Standard Costing, Operational Performance Measures, and the Balanced Scorecard

After completing this chapter, you should be able to:

1. Explain how standard costing is used to help manage costs.
2. Describe two ways to set standards, and distinguish between perfection and practical standards.
3. Compute and interpret the direct-material price and quantity variances and the direct-labor rate and efficiency variances.
4. Explain several methods for determining the significance of cost variances.
5. Describe some behavioral effects of standard costing.
6. Explain how standard costs are used in product costing.
7. Summarize some advantages of standard costing.
8. Describe the changing role of standard-costing systems in today's manufacturing environment.
9. Describe the operational performance measures appropriate for today's manufacturing environment.
10. Describe the balanced scorecard concept and explain the reasoning behind it.
11. After completing the appendix, prepare journal entries to record and close out cost variances.

Cyber Desserts from DCdesserts.com

Washington, DC—People living here in the nation's capital are often surprised to learn that many of the city's sweet tooths are being served by a Web-based company called DCdesserts.com. An innovative purveyor of fancy desserts, DCdesserts.com operates its business almost entirely over the Internet. "We supply fancy desserts to some of Washington's best restaurants, caterers, and gourmet food stores," says Tyler Martin, DCdesserts.com's founder and owner. "We've supplied desserts for the U.S. Senate dining room, and we've even had a president or two sample our wares."

The interesting thing about this company, though, is that almost all of its business dealings are done via the Internet. "We post our menu on our website, say on a Monday," explains Martin. "Then we accept orders up until midnight on Tuesday, for delivery on Friday. On Wednesday, we order ingredients, again mostly over the Web, and accept delivery on Thursday. We bake the desserts throughout the day on Friday and deliver them Friday afternoon. Of course, we do all this on a rolling basis, so we're starting a new sequence every day."

A tour of DCdesserts.com's production facilities and a talk with the company's director of cost management, however, demonstrated that there is much more to the company's success than its innovative Web-based strategy. "We have an incredibly tight cost control system here," says Maria Gonzales. "We set standards for everything, including the quantity and price of ingredients and the expected time and hourly rate for labor. When we have deviations from our standard cost to produce a batch of desserts, we investigate. If something's going wrong, we want to correct it. And if someone's discovered a more efficient way to do something, which results in a favorable cost variance, we want to know that, too."

Gonzales was quick to add, though, that the standard-costing system was not used punitively. "We never use it to beat people over the head. It's a diagnostic tool, that's all. It helps us keep tabs on the financial dimensions of our production process."

"We collect a lot of nonfinancial data as well," explained Gonzales. "We measure all kinds of things, like machine downtime, time for raw-material delivery, and a host of others. We're doing a lot with these nonfinancial, operational performance measures now."

DCdesserts.com is thriving by supplying some of the best desserts in Washington, and doing so in a cost-efficient manner.

A budget provides a plan for managers to follow in making decisions and directing an organization's activities. At the end of a budget period, the budget serves another useful purpose. At that time, managers use the budget as a benchmark against which to compare the results of actual operations. Did the company make as much profit as anticipated in the budget? Were costs greater or less than expected? These questions involve issues of cost management and control. In this chapter, we will study one of the tools used by managerial accountants to assist managers in controlling an organization's operations and costs.

Managing Costs

How can managers use a control system as a cost management tool? Any control system has three basic parts: a predetermined or *standard* performance level, a measure of *actual* performance, and a *comparison* between standard and actual performance. A thermostat is a control system with which we are all familiar. First, a thermostat has a predetermined or standard temperature, which can be set at any desired level. If you want the temperature in a room to be 68 degrees, you set the thermostat at the *standard* of 68 degrees. Second, the thermostat has a thermometer, which measures the *actual* temperature in the room. Third, the thermostat *compares* the preset or standard temperature with the actual room temperature. If the actual temperature falls below the preset or standard temperature, the thermostat activates a heating device. The three features of a control system are depicted in Exhibit 10–1.

A managerial accountant's budgetary-control system works like a thermostat. First, a predetermined or **standard cost** is set. In essence, a standard cost is a budget for the production of one unit of product or service. It is the cost chosen by the managerial accountant to serve as the benchmark in the budgetary-control system. When the firm produces many units, the managerial accountant uses the standard unit cost to determine the total standard or budgeted cost of production. For example, suppose the standard direct-material cost for one unit of product is $5 and 100 units are manufactured. The total standard or budgeted direct-material cost, given an actual output of 100 units, is $500 ($5 × 100).

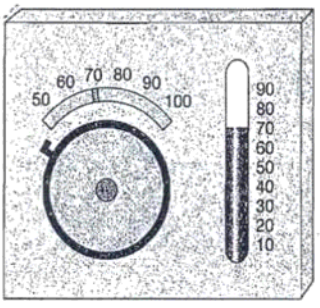
Second, the managerial accountant measures the actual cost incurred in the production process.

Third, the managerial accountant compares the actual cost with the budgeted or standard cost. Any difference between the two is called a **cost variance.** Cost variances then are used in controlling costs.

