit 16.4
Flexible and Master Budget, August—Bayou Division

	A	B	C	D	E
1		Flexible Budget (based on actual activity of 80,000 units)	Sales Activity Variance (based on variance in sales volume)		Master Budget (based on planned activity of 100,000 units)
2	Sales units	80,000	20,000		100,000
3					
4	Sales revenue	$ 800,000	$ 200,000	U	$ 1,000,000
5	Less				
6	Variable costs				
7	Variable manufacturing costs	304,000	76,000	F	380,000
8	Variable selling and administrative	72,000	18,000	F	90,000
9	Total variable costs	$ 376,000	$ 94,000	F	$ 470,000
10	Contribution margin	$ 424,000	$ 106,000	U	$ 530,000
11	Fixed costs				
12	Fixed manufacturing overhead	200,000	–0–		200,000
13	Fixed selling and administrative costs	140,000	–0–		140,000
14	Total fixed costs	$ 340,000	–0–		$ 340,000
15	Profit	$ 84,000	$ 106,000	U	$ 190,000
16					

When sales fall and plants reduce production, manufacturing costs decrease. Companies compute a sales activity variance to distinguish between lower sales and increased manufacturing efficiency as explanations for the lower reported costs.

Furthermore, the resulting flexible budget shows budgeted sales, costs, and operating profits *after* considering the activity decrease but *before* considering differences in *unit* selling prices, variable costs, and fixed costs from the master budget. As noted, we refer to this change from the master budget plan as the sales activity variance, also known as *sales volume variance.*

Note the makeup of the $106,000 sales activity variance in Exhibit 16.4. First, the difference between the master budget sales of $1,000,000 and the flexible budget sales of $800,000, which is the budgeted $10 unit sales price multiplied by the 80,000 units actually sold, is $200,000. This is based on the 20,000-unit decrease in sales volume multiplied by the budgeted $10 unit sales price. We use the *budgeted* unit sales price instead of the *actual* price because we want to isolate the impact of the activity decrease from changes in the sales price. We want to focus on the effects of volume alone. Thus, the sales amount in the flexible budget is *not the actual revenue* (actual price times actual volume) but the *budgeted unit sales price times the actual number of units sold*. Second, variable costs are *expected* to decrease by $94,000, giving an unfavorable contribution margin of $106,000 (= $200,000 − $94,000), which is the unfavorable sales activity variance.

Interpreting Variances Holding everything else constant, the 20,000-unit decrease in sales creates an unfavorable sales activity variance as shown in Exhibit 16.4. Does this indicate poor performance? Perhaps it does not. Economic conditions could have been worse than planned, decreasing the volume demanded by the market. Hence, perhaps, the 20,000-unit decrease in sales volume could have been even greater, taking everything into account.

Note that both variable cost variances are labeled *favorable,* but this doesn't mean that they are good for the company. Variable costs are expected to decrease when volume is lower than planned.

Self-Study Question

1. Prepare a flexible budget for Bayou Division for August with the same master budget as in Exhibit 16.4 but assuming that 110,000 units were actually sold.

The solution to this question is at the end of the chapter on page 624.

Profit Variance Analysis as a Key Tool for Managers

L.O. 4
Prepare and use a profit variance analysis.

profit variance analysis
Analysis of the causes of differences between budgeted profits and the actual profits earned.

The **profit variance analysis** shows additional detail about the differences between budgeted profits and actual profits earned. The actual results can be compared with both the flexible budget and the master budget in a profit variance analysis (Exhibit 16.5). Columns (5), (6), and (7) are carried forward from Exhibit 16.4.

Column (1) is the reported income statement based on the actual sales (see Exhibit 16.1). Column (2) summarizes manufacturing (production) variances, which are discussed in more detail later in this chapter, and Column (3) shows marketing and administrative variances. Costs have been divided into fixed and variable portions here and would be presented in more detail to the managers of centers having responsibility for them.

Exhibit 16.5 Profit Variance Analysis, August—Bayou Division

	A	B	C	D	E	F	G	H	I	J	K	L	M
1		(1)	(2)			(3)		(4)		(5)	(6)		(7)
2		Actual (based on actual activity of 80,000 units)	Manufacturing Variances			Marketing and Administrative Variances		Sales Price Variance		Flexible Budget (based on actual activity of 80,000 units)	Sales Activity Variance		Master Budget (based on planned activity of 100,000 units)
3	Sales revenue	$ 840,000						$ 40,000	F	$ 800,000	$ 200,000	U	$ 1,000,000
4	Less												
5	Variable costs												
6	Variable manufacturing costs	329,680	$ 25,680	U	[a]					304,000	76,000	F	380,000
7	Variable selling and administrative	68,000				$ 4,000	F			72,000	18,000	F	90,000
8	Contribution margin	$ 442,320	$ 25,680	U		$ 4,000	F	$ 40,000	F	$ 424,000	$ 106,000	U	$ 530,000
9	Fixed costs												
10	Fixed manufacturing overhead	195,500	4,500	F						200,000	–0–		200,000
11	Fixed selling and administrative costs	132,320				7,680	F			140,000	–0–		140,000
12	Profit	$ 114,500	$ 21,180	U		$ 11,680	F	$ 40,000	F	$ 84,000	$ 106,000	U	$ 190,000
13													
14	[a]The individual cost variances are shown in Exhibit 16.11.												
15													

Cost variances result from deviations in input prices and efficiencies in operating the company. They are important for measuring productivity and helping to control costs.

Sales Price Variance

sales price variance Difference between the actual revenue and actual units sold multiplied by budgeted selling price.

The **sales price variance,** Column (4) in Exhibit 16.5, is derived from the *difference between the actual revenue and budgeted selling price multiplied by the actual number of units sold* [$40,000 = ($840,000 − {$10 × 80,000 units})]. This is equivalent, of course, to the difference between the average actual selling price ($10.50 = $840,000 ÷ 80,000 units) and the budgeted selling price ($10) multiplied by the actual quantity sold [= $40,000 = ($10.50 − $10) × 80,000 units].

Variable Production Cost Variances

Be careful to distinguish the variable cost variances in Columns (2) and (3) of Exhibit 16.5, which are *input* variances, from the variable cost variances in Column (6), which are part of the *sales activity* variance. Management expects the costs in the flexible budget to be lower than the master budget, creating a sales activity variance, because the sales volume is lower than planned.

As indicated in Column (5), variable production costs *should have been* $304,000 for a production and sales volume of 80,000 units, not $380,000 as expressed in the master budget in Column (7). Column (1) indicates that the *actual* variable production costs were $329,680, or $50,320 (= $76,000F − $25,680U) lower than the master budget, but $25,680 higher than the flexible budget. Which number should be used to evaluate production cost control, the $50,320 F variance from the master budget or the $25,680 U variance from the flexible budget?

The number to use to evaluate production performance is the $25,680 U variance from the flexible budget. This points out a benefit of flexible budgeting. A superficial comparison of the master budget plan with the actual results would have indicated a favorable variance of $50,320. In fact, production is actually responsible for an unfavorable variance of $25,680, which is caused by deviation from production norms. We discuss the source of this $25,680 in more detail in the following section.