Management by Exception

Managers are busy people. They do not have time to look into the causes of every variance between actual and standard costs. However, they do take the time to investigate

Exhibit 10–1
Control System: A Thermostat



1. **Predetermined or standard performance** (The thermostat is set to a standard temperature.)
2. **Measure of actual performance** (The thermometer measures the actual room temperature.)
3. **Comparison of actual and standard performance** (The thermostat compares the preset or standard temperature with the actual temperature.)

the causes of significant cost variances. This process of following up on only significant cost variances is called **management by exception.** When operations are going along as planned, actual costs and profit will typically be close to the budgeted amounts. However, if there are significant departures from planned operations, such effects will show up as significant cost variances. Managers investigate these variances to determine their causes, if possible, and take corrective action when indicated.

What constitutes a significant variance? No precise answer can be given to this question, since it depends on the size and type of the organization and its production process. We will consider this issue later in the chapter when we discuss common methods for determining the significance of cost variances. First, however, we will turn our attention to the process of setting standards.

Setting Standards

Methods for Setting Standards

Managerial accountants typically use two methods for setting cost standards: analysis of historical data and task analysis.

Analysis of Historical Data One indicator of future costs is historical cost data. In a mature production process, where the firm has a lot of production experience, historical costs can provide a good basis for predicting future costs. The methods for analyzing cost behavior that we studied in Chapter 7 are used in making cost predictions. The managerial accountant often will need to adjust these predictions to reflect movements in price levels or technological changes in the production process. For example, the amount of rubber required to manufacture a particular type of tire will likely be the same this year as last year, unless there has been a significant change in the process used to manufacture tires. However, the price of rubber is likely to be different this year than last, and this fact must be reflected in the new standard cost of a tire.

Despite the relevance of historical cost data in setting cost standards, managerial accountants must guard against relying on them excessively. Even a seemingly minor change in the way a product is manufactured may make historical data almost totally irrelevant. Moreover, new products also require new cost standards. For new products, such as genetically engineered medicines, there are no historical cost data upon which to base standards. In such cases, the managerial accountant must turn to another approach.

Task Analysis Another way to set cost standards is to analyze the process of manufacturing a product to determine what it *should* cost. The emphasis shifts from what the product *did* cost in the past to what it *should* cost in the future. In using **task analysis,** the managerial accountant typically works with engineers who are intimately familiar with the production process. Together they conduct studies to determine exactly how much direct material should be required and how machinery should be used in the production process. Time and motion studies are conducted to determine how long each step performed by direct laborers should take.

A Combined Approach Managerial accountants often apply both historical cost analysis and task analysis in setting cost standards. It may be, for example, that the technology has changed for only one step in the production process. In such a case, the managerial accountant would work with engineers to set cost standards for the technologically changed part of the production process. However, the accountant would likely rely on the less expensive method of analyzing historical cost data to update the cost standards for the remainder of the production process.

standard-setting process. For example, task analysis should be carried out by a team consisting of production engineers, production supervisors, and managerial accountants.

Perfection versus Practical Standards: A Behavioral Issue

How difficult should it be to attain standard costs? Should standards be set so that actual costs rarely exceed standard costs? Or should it be so hard to attain standards that actual costs frequently exceed them? The answers to these questions depend on the purpose for which standards will be used and how standards affect behavior.

Perfection Standards A **perfection** (or **ideal**) **standard** is one that can be attained only under nearly perfect operating conditions. Such standards assume peak efficiency, the lowest possible input prices, the best-quality materials obtainable, and no disruptions in production due to such causes as machine breakdowns or power failures. Some managers believe that perfection standards motivate employees to achieve the lowest cost possible. They claim that since the standard is theoretically attainable, employees will have an incentive to come as close as possible to achieving it.

Other managers and many behavioral scientists disagree. They feel that perfection standards discourage employees, since they are so unlikely to be attained. Moreover, setting unrealistically difficult standards may encourage employees to sacrifice product quality to achieve lower costs. By skimping on raw-material quality or the attention given manual production tasks, employees may be able to lower the production cost. However, this lower cost may come at the expense of a higher rate of defective units. Thus, the firm ultimately may incur higher costs than necessary as defective products are returned by customers or scrapped upon inspection.

Practical Standards Standards that are as tight as practical, but still are expected to be attained, are called **practical** (or **attainable**) **standards.** Such standards assume a production process that is as efficient as practical under normal operating conditions. Practical standards allow for such occurrences as occasional machine breakdowns and normal amounts of raw-material waste. Attaining a practical standard keeps employees on their toes, without demanding miracles. Most behavioral theorists believe that practical standards encourage more positive and productive employee attitudes than do perfection standards.

Use of Standards by Nonmanufacturing Organizations

"At Best Foods, standard costs are set at attainable levels." (10a)
Best Foods (recently purchased by Unilever)

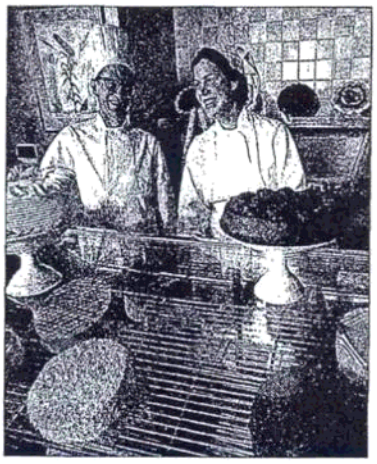
Many service industry firms, nonprofit organizations, and governmental units make use of standard costs. For example, airlines set standards for fuel and maintenance costs. A county motor vehicle office may have a standard for the number of days required to process and return an application for vehicle registration. These and similar organizations use standards in budgeting and cost control in much the same way that manufacturers use standards.

Cost Variance Analysis

DC desserts

To illustrate the use of standards in managing costs, we will focus on a producer of fancy desserts located in the Washington, DC, area. DCdesserts.com supplies fresh and frozen desserts to a variety of restaurants, caterers, and upscale food stores. The

company's order-taking system is entirely Web-based. DCdesserts.com posts its menu of fresh fancy dessert products for each day on its website fours days in advance of the delivery date. Orders are accepted via the Internet three days in advance of delivery. For example, the menu of desserts to be available for delivery on Friday afternoon is posted to DCdesserts.com's website on Monday, and orders are accepted up to midnight on Tuesday. The company places orders for ingredients on Wednesday and accepts delivery on Thursday. DCdesserts.com's ordering is also done largely via the Internet. Production then takes place throughout the day on Friday, and the desserts are delivered Friday afternoon. DCdesserts.com uses three independent delivery services to deliver its dessert products: Capital Couriers, Potomac Door-to-Door, and Washington Delivery Service.



DCdesserts.com also produces frozen dessert products for upscale grocery stores. Unlike the fresh desserts, which vary daily, the frozen desserts are stock items that are varied less frequently. Like the fresh desserts, however, the frozen dessert menu is posted to DCdesserts.com's website, and orders are accepted entirely via the Internet. DCdesserts.com produces its fresh fancy desserts and frozen desserts in two different production facilities, both located near the Washington beltway.

The production process for the fresh fancy desserts involves a combination of semiautomated equipment and manual labor. Even in this era of widespread automation, making fancy desserts still involves considerable direct labor. In the words of DCdesserts.com's founder and owner, "making a Black Forest cake or a linzer torte to be served in the U.S. Senate dining room is not the same as making your basic pumpkin pie. There's a lot of touch labor by skilled people in doing these fancy desserts." The basic steps in the production process are much as you might expect. These steps include selecting ingredients, mixing, baking, cooling, and finishing. The finishing work, of course, involves the most skilled direct labor. In making a six-layer chocolate raspberry cake, for example, each individual cake layer must be sliced into two pieces, and then fillings and icings are applied to each layer. The cake's top is finished artistically, and any additional toppings are carefully applied.

DCdesserts.com's director of cost management has set standards for direct material and direct labor as follows for a category of dessert products generically referred to as multilayer fancy cakes.

Direct-Material Standards

The standard quantity and price of ingredients for one multilayer fancy cake, such as a Black Forest cake, are shown in the following table:

Standard quantity:	
Ingredients in finished product	4.75 pounds
Allowance for normal waste	.25 pound
Total standard quantity required per multilayer fancy cake	5.00 pounds
Standard price:	
Purchase price per pound of ingredients (net of purchase discounts)	$1.30
Transportation cost per pound	.10
Total standard price per pound of ingredients	$1.40

The standard quantity of ingredients needed to produce one cake is 5 pounds, even though only 4.75 pounds actually remain in the finished product. One-quarter pound of ingredients is wasted as a normal result of the production process. Therefore, the entire amount of ingredients needed to produce a fancy cake is included in the standard quantity of material.

The standard price of ingredients reflects all of the costs incurred to acquire the material and transport it to the plant. Notice that the cost of transportation is added to the purchase price. Any purchase discounts would be subtracted out from the purchase price to obtain a net price.

To summarize, the **standard direct-material quantity** is the total amount of direct material normally required to produce a finished product, including allowances for normal waste or inefficiency. The **standard direct-material price** is the total delivered cost, after subtracting any purchase discounts.

Direct-Labor Standards

The standard quantity and rate for direct labor for the production of one multilayer fancy cake are:

Standard quantity:	
Direct labor required per multilayer fancy cake	.5 hours
Standard rate:	
Hourly wage rate	$16
Fringe benefits (25% of wages)	4
Total standard rate per hour	$20

The **standard direct-labor quantity** is the number of direct-labor hours normally needed to manufacture one unit of product. The **standard direct-labor rate** is the total hourly cost of compensation, including fringe benefits.