Fixed Production Cost Variance

The fixed production cost variance is simply the difference between actual and budgeted costs. Fixed costs are treated as period costs here; they should not be affected by activity levels within a relevant range. Hence, the flexible budget's fixed costs equal the master budget's fixed costs.

Marketing and Administrative Variances

Marketing and administrative costs are treated like production costs. Variable costs are expected to change as activity changes; hence, variable costs were expected to decrease by $18,000 between the flexible and master budgets (Exhibit 16.5) because volume decreased by 20,000 units. The $4,000 favorable variance for variable marketing and administrative costs must be caused by factors other than sales activity. Comparing actual costs with the flexible budget reveals a $7,680 favorable variance for fixed marketing and administrative costs. Fixed marketing and administrative costs do not change as volume changes; hence, the flexible and master budget amounts are the same.

Performance Measurement and Control in a Cost Center

Before this point, we have considered the measurement of variances for the evaluation and control of profit centers. The performance measure was profit and the variances were computed as differences between various components of profits. To investigate

the cost variances further, we now change the focus of the analysis to a cost center level and consider using costs (budgeted, or planned, versus actual) as a basis for performance evaluation. Because we are focusing on cost centers whose production managers typically do not control what they are asked to produce, we will use actual unit production, not sales, as a baseline. We begin with the costs associated with the flexible budget and analyze differences between actual costs and these flexible budget costs.

Variable Production Costs

We start the analysis with the budgeting information used to determine variable product costs, namely the quantities of inputs and the input unit prices. For any variable resource (e.g., direct materials), the unit variable cost in the budget is determined by multiplying the expected (budgeted) amount of the resource used in each unit of output by the expected price of each unit of the resource.

See Exhibit 16.6 for the basic data for the analysis of Bayou's production cost variances in the standard cost sheet. This **standard cost sheet** provides the quantities of each input required to produce a unit of output along with the budgeted unit prices for each input. Notice that overhead "quantity" is expressed in terms of direct labor-hours because that is what is being used to apply the overhead. Thus, the standard cost per unit of input for overhead is really the standard labor-based burden rate.

standard cost sheet Form providing standard quantities of inputs used to produce a unit of output and the standard prices for the inputs.

Direct Materials

Bayou determines the standard price of the materials it uses to make frames as follows. For simplicity we assume that a single material (metal) is used and each frame requires 4 pounds of this material. Bayou's purchasing manager estimates that the cost of metal with the correct specifications and quality should be \$0.55 per pound. The \$0.55 is the standard price for a unit of input, not output. The standard materials cost for a unit of output, a frame, is \$2.20 (= 4 pounds × \$0.55 per pound).

Direct Labor

Direct labor standards are based on a standard labor rate for the work performed and the standard number of labor-hours required. The standard labor rate includes wages earned as well as fringe benefits, such as medical insurance and pension plan contributions, and employer-paid taxes (for example, unemployment taxes and the employer's share of an employee's social security taxes). Most companies develop one standard for each labor category.

We assume that Bayou Division has only one category of labor. The standard labor cost for each good frame completed is \$1 (= 0.05 hours × \$20 per hour).

Variable Production Overhead

We discussed in Chapters 6 and 7 the way that companies determine an activity measure to apply production overhead. Bayou

Input	(1) Standard Quantity of Input per Unit of Output	(2) Standard Input Price or Rate per Unit of Input	(3) Standard Cost per Unit of Output (frame)
Direct material	4 pounds	\$ 0.55 per pound	\$2.20
Direct labor	0.05 hours	20.00 per hour	1.00
Variable overhead	0.05 hours	12.00 per hour	0.60
Total variable manufacturing costs			\$3.80

Exhibit 16.6 Standard Cost Sheet, Variable Manufacturing Costs, August—Bayou Division

uses a simple variable overhead basis, direct labor-hours, to determine its variable overhead standards. Management reviewed prior period activities and costs, estimated how costs will change in the future, and performed a regression analysis in which overhead cost was the dependent variable and labor-hours the independent variable. After analyzing these estimates, the accountants determined that the best estimate was $12.00 per standard labor-hour as the variable production overhead rate. The standard variable overhead cost for each good frame completed is $0.60 (= 0.05 hours × $12.00 per hour).

Variable Cost Variance Analysis

L.O. 5
Compute and use variable cost variances.

Standard costs are used to evaluate a company's performance. Comparing the budget (prepared using standard costs) to actual results identifies production cost variances. We now review production cost variances in detail.

General Model

cost variance analysis
Comparison of actual input amounts and prices with standard input amounts and prices.

price variance
Difference between actual costs and budgeted costs arising from changes in the cost of inputs to a production process or other activity.

efficiency variance
Difference between budgeted and actual results arising from differences between the inputs that were budgeted per unit of output and the inputs actually used.

total cost variance
Difference between budgeted and actual results (equal to the sum of the price and efficiency variances).

The conceptual **cost variance analysis** model compares actual input quantities and prices with standard input quantities and prices. *Both the actual and standard input quantities are for the actual output attained*. A **price variance** and an **efficiency variance** can be computed for each variable manufacturing input (see Exhibit 16.7). The actual costs incurred—Column (1)—for the time period are compared with the standard allowed per unit times the number of good units of output produced—Column (3). This comparison provides the **total cost variance** for the cost or input.

Some companies compute only the total variance. Others make a more detailed breakdown into price and efficiency variances. Managers who are responsible for price variances would not be held responsible for efficiency variances and vice versa. For example, purchasing department managers are usually held responsible for direct materials price variances, and manufacturing department managers are usually held responsible for using the direct materials efficiently.

This breakdown of the total variance into price and efficiency components is facilitated by the middle term, Column (2), in Exhibit 16.7. In going from Column (1) to Column (2), we go from *actual price* (*AP*) times *actual quantity* (*AQ*) of input to *standard price* (*SP*) times *actual quantity* (*AQ*) of input. Thus, the variance is calculated as

$$\begin{aligned}\text{Price variance} &= (AP \times AQ) - (SP \times AQ)\\ &= (AP - SP) \times AQ\end{aligned}$$

The efficiency variance is derived by comparing Column (2), standard price (*SP*) multiplied by actual quantity of input (*AQ*), with Column (3), standard price (*SP*) multiplied by standard quantity of input allowed for actual good output produced (*SQ*). Thus, the efficiency variance is calculated as

$$\begin{aligned}\text{Efficiency variance} &= (SP \times AQ) - (SP \times SQ)\\ &= SP \times (AQ - SQ)\end{aligned}$$

This general model could seem rather abstract at this point, but as we work examples, it will become more concrete and intuitive to you.

As the general model outlined in Exhibit 16.7 is applied to each variable cost incurred, a more comprehensive cost variance analysis results. The general model of the comprehensive cost variance analysis will be applied to Bayou Division's variable production costs. The comprehensive cost variance analysis will ultimately explain, in detail, the unfavorable variable production variance of $25,680 that we calculated in Column (2) of Exhibit 16.5.