Standard Costs Given Actual Output

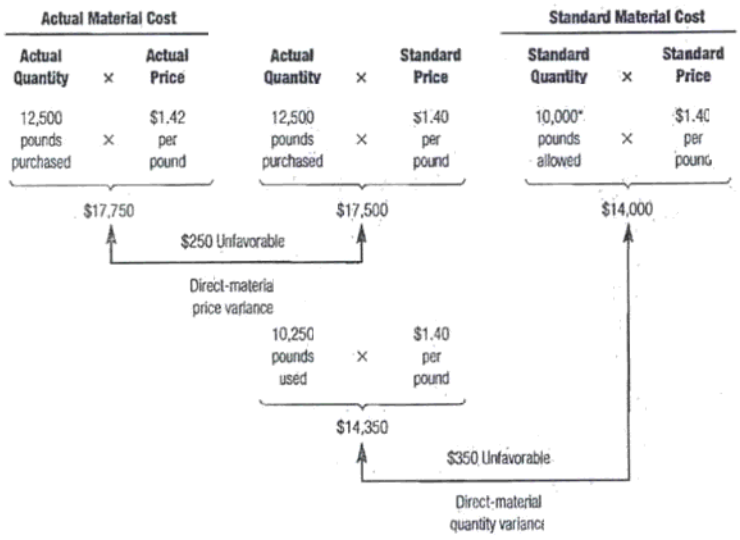
During September DCdesserts.com produced 2,000 multilayer fancy cakes. The total standard or budgeted costs for direct material and direct labor are computed as follows:

Direct material:	
Standard direct-material cost per cake (5 pounds × $1.40 per pound)	$ 7
Actual output	× 2,000
Total standard direct-material cost	$14,000
Direct labor:	
Direct-labor cost per cake (.5 hours × $20.00 per hour)	$ 10
Actual output	× 2,000
Total standard direct-labor cost	$20,000

Notice that the total standard cost for the direct-material and direct-labor inputs is based on DCdesserts.com's actual *output.* The company should incur costs of $34,000 for direct material and direct labor, *given that it produced 2,000 multilayer fancy cakes.* The total standard costs for direct material and direct labor serve as the managerial accountant's benchmarks against which to compare actual costs. This comparison then serves as the basis for controlling direct-material and direct-labor costs.

Analysis of Cost Variances

During September, DCdesserts.com incurred the following actual costs for direct material and direct labor in the production of multilayer fancy cakes.



*Actual output × Standard quantity per unit = 2,000 units × 5 pounds per unit = 10,000 pounds allowed.

Exhibit 10–2
Direct-Material Price and Quantity Variances

Direct material purchased: actual cost 12,500 pounds at $1.42 per pound	$17,750
Direct material used: actual cost 10,250 pounds at $1.42 per pound	$14,555
Direct labor: actual cost 980 hours at $21 per hour	$20,580

Compare these actual expenditures with the total standard costs for the production of 2,000 multilayer fancy cakes. DCdesserts.com spent more than the budgeted amount for both direct material and direct labor. But why were these excess costs incurred? Is there any further analysis the managerial accountant can provide to help answer this question?

Direct-Material Variances

What caused DCdesserts.com to spend more than the anticipated amount on direct material? First, the company purchased ingredients at a higher price ($1.42 per pound) than the standard price ($1.40 per pound). Second, the company used more ingredients than the standard amount. The amount actually used was 10,250 pounds instead of the standard amount of 10,000 pounds, which is based on actual output of 2,000 multilayer fancy cakes. The managerial accountant can show both of these deviations from standards by computing a **direct-material price variance** (or **purchase price variance**) and a **direct-material quantity variance.** The computation of these variances is depicted in Exhibit 10–2.

The formula for the direct-material price variance is as follows:

$$\text{Direct-material price variance} = (PQ \times AP) - (PQ \times SP) = PQ(AP - SP)$$

where

PQ = Quantity purchased
AP = Actual price
SP = Standard price

DCdesserts.com's direct-material price variance for September's production of multilayer fancy cakes is computed as follows:

$$\begin{aligned}\text{Direct-material price variance} &= PQ(AP - SP)\\ &= 12{,}500(\$1.42 - \$1.40)\\ &= \$250 \text{ Unfavorable}\end{aligned}$$

This variance is unfavorable, because the actual purchase price exceeded the standard price. Notice that the price variance is based on the quantity of material *purchased* (PQ), not the quantity actually used in production.

As Exhibit 10–2 shows, the following formula defines the direct-material quantity variance.

$$\text{Direct-material quantity variance} = (AQ \times SP) - (SQ \times SP) = SP(AQ - SQ)$$

where

AQ = Actual quantity used
SQ = Standard quantity allowed

DCdesserts.com's direct-material quantity variance for September's production of multilayer fancy cakes is computed as follows:

$$\begin{aligned}\text{Direct-material quantity variance} &= SP(AQ - SQ)\\ &= \$1.40(10{,}250 - 10{,}000)\\ &= \$350 \text{ Unfavorable}\end{aligned}$$

This variance is unfavorable, because the actual quantity of direct material used in September exceeded the standard quantity allowed, *given actual September output* of 2,000 multilayer fancy cakes. The quantity variance is based on the quantity of material actually *used* in production (AQ).