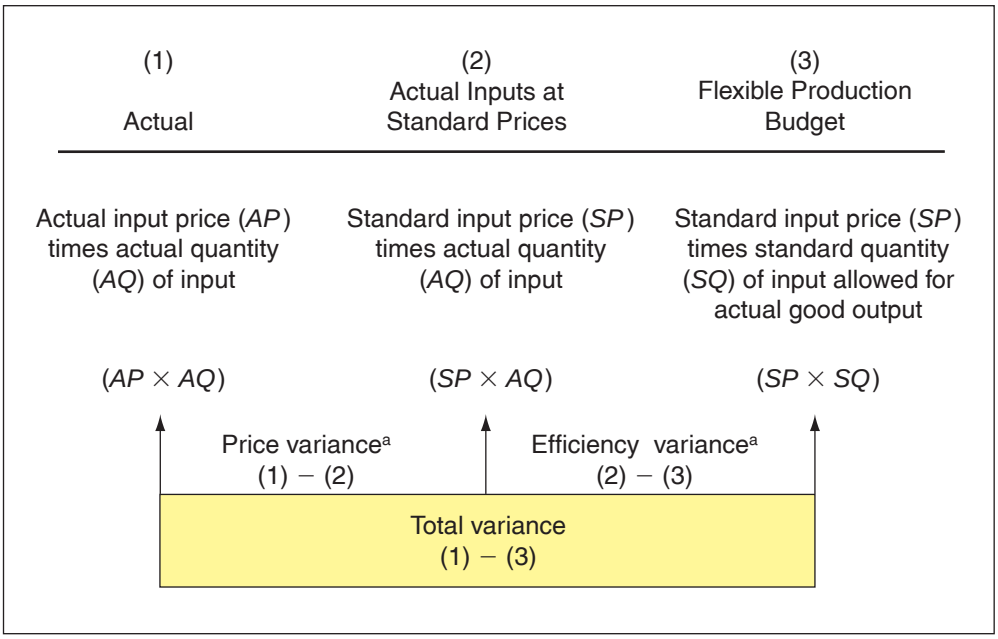


Exhibit 16.7 General Model for Variable Cost Variance Analysis

[a]The terms *price* and *efficiency* variances are general categories. Terminology varies from company to company, but the following specific variance titles are frequently used:

Input	Price Variance Category	Efficiency Category
Direct materials	Price (or purchase price) variance	Usage or quantity variance
Direct labor	Rate variance	Efficiency variance
Variable overhead	Spending variance	Efficiency variance

We shall avoid unnecessary complications by simply referring to these variances as either a *price* or *efficiency* variance.

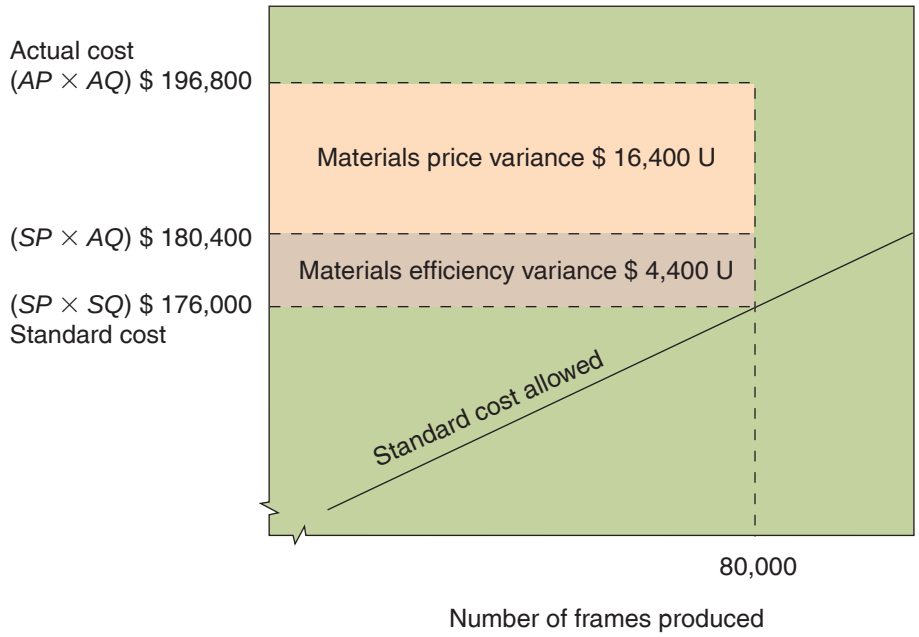
As we proceed through the variance analysis for each production cost input—direct materials, direct labor, and variable production overhead—you will notice some minor modifications to the general model presented in Exhibit 16.7. It is important to recognize that these are modifications to one general approach rather than a number of independent approaches to variance analysis. In variance analysis, a few basic methods can be applied with minor modifications to numerous business and nonbusiness situations.

Direct Materials

Information about Bayou Division's use of direct materials for August follows:

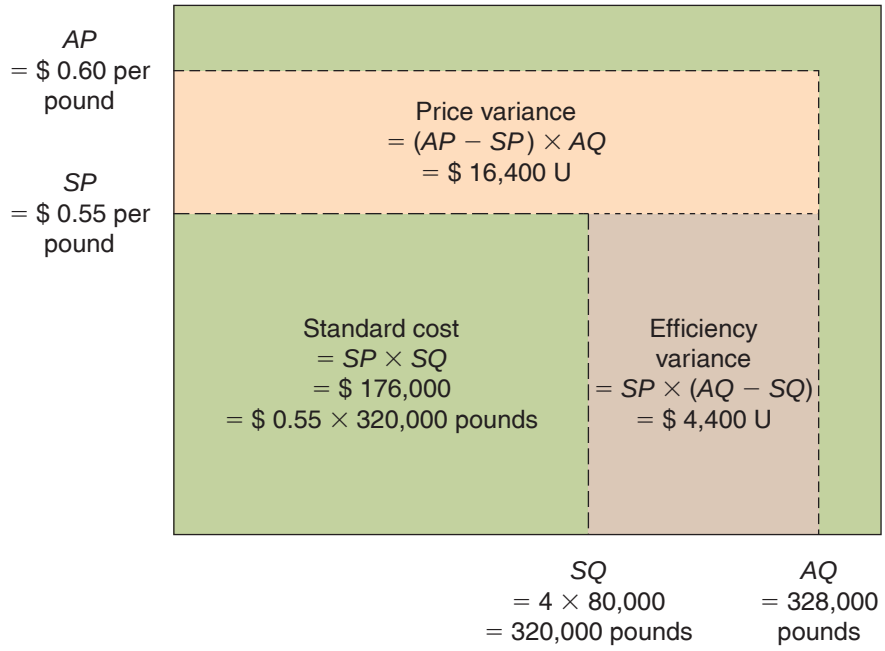
Standard costs
4 pounds per frame @ $0.55 per pound . . . . . = $2.20 per frame
Frames produced in August . . . . . = 80,000
Actual materials purchased and used
328,000 pounds @ $0.60 per pound . . . . . = $196,800

These relationships are shown graphically as follows:



An alternative way to view these variances graphically is shown below. Material quantities are shown on the horizontal axis and the prices for the materials are shown on the vertical axis. The area of the outside box is $196,800 (= $0.60 × 328,000 pounds), the actual price multiplied by the actual quantity of material.

The area of the box on the lower left-hand side is the standard or budgeted cost of the materials for the actual quantity of output produced, $176,000 (= $0.55 × 320,000 pounds). The areas of the other two boxes are the price and efficiency variances.



Actual cost = $ 176,000 + $ 16,400 + $ 4,400 = $ 196,800

Based on these data, the direct materials price and efficiency variance calculations are shown in Exhibit 16.8. Note that with a standard of 4 pounds per frame and 80,000 frames actually produced in August, Bayou expects to use 320,000 pounds to produce the

Exhibit 16.8 Direct Materials Variances, August (80,000 Frames)—Bayou Division

(1) Actual	(2) Actual Inputs at Standard Price	(3) Flexible Production Budget
Actual materials price (AP = \$0.60) × Actual quantity (AQ = 328,000 pounds) of direct materials	Standard materials price (SP = \$0.55) × Actual quantity (AQ = 328,000 pounds) of direct materials	Standard materials price (SP = \$0.55) × Standard quantity (SQ = 320,000 pounds) of direct materials allowed for actual output
$(AP \times AQ)$	$(SP \times AQ)$	$(SP \times SQ)$
\$0.60 × 328,000 = \$196,800	\$0.55 × 328,000 = \$180,400	\$0.55 × 320,000 = \$176,000
Price variance[a] \$196,800 − \$180,400 = \$16,400 U		Efficiency variance[a] \$180,400 − \$176,000 = \$4,400 U

[a] Shortcut formulas:

$(AP \times AQ) - (SP \times AQ)$
$= (AP - SP) \times AQ$
$= (\$.60 - \$.55) \times 328{,}000$
$= \$16{,}400$ U

$(SP \times AQ) - (SP \times SQ)$
$= SP \times (AQ - SQ)$
$= \$.55 \times (328{,}000 - 320{,}000)$
$= \$4{,}400$ U

Total variance = \$20,800 U

80,000 frames. Because each pound of material has a standard cost of \$0.55, the standard materials cost allowed to make 80,000 frames is:

$$\begin{aligned}\text{Standard cost allowed to produce 80,000 frames} &= SP \times SQ \\ &= \$0.55 \times (4 \text{ pounds} \times 80{,}000 \text{ frames}) \\ &= \$176{,}000\end{aligned}$$

flexible production budget Standard input price times standard quantity of input allowed for actual good output.

Note that Column (3) of Exhibit 16.8 is called the **flexible production budget.** The flexible budget concept can be applied to production as well as to sales. The flexible budget in Exhibit 16.5 was based on actual sales volume (that is, number of frames *sold*). The flexible budget in Exhibit 16.8 is based on actual production volume (that is, number of frames *produced*).[1]

Responsibility for Direct Materials Variances

The direct materials price variance (see Exhibit 16.8) shows that in August, the prices paid for direct materials exceeded the standards allowed, thus creating an unfavorable variance of \$16,400. Responsibility for this variance is usually assigned to the purchasing department. Reports to management include an explanation of the variance, for example, failure to take purchase discounts, higher transportation costs than expected, different grade of direct materials purchased, or changes in the market price of direct materials.

For a maker of wooden frames, an unfavorable material efficiency variance can be a signal of increased scrap that results from an inefficient production process. A wood cutting station with saws that have dull blades could be the cause.

[1] In this case, the number of frames sold is equal to the number of frames produced. We discuss cases in which production and sales differ in Chapter 17.

The explanation for Bayou's variance was the closure of a nearby vendor's plant, which required a change in suppliers and increased transportation costs that caused the price of materials to be higher than expected. The long-term effect on prices is uncertain so management has begun market research to determine whether Bayou should attempt to increase sales prices for its frames.

Direct materials efficiency variances are typically the responsibility of production departments. In setting standards, an allowance is usually made for defects in direct materials, inexperienced workers, poor supervision, and the like. If actual materials usage is less than these standards, a favorable variance occurs. If usage exceeds standards, an unfavorable variance occurs.

At Bayou, the unfavorable materials efficiency variance was attributed to an increase in the amount of scrap that results from the cutting process. One of the new employees hired in August required some time to learn to work efficiently with the material. The production supervisor claimed that this was a one-time occurrence and foresaw no similar problems in the future.

Direct Labor

To illustrate the computations of direct labor variances, assume the following for Bayou Division:

Standard costs: 0.05 hour per frame @ $20 per hour = ...	$1 per frame
Number of frames produced in August	80,000
Actual direct labor costs	
Actual hours worked	4,400
Total actual labor cost	$79,200
Average cost per hour (= $79,200 ÷ 4,400 hours)	$18

See Exhibit 16.9 for the computation of the direct labor price and efficiency variances.

Direct Labor Price Variance The direct labor price variance is caused by the difference between actual and standard labor costs per hour. Bayou Division's direct labor costs were less than the standard allowed, creating a favorable labor price variance of $8,800. The explanation given for this favorable labor price variance is that Bayou hired less experienced employees in August; they were paid a lower than standard wage, thus reducing the *average* wage rate for all workers to $18.

Wage rates for many companies are set by union contract. If the wage rates used in setting standards are the same as those in the union contract, labor price variances will not occur.

Labor Efficiency Variance The labor efficiency variance is a measure of labor productivity. It is one of the most closely watched variances because production managers usually can control it. Unfavorable labor efficiency variances have many causes, including the employees themselves. Poorly motivated or poorly trained workers are less productive; highly motivated and well-trained employees are more likely to generate favorable efficiency variances. Sometimes poor materials or faulty equipment can cause productivity problems. Poor supervision and scheduling can lead to unnecessary idle time.

Production department managers are usually responsible for direct labor efficiency variances. Scheduling problems can stem from other production departments that have delayed production. The personnel department could be responsible if the variance occurs because it provided the wrong type of worker. The $8,000 unfavorable direct labor efficiency variance at Bayou Division (see Exhibit 16.9) was attributed to the inexperienced worker previously mentioned. Note that one event, such as hiring inexperienced employees, can affect more than one variance.