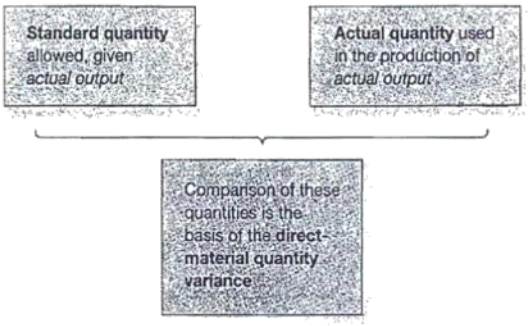
"The folks that have had the opportunity in the last eight months to engage as a real business partner are really excited by it, and we are doing some exciting things about our material [purchasing] organization, and finance, what we call vendor cost analysis folks." (10b)

Boeing

Quantity Purchased versus Quantity Used As stated above, the direct-material price variance is based on the quantity purchased (PQ). This makes sense, because deviations between the actual and standard price, which are highlighted by the price variance, relate to the *purchasing* function in the firm. Timely action to follow up a significant price variance will be facilitated by calculating this variance as soon as possible after the material is *purchased*.

In contrast, the direct-material quantity variance is based on the amount of material *used* in production (AQ). The quantity variance highlights deviations between the quantity of material actually used (AQ) and the standard quantity allowed (SQ). Thus, it makes sense to compute this variance at the time the material is *used* in production.

Basing the Quantity Variance on Actual Output Notice that the standard quantity of material must be based on the actual production output in order for the quantity variance to be meaningful. It would not make any sense to compare standard or budgeted material usage at one level of output (say, 1,000 multilayer fancy cakes) with the actual material usage at a *different* level of output (say, 2,000 multilayer fancy cakes). Everyone would expect more direct material to be used in the production of 2,000 cakes than in the production of 1,000 cakes. For the direct-material quantity variance to provide helpful information for management, the standard or budgeted quantity must be based on *actual output*. Then the quantity variance compares the following two quantities.



Direct-Labor Variances


Topic 10–2

Why did DCdesserts.com spend more than the anticipated amount on direct labor during September? First, the division incurred a cost of $21 per hour for direct labor instead of the standard amount of $20 per hour. Second, the division used only 980 hours of direct labor, which is less than the standard quantity of 1,000 hours, given actual output of 2,000 multilayer fancy cakes. The managerial accountant analyzes direct-labor costs by computing a **direct-labor rate variance** and a **direct-labor efficiency variance.** Exhibit 10–3 depicts the computation of these variances.

The formula for the direct-labor rate variance is shown below.

$$\text{Direct-labor rate variance} = (AH \times AR) - (AH \times SR) = AH(AR - SR)$$

where

AH = Actual hours used
AR = Actual rate per hour
SR = Standard rate per hour

DCdesserts.com's direct-labor rate variance for September's production of multilayer fancy cakes is computed as follows:

$$\text{Direct-labor rate variance} = AH(AR - SR)$$
$$= 980(\$21 - \$20) = \$980 \text{ Unfavorable}$$

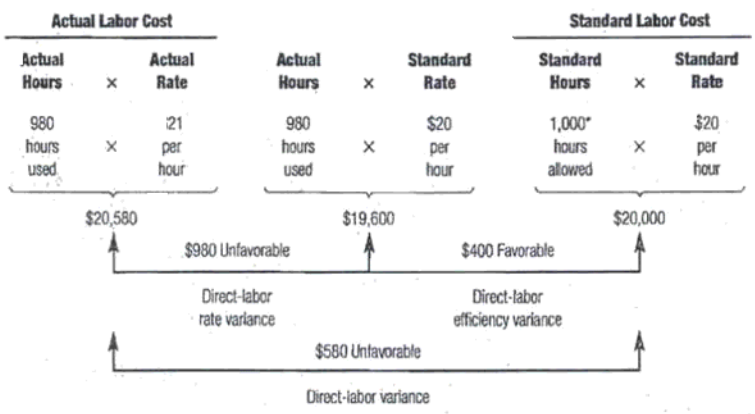


Exhibit 10–3
Direct-Labor Rate and Efficiency Variances

*Actual output × Standard hours per unit = 2,000 units × .5 hours per unit = 1,000 hours allowed.

This variance is unfavorable because the actual rate exceeded the standard rate during September.

As Exhibit 10–3 shows, the formula for the direct-labor efficiency variance is as follows:

$$\text{Direct-labor efficiency variance} = (\text{AH} \times \text{SR}) - (\text{SH} \times \text{SR}) = \text{SR}(\text{AH} - \text{SH})$$

where

SH = Standard hours allowed

DCdesserts.com's direct-labor efficiency variance for September is computed as follows:

$$\begin{aligned}\text{Direct-labor efficiency variance} &= \text{SR}(\text{AH} - \text{SH}) \\ &= \$20(980 - 1{,}000) \\ &= \$400 \text{ Favorable}\end{aligned}$$

This variance is favorable, because the actual direct-labor hours used in September were less than the standard hours allowed, *given actual September output* of 2,000 multilayer fancy cakes.

Management Accounting Practice

Parker Hannifin

PARKER HANNIFIN CORPORATION'S BRASS PRODUCTS DIVISION

Parker Hannifin's Brass Products Division, a world-class manufacturer of brass fittings, valves, and tubing, is a standard-costing success story.[1] "Parker Brass uses its standard-costing system and variance analyses as important business tools to target problem areas so it can develop solutions for continuous improvement. Variances are reported for each product line, and if any production variance exceeds 5 percent of product-line sales, the product-line manager is required to provide an explanation. Also required is a plan to correct the problems underlying any unfavorable variances. Variance reports, which are generated within one day of the completion of a job order, are distributed to managers and production schedulers. A variance database is kept, which can be accessed by product-line managers, to provide variance data by part number, by job-order number, or by dollar amount."