Exhibit 16.9 Direct Labor Variances, August (80,000 Frames)—Bayou Division

(1) Actual	(2) Actual Inputs at Standard Price	(3) Flexible Production Budget
Actual labor price (AP = \$18) × Actual quantity (AQ = 4,400 hours) of direct labor	Standard labor price (SP = \$20) × Actual quantity (AQ = 4,400 hours) of direct labor	Standard labor price (SP = \$20) × Standard quantity (SQ = 4,000 hours) of direct labor allowed for actual output
($AP \times AQ$)	($SP \times AQ$)	($SP \times SQ$)
\$18 × 4,400 = \$79,200	\$20 × 4,400 = \$88,000	\$20 × 4,000 = \$80,000

Price variance[a]: \$79,200 − \$88,000 = \$8,800 F

Efficiency variance[a]: \$88,000 − \$80,000 = \$8,000 U

[a] Shortcut formulas:

$(AP \times AQ) - (SP \times AQ)$
$= (AP - SP) \times AQ$
$= (\$18 - \$20) \times 4{,}400$
$= \$8{,}800$ F

$(SP \times AQ) - (SP \times SQ)$
$= SP \times (AQ - SQ)$
$= \$20 \times (4{,}400 - 4{,}000)$
$= \$8{,}000$ U

Total variance = \$800 F

Variable Production Overhead

To illustrate the computation of variable production overhead variances, assume the following for Bayou:

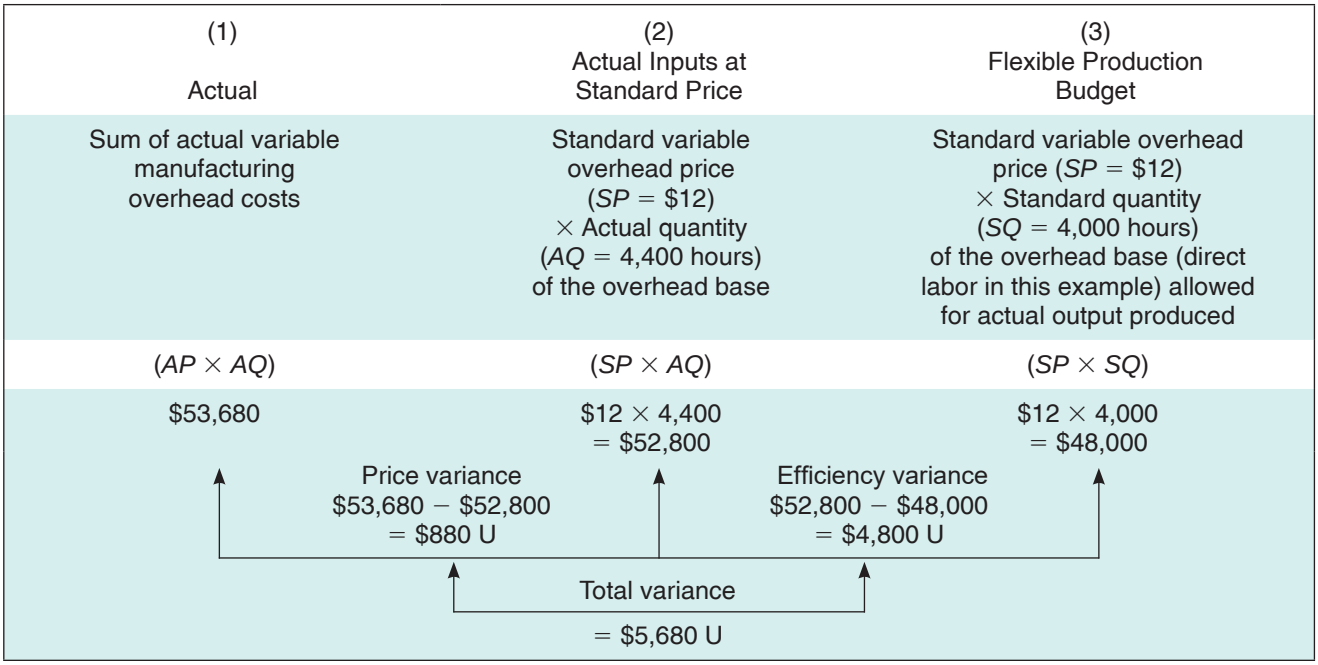
Standard costs: 0.05 hour per frame @ \$12 per hour = ... ($12 is the variable production overhead rate)	\$0.60 per frame
Number of frames produced in August.	80,000
Actual variable overhead cost in August.	\$53,680

See Exhibit 16.10 for the computation of the variable production overhead price and efficiency variances.

Variable Production Overhead Price Variances The variable overhead standard rate was derived from a two-stage estimation of (1) costs at various levels of activity and (2) the relationship between those estimated costs and the basis, which is direct labor-hours at Bayou Division. The price variance could have occurred because (1) actual costs—for example, machine power, materials handling, supplies, some indirect labor—were different from those expected and (2) the relationship between variable production overhead costs and direct labor-hours is not perfect.

The variable overhead price variance actually contains some efficiency items as well as price items. For example, suppose that utilities costs are higher than expected. The reason for this could be that utility rates are higher than expected or that kilowatt-hours (kwh) per labor-hour are higher than expected (for example, if workers do not turn off power switches when machines are not being used). Both are part of the price variance because together they cause utility costs to be higher than expected. Some companies separate these components of the variable overhead price variance; this is done for energy costs in heavy manufacturing companies, for example.

Exhibit 16.10 Variable Overhead Variances, August (80,000 Frames)—Bayou Division



At Bayou Division, the $880 unfavorable price variance for August (see Exhibit 16.10) was attributed to waste in using supplies and recent price increases for petroleum products used to maintain the machines.

Variable Overhead Efficiency Variance The variable overhead efficiency variance must be interpreted carefully. It is *not* related to the use (or efficiency) of variable overhead. It is related to efficiency in using the base on which variable overhead is applied. For example, Bayou applies variable overhead on the basis of direct labor-hours. Thus, if there is an unfavorable direct labor efficiency variance because actual direct labor-hours were higher than the standard allowed, there will be a corresponding unfavorable variable overhead efficiency variance. Bayou used 400 direct labor-hours more than the standard allowed, resulting in the following direct labor and variable overhead efficiency variances.

Direct labor efficiency (Exhibit 16.9)	
$20 × 400 hours =	$ 8,000 U
Variable overhead efficiency (Exhibit 16.10)	
$12 × 400 hours =	4,800 U
Total direct labor and variable overhead efficiency variances	
$32 × 400 hours =	$12,800 U

Variable overhead is assumed to vary directly with direct labor-hours, which is the base on which variable overhead is applied. Thus, inefficiency in using the base (for example, direct labor-hours, machine-hours, units of output) is assumed to cause an increase in variable overhead. This emphasizes the importance of selecting the proper base for applying variable overhead. Managers who are responsible for controlling the base will probably be held responsible for the variable overhead efficiency variance as well. Whoever is responsible for the $8,000 unfavorable direct labor efficiency variance at Bayou should be held responsible for the unfavorable variable overhead efficiency variance.

Variable Cost Variances Summarized in Graphic Form

See Exhibit 16.11 for a summary of the variable production cost variances. Note that the total unfavorable variable production cost variance of $25,680 is the same as that derived

Exhibit 16.11 Variable Manufacturing Cost Variance Summary, August—Bayou Division

Total $25,680 U	Direct materials $20,800 U	Price $16,400 U	$(AP - SP) \times AQ = (\$.60 - \$.55) \times 328{,}000$ pounds	
		Efficiency $4,400 U	$SP \times (AQ - SQ) = \$.55 \times (328{,}000$ lbs. $- 320{,}000$ lbs.)	
	Direct labor $800 F	Price $8,800 F	$(AP - SP) \times AQ = (\$18 - \$20) \times 4{,}400$ hours	
		Efficiency $8,000 U	$SP \times (AQ - SQ) = \$20 \times (4{,}400$ hrs. $- 4{,}000$ hrs.)	
	Variable overhead $5,680 U	Price $880 U	Actual $- (SP \times AQ) = \$53{,}680 - (\$12 \times 4{,}400$ hrs.)	
		Efficiency $4,800 U	$SP \times (AQ - SQ) = \$12 \times (4{,}400$ hrs. $- 4{,}000$ hrs.)	

in Exhibit 16.5. The cost variance analysis just completed is a more detailed analysis of the variable production cost variance derived in Exhibit 16.5.

A summary of this nature is useful for reporting variances to high-level managers. It provides both an overview of variances and their sources. When used for reporting, the computations at the right of Exhibit 16.11 usually are replaced with a brief explanation of the cause of the variance.

Management might want more detailed information about some of the variances. Extending each variance branch in Exhibit 16.11 to show variances by product line, department, or other categories can provide this additional detail.

Self-Study Question

2. Last month, the following events took place at Superior Supplies:
   - Produced 100,000 "leatherlike" digital music player cases.
   - Had standard variable costs per unit (that is, per case):

Direct materials: 3 pounds at $1.50	$ 4.50
Direct labor: 0.20 labor-hours at $22.50	4.50
Variable production overhead:	
.20 labor-hours at $10.00	2.00
Total per case	$11.00

   - Incurred actual production costs:

Direct materials purchased and used:	
325,000 pounds at $1.40	$455,000
Direct labor: 19,000 labor-hours at $25	475,000
Variable overhead	209,000

Compute the direct materials, labor, and variable production overhead price and efficiency variances.

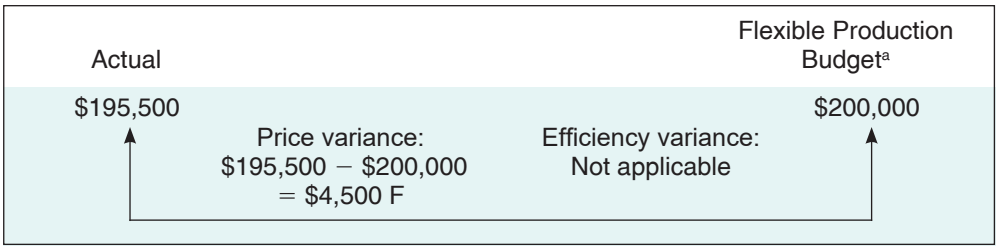
The solution to this question is at the end of the chapter on page 625.

Fixed Cost Variances

L.O. 6
Compute and use fixed cost variances.

Variance analysis treats fixed production costs and variable production costs differently. Because fixed costs are unchanged when volume changes (at least within the relevant range), the amount budgeted for fixed overhead is the same in both the master and flexible budgets. This is consistent with the variable costing method of product costing in which fixed production overhead is treated as a period cost.

Exhibit 16.12
Fixed Overhead Variances, August—Bayou Division



[a] For fixed costs, there is no difference between the flexible and master (or static) budget within the relevant range.

Fixed Cost Variances with Variable Costing

The income statements in Exhibit 16.5 were prepared using variable costing. Therefore, there is no absorption of the fixed costs by units of production. All the fixed manufacturing overhead is charged to income in the period incurred. Fixed overhead has no input-output relationships and, thus, no efficiency variance. The difference between the flexible budget and the actual fixed overhead is entirely due to changes in the costs that make up fixed overhead (for example, insurance premiums on the factory are higher than expected). Hence, the variance falls under the category of a price variance (also called a **spending** or a **budget variance**).

spending (or budget) variance
Price variance for fixed overhead.

The fixed manufacturing overhead in both the flexible and master budgets in Exhibit 16.5 was $200,000. The actual cost was $195,500. See Exhibit 16.12 for the variance analysis. Note that it has no calculation of the efficiency with which inputs are used.

Absorption Costing: The Production Volume Variance

So far, we have assumed that fixed manufacturing costs are treated as period costs, which is consistent with variable costing. If fixed manufacturing costs are unitized and treated as product costs, another variance is computed. *This occurs when companies use full absorption, standard costing.*

Developing the Standard Unit Cost for Fixed Production Costs

Like other standard costs, the fixed manufacturing standard cost is determined before the start of the production period. Unlike standard variable manufacturing costs, fixed costs are period costs by nature. To convert them to product costs requires estimating both the period cost and the production volume for the period. From Chapter 7, we know that

$$\text{Standard (or predetermined) fixed production overhead cost} = \frac{\text{Budgeted fixed manufacturing cost}}{\text{Budgeted activity level}}$$

The estimated annual fixed manufacturing overhead at Bayou was $2,400,000, and the annual production volume was estimated to be 1,200,000 frames, or 60,000 direct labor-hours at .05 hour per frame. Thus, Bayou determines its standard fixed manufacturing cost per frame as follows:

$$\text{Standard cost per frame} = \frac{\$2{,}400{,}000 \text{ budgeted fixed manufacturing cost}}{1{,}200{,}000 \text{ frames (budgeted activity level)}} = \underline{\$2.00 \text{ per frame}}$$

The rate could be computed per direct labor-hour, as follows:

$$\text{Standard cost per hour} = \frac{\$2{,}400{,}000 \text{ budgeted fixed manufacturing cost}}{60{,}000 \text{ hours (budgeted activity level)}} = \underline{\$40.00 \text{ per hour}}$$

production volume variance
Variance that arises because the volume used to apply fixed overhead differs from the estimated volume used to estimate fixed costs per unit.

Each frame is expected to require .05 direct labor-hour (= 60,000 hours ÷ 1,200,000 frames), so the standard cost per frame is still $2.00 (= $40 per hour × .05 hour per frame).

If 80,000 units are actually produced during the month, $160,000 (= $2 per frame × 80,000 frames) of fixed overhead costs is applied to these units produced. The **production volume variance** is the difference between the $160,000 applied fixed overhead and the $200,000 (= $2,400,000 ÷ 12 months) budgeted fixed overhead as in Exhibit 16.13.