From the perspective of Parker Brass's management, the division has modified its standard-costing system to provide disaggregated and timely cost information to enable timely corrective action in a rapidly changing business environment.

Notice that the direct-labor rate and efficiency variances add up to the total direct-labor variance. However, the rate and efficiency variances have opposite signs, since one variance is unfavorable and the other is favorable.

Direct-labor rate variance	$980 Unfavorable	Different signs of variances cancel just as plus and minus signs cancel in arithmetic.
Direct-labor efficiency variance	400 Favorable	
Direct-labor variance	$580 Unfavorable	

Basing the Efficiency Variance on Actual Output The number of standard hours of direct labor allowed is based on the *actual* production output. It would not be meaningful to compare standard or budgeted labor usage at one level of output with the actual hours used at a different level of output.

[1]David Johnsen and Parvez Sopariwala, "Standard Costing Is Alive and Well at Parker Brass," *Management Accounting Quarterly* 1, no. 2 (Winter 2000), pp. 12–20.

Multiple Types of Direct Material or Direct Labor

Manufacturing processes usually involve several types of direct material. In such cases, direct-material price and quantity variances are computed for each type of material. Then these variances are added to obtain a total price variance and a total quantity variance, as follows:

	Price Variance	Quantity Variance
Direct material A	$1,000 F	$1,600 U
Direct material B	2,500 U	200 U
Direct material C	800 U	500 F
Total variance	$2,300 U	$1,300 U

Similarly, if a production process involves several types of direct labor, rate and efficiency variances are computed for each labor type. Then they are added to obtain a total rate variance and a total efficiency variance.

Allowing for Spoilage or Defects

In some manufacturing processes, a certain amount of spoilage or defective production is normal. This must be taken into account when the standard quantity of material is computed. To illustrate, suppose that 100 gallons of chemicals are normally required in a chemical process in order to obtain 80 gallons of good output. If total good output in January is 500 gallons, what is the standard allowed quantity of input?

$$\text{Good output quantity} = 80\% \times \text{Input quantity}$$

Dividing both sides of the equation by 80%:

$$\frac{\text{Good output quantity}}{80\%} = \text{Input quantity allowed}$$

Using the numbers in the illustration:

$$\frac{\text{500 gallons of good output}}{80\%} = \text{625 gallons of input allowed}$$

The total standard allowed input is 625 gallons, given 500 gallons of good output.

Significance of Cost Variances

Managers do not have time to investigate the causes of every cost variance. Management by exception enables managers to look into the causes of only significant variances. But what constitutes an exception? How does the manager know when to follow up on a cost variance and when to ignore it?

These questions are difficult to answer, because to some extent the answers are part of the art of management. A manager applies judgment and experience in making guesses, pursuing hunches, and relying on intuition to determine when a variance should be investigated. Nevertheless, there are guidelines and rules of thumb that managers often apply.

Size of Variances The absolute size of a variance is one consideration. Managers are more likely to follow up on large variances than on small ones. The relative size of the variance is probably even more important. A manager is more likely to investigate a $20,000 material quantity variance that is 20 percent of the standard direct-material cost of $100,000, than a $50,000 labor efficiency variance that is only 2 percent of the standard direct-labor cost of $2,500,000. The *relative* magnitude of the $20,000 material quantity variance (20 percent) is greater than the *relative* magnitude of the $50,000 labor efficiency variance (2 percent). For this reason, managerial accountants often show the relative magnitude of variances in their cost-variance reports. For example,

Exhibit 10–4
Cost Variance Report for September: DCdesserts.com

	Amount		Percentage of Standard Cost
Direct material			
Standard cost, given actual output	$14,000		
Direct-material price variance	250	Unfavorable	1.79%
Direct-material quantity variance	350	Unfavorable	2.50%
Direct labor			
Standard cost, given actual output	$20,000		
Direct-labor rate variance	980	Unfavorable	4.9%
Direct-labor efficiency variance	400	Favorable	(2.0%)

the September cost-variance report for DCdesserts.com's production of multilayer fancy cakes is shown in Exhibit 10–4.

Managers often apply a rule of thumb that takes into account both the absolute and the relative magnitudes of a variance. An example of such a rule is the following: Investigate variances that are either greater than $10,000 or greater than 10 percent of standard cost.

Recurring Variances Another consideration in deciding when to investigate a variance is whether the variance occurs repeatedly or only infrequently. Suppose a manager uses the rule of thumb stated above and direct-material quantity variances occur as shown in the following Excel spreadsheet.

Microsoft Excel - Direct-Material Quantity Variances

File Edit View Insert Format Tools Data Window Help

E8 =C8/B8

	A	B	C	D	E
1		Standard	Direct-Material		Percentage
2		Direct-Material	Quantity		of Standard
3	Month	Cost	Variance		Cost
4					
5	January	$ 50,000	$ 3,000	F*	6.0%
6	February	50,000	3,200	F	6.4%
7	March	50,000	1,800	F	3.6%
8	April	50,000	3,100	F	6.2%
9					
10	*F denotes a favorable variance.				