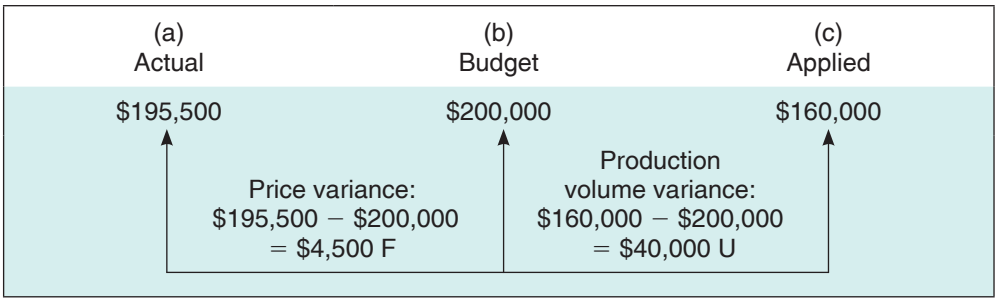


Exhibit 16.13 Fixed Overhead Variances, August—Bayou Division

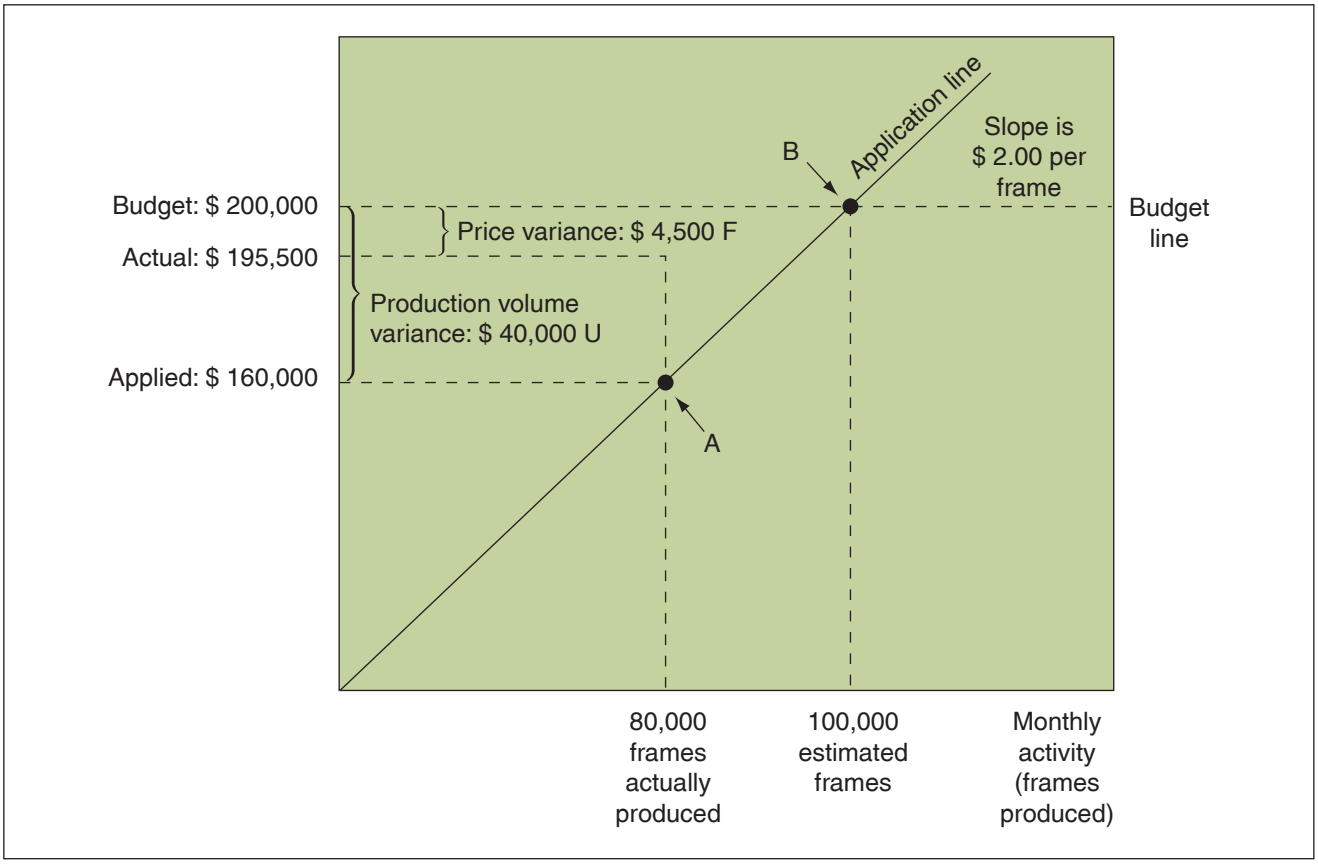
In this situation, a $40,000 unfavorable production volume variance exists. It is unfavorable because less overhead was applied than was budgeted; production was lower than the average monthly estimate. This variance is a result of the full absorption costing system; it does not occur in variable costing.

This $160,000 applied fixed overhead equals $2 per frame multiplied by 80,000 units actually produced (see Exhibit 16.14). If the $40 rate per direct labor-hour had been used, the amount applied to the 80,000 units produced would still be $160,000 (= $40 × 0.05 × 80,000).

A variance occurs if the number of units actually produced differs from the number of units used to estimate the fixed cost per unit. Again, this variance is commonly referred to as a *production volume variance* (also called a *capacity variance,* an *idle capacity variance,* or a *denominator variance*).

Our example has a production volume variance because the 80,000 frames actually produced during the month do not equal the 100,000 estimated for the month. Consequently, production is charged $160,000 (point A in Exhibit 16.14) instead of $200,000 (point B in Exhibit 16.14). The $40,000 difference is the production volume variance

Exhibit 16.14 Fixed Overhead Variances, Graphic Presentation—Bayou Division



because it is caused by a deviation in production volume level (number of frames produced) from that estimated to arrive at the standard cost.

If Bayou had estimated 80,000 frames per month instead of 100,000 frames, the standard cost would have been $2.50 per frame (= $200,000 ÷ 80,000 frames). Thus, $200,000 (= $2.50 × 80,000 frames) would have been applied to units produced, and there would have been no production volume variance.

The production volume variance applies only to fixed costs; it occurs because we are allocating a fixed period cost to units on a predetermined basis. It does not represent resources spent or saved. This is unique to full absorption costing. The benefits of calculating the variance for control purposes are questionable. Although the production volume variance signals a difference between expected and actual production levels, so does a simple production report of actual versus expected production quantities.

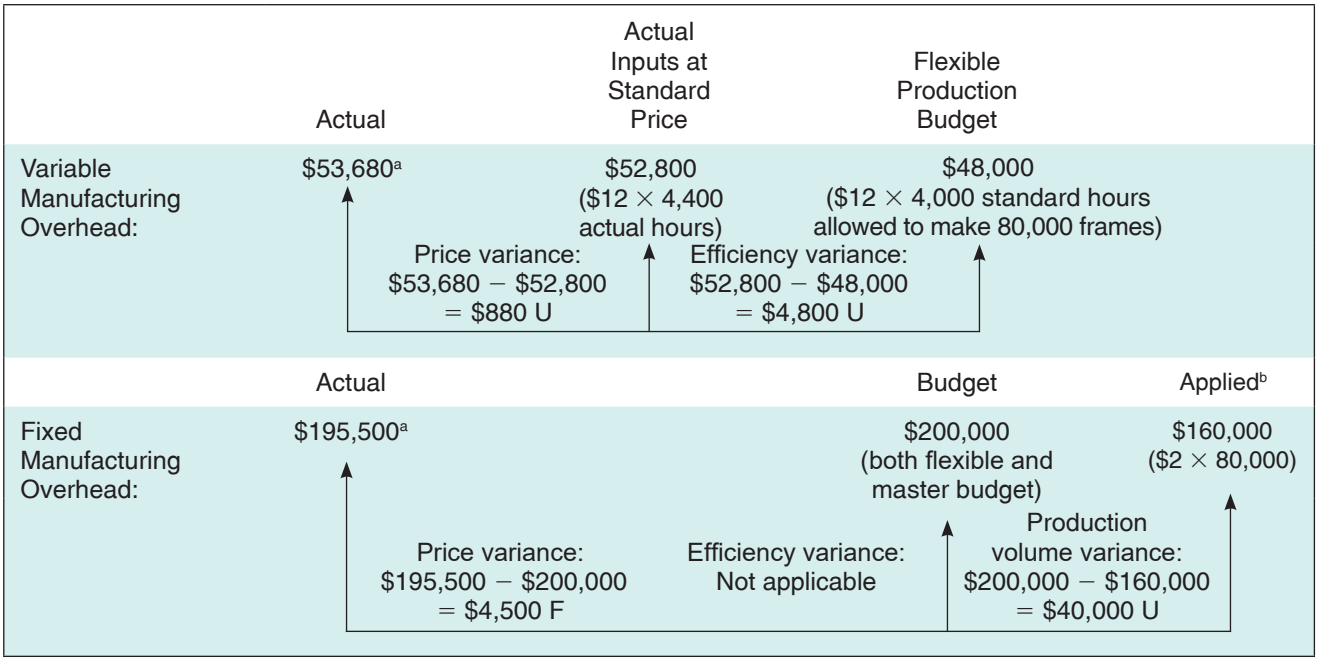
Compare with the Fixed Production Cost Price Variance The fixed production cost price variance is the difference between actual and budgeted fixed production costs. Unlike the production volume variance, the price variance commonly is used for control purposes because it is a measure of differences between actual and budgeted period costs.