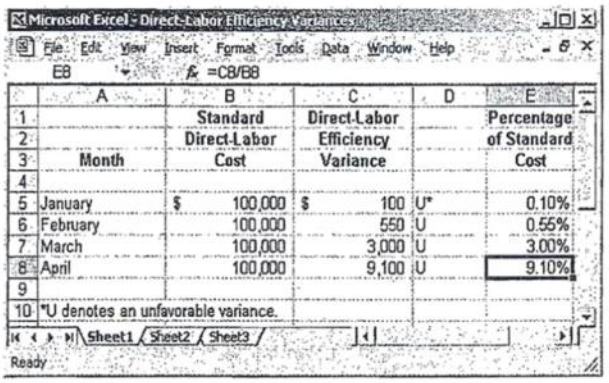
Sheet1 Sheet2 Sheet3

Ready

A strict adherence to the rule of thumb indicates no investigation, since none of the monthly variances is greater than $10,000 or 10 percent of standard cost. Nevertheless, the manager might investigate this variance in April, since it has *recurred* at a reasonably high level for several consecutive months. In this case, the consistency of the variance triggers an investigation, not its absolute or relative magnitude.

Trends A trend in a variance may also call for investigation. Suppose a manager observes the direct-labor efficiency variances shown in the following Excel spreadsheet.

None of these variances is large enough to trigger an investigation if the manager uses the "$10,000 or 10 percent" rule of thumb. However, the four-month *trend* is worrisome. An alert manager will likely follow up on this unfavorable trend to determine its causes before costs get out of hand.



Microsoft Excel - Direct-Labor Efficiency Variances

File Edit View Insert Format Tools Data Window Help

E8 =C8/B8

	A	B	C	D	E
1		Standard	Direct-Labor		Percentage
2		Direct-Labor	Efficiency		of Standard
3	Month	Cost	Variance		Cost
4					
5	January	$ 100,000	$ 100	U*	0.10%
6	February	100,000	550	U	0.55%
7	March	100,000	3,000	U	3.00%
8	April	100,000	9,100	U	9.10%
9					
10	*U denotes an unfavorable variance.				

Sheet1 Sheet2 Sheet3

Ready

Controllability Another important consideration in deciding when to look into the causes of a variance is the manager's view of the **controllability** of the cost item. A manager is more likely to investigate the variance for a cost that is controllable by someone in the organization than one that is not. For example, there may be little point to investigating a material price variance if the organization has no control over the price. This could happen, for example, if the firm has a long-term contract with a supplier of the material at a price determined on the international market. In contrast, the manager is likely to follow up on a variance that should be controllable, such as a direct-labor efficiency variance or a direct-material quantity variance.

Favorable Variances It is just as important to investigate significant favorable variances as significant unfavorable variances. For example, a favorable direct-labor efficiency variance may indicate that employees have developed a more efficient way of performing a production task. By investigating the variance, management can learn about the improved method. It may be possible to use a similar approach elsewhere in the organization.

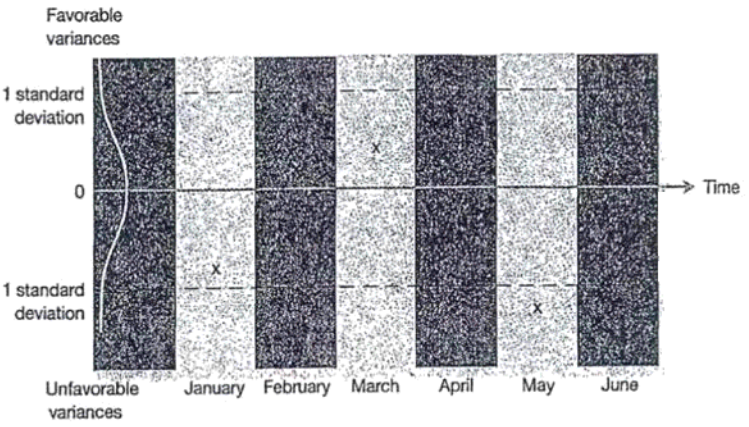
Costs and Benefits of Investigation The decision whether to investigate a cost variance is a cost-benefit decision. The costs of investigation include the time spent by the investigating manager and the employees in the department where the investigation occurs. Other potential costs include disruption of the production process as the investigation is conducted, and corrective actions taken to eliminate the cause of a variance. The benefits of a variance investigation include reduced future production costs if the cause of an unfavorable variance is eliminated. Another potential benefit is the cost saving associated with the lowering of cost standards when the cause of a favorable variance is discovered.

Weighing these considerations takes the judgment of skillful and experienced managers. Key to this judgment is an intimate understanding of the organization's production process and day-to-day contact with its operations.