Exhibits 16.13 and 16.14 summarize the computation of the fixed production price (spending) and production volume variances. Reviewing them will help you see the relationship between actual, budgeted, and applied fixed production costs.

Summary of Overhead Variances

The method of computing overhead variances described in this chapter is known as the *four-way analysis of overhead variances* because it computes the following four variances: price and efficiency for variable overhead, and price and production volume for fixed overhead. See Exhibit 16.15 for a summary of the four-way analysis of variable and fixed overhead variances based on facts given in the chapter.

Exhibit 16.15 Summary of Overhead Variances, Four-Way Analysis, August—Bayou Division



[a] Amount given in chapter.

[b] This is the amount of fixed manufacturing costs applied to units produced when using full absorption costing.

Self-Study Question

3. This question follows up Self-Study Question 2. Assume that the fixed production cost budget for the month was $320,000, and actual fixed production overhead costs were $332,000. The estimated monthly production was 80,000 cases (or 16,000 standard labor-hours).

   Compute the fixed production overhead price variance and the fixed production overhead production volume variance.

The solution to this question is at the end of the chapter on page 625.

Key Points

Several points regarding overhead variances are important.

- The variable overhead efficiency variance measures the efficiency in using the allocation base (for example, direct labor-hours).
- The production volume variance occurs only when fixed production cost is unitized (for example, when using full absorption costing). Furthermore, the budgeted fixed overhead might not equal the amount applied to units produced.
- There is no efficiency variance for fixed production costs. (Do not confuse production volume variance with an efficiency variance.)

Does Standard Costing Lead to Waste? *In Action*

Standard costing systems base the reported product costs on standards, such as those in Exhibit 16.6. Recently, many commentators have criticized standard costing as motivating behavior that does not increase company value. The problem, according to analysts such as Bruce Baggaley and Brian Maskell, is that standard costing systems give incentives to managers and workers to increase production, even if it only builds inventory, because the focus is on unit costs. In addition, a standard costing system "requires an expensive and wasteful data collection system."

As always, it is important to distinguish between a concept and a practice. The *concept* of standard costing *is* simply that firms can create benchmarks against which to evaluate performance. Standard costing, as usually *practiced,* includes the development of standard costs for fixed overhead and consequently for production volume variances. Managers evaluated by variances that include production volume variances do have an incentive to overproduce. This is the reason that performance evaluation systems, including standard costing, have to be applied with an understanding of the undesirable incentives they provide managers.

Source: Bruce Baggaley and Brian Maskell, "Value Stream Management for Lean Companies, Part II," *Journal of Cost Management* 17 (no. 3): 24–30.

The Debrief

Meera Patel, the CFO of Newfoundland Enterprises, has finished looking through the variance analyses. She comments:

> These analyses are very helpful. As CFO, the profit variance analysis in Exhibit 16.5 is especially useful in setting priorities. Looking at that spreadsheet, I am convinced we have to focus on our marketing efforts to get the sales volume up. Part of the volume loss might have been due to being too aggressive in going after price and getting a favorable price variance, but there is more to it, I'm sure.
>
> Although that will be my focus, I am going to pass the cost variance analysis on to the plant controller. There are some opportunities here as well. Most important, preparing and analyzing these variances routinely will force us to look for improvements continually.

Summary

This chapter discusses the computation and analysis of variances. A *variance* is the difference between a budget, or standard, and an actual result.

The following summarizes the key ideas tied to the chapter's learning objectives.

LO. 1. Use budgets for performance evaluation. *Budgets* provide a view of anticipated operations and enable management to measure the performance of employees in various areas of the production and sales processes.

LO. 2. Develop and use flexible budgets. The *master budget* is typically static; that is, it is developed in detail for one level of activity. A *flexible budget* recognizes that variable costs and revenues are expected to differ from the budget if the actual activity (for example, actual sales volume) differs from what was budgeted. A flexible budget can be thought of as the costs and revenues that would have been budgeted if the activity level had been correctly estimated in the master budget. The general relationship between the actual results, the flexible budget, and the master budget follows:

Actual	Flexible Budget	Master Budget
Actual costs and revenues based on actual activity	Cost and revenues that would have been budgeted if actual activity had been budgeted	Budgeted costs and revenues based on budgeted activity

LO. 3. Compute and interpret the sales activity variance. The sales activity variance is the difference between the operating profit in the master budget and the flexible budget. This difference (or variance) occurs because the actual number of units sold is different from the number budgeted in the master budget.

LO. 4. Prepare and use a profit variance analysis. The *profit variance analysis* outlines the causes of differences between budgeted profits and the actual profits earned. Variances are separated into four categories: production, marketing and administrative, sales price, and sales activity.

LO. 5. Compute and use variable cost variances. The model used for calculating variable production cost variances is based on the following diagram, which divides the total variance between actual and standard into *price* and *efficiency* components:

(1) Actual	(2) Actual Inputs at Standard Price	(3) Flexible Production Budget
Actual input price (AP) × Actual quantity (AQ) of input	Standard input price (SP) × Actual quantity (AQ) of input	Standard input price (SP) × Standard quantity (SQ) of input allowed for actual output
$(AP \times AQ)$	$(SP \times AQ)$	$(SP \times SQ)$

Price variance
(1) − (2)
$(AP \times AQ) - (SP \times AQ)$
$= (AP - SP) \times AQ$

Efficiency variance
(2) − (3)
$(SP \times AQ) - (SP \times SQ)$
$= SP \times (AQ - SQ)$

Total variance
(1) − (3)
$(AP \times AQ) - (SP \times SQ)$

LO. 6. Compute and use fixed cost variances. Fixed production costs have no efficiency variance. The price variance is the difference between actual fixed costs and the fixed costs in the flexible budget. If fixed costs are unitized and assigned to units produced, a production volume variance also can arise. The production volume variance is the difference between the budgeted fixed costs and the amount applied to production.