A Statistical Approach

There are many reasons for cost variances. For example, a direct-labor efficiency variance could be caused by inexperienced employees, employee inefficiency, poor-quality raw materials, poorly maintained machinery, an intentional work slowdown due to employee grievances, or many other factors. In addition to these substantive reasons, there are purely random causes of variances. People are not robots, and they are not

Exhibit 10–5
Statistical Control Chart



perfectly consistent in their work habits. Random fluctuations in direct-labor efficiency variances can be caused by such factors as employee illnesses, workers experimenting with different production methods, or simply random fatigue. Ideally, managers would be able to sort out the randomly caused variances from those with substantive and controllable underlying causes. It is impossible to accomplish this with 100 percent accuracy, but a **statistical control chart** can help.

A statistical control chart plots cost variances across time and compares them with a statistically determined *critical value* that triggers an investigation. This critical value is usually determined by assuming that cost variances have a normal probability distribution with a mean of zero. The critical value is set at some multiple of the distribution's standard deviation. Variances greater than the critical value are investigated.

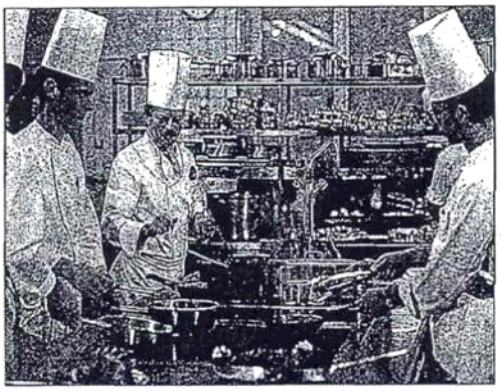
Exhibit 10–5 shows a statistical control chart with a critical value of 1 standard deviation. The manager would investigate the variance observed in May, since it falls further than 1 standard deviation from the mean (zero). The variances for the remaining five months would not be investigated. The presumption is that these minor variances are due to random causes and are not worth investigating.

Behavioral Impact of Standard Costing

Standard costs and variance analysis are useful in diagnosing organizational performance. These tools help managers discern "the story behind the story"—the details of operations that underlie reported cost and profit numbers. Standard costs, budgets, and variances are also used to evaluate the performance of individuals and departments. The performance of individuals, relative to standards or budgets, often is used to help determine salary increases, bonuses, and promotions. When standards and variances affect employee reward structures, they can profoundly influence behavior.

For example, suppose the manager of a hotel's Food and Beverage Department earns a bonus when food and beverage costs are below the budgeted amount, given actual sales. This reward structure will provide a concrete incentive for the manager to keep food and beverage costs under control. But such an incentive can have either positive or negative effects. The bonus may induce the manager to seek the most economical food suppliers and to watch more carefully for employee theft and waste. However, the bonus could also persuade the manager to buy cheaper but less tender steaks for the restaurant. This could ultimately result in lost patronage for the restaurant and the hotel.

One aspect of skillful management is knowing how to use standards, budgets, and variances to get the most out of an organization's employees. Unfortunately, there are no simple answers or formulas for success in this area. Despite such difficulties, standards, budgets, and variances are used in the executive compensation schemes of many well-known companies.



Incentive systems should be carefully designed so that employees try to carefully manage costs without allowing a deterioration in product or service quality. The head chef in this hotel's restaurant is evaluated both on his ability to control costs and on the satisfaction level of the restaurant's customers.

Controllability of Variances

Cost control is accomplished through the efforts of individual managers in an organization. By determining which managers are in the best position to influence each cost variance, the managerial accountant can assist managers in deriving the greatest benefit from cost variance analysis.

Who is responsible for the direct-material price and quantity variances? The direct-labor rate and efficiency variances? Answering these questions is often difficult, because it is rare that any one person completely controls any event. Nevertheless, it is often possible to identify the manager who is *most able to influence* a particular variance, even if he or she does not exercise complete control over the outcome.

Direct-Material Price Variance The purchasing manager is generally in the best position to influence material price variances. Through skillful purchasing practices, an expert purchasing manager can get the best prices available for purchased goods and services. To achieve this goal, the purchasing manager uses such practices as buying in quantity, negotiating purchase contracts, comparing prices among vendors, and global sourcing.

Despite these purchasing skills, the purchasing manager is not in complete control of prices. The need to purchase component parts with precise engineering specifications, the all-too-frequent rush requests from the production department, and worldwide shortages of critical materials all contribute to the challenges faced by the purchasing manager.

"We designate variances as controllable or uncontrollable. Plant managers are held accountable for the controllable variances." (10c)

Best Foods (recently purchased by Unilever)

Direct-Material Quantity Variance The production supervisor is usually in the best position to influence material quantity variances. Skillful supervision and motivation of production employees, coupled with the careful use and handling of materials, contribute to minimal waste. Production engineers are also partially responsible for material quantity variances, since they determine the grade and technical specifications of materials and component parts. In some cases, using a low-grade material may result in greater waste than using a high-grade material.

Direct-Labor Rate Variance Direct-labor rate variances generally result from using a different mix of employees than that anticipated when the standards were set. Wage rates differ among employees due to their skill levels and their seniority with the organization. Using a higher proportion of more senior or more highly skilled employees than a task requires can result in unfavorable direct-labor rate variances. The production supervisor is generally in the best position to influence the work schedules of employees.

Direct-Labor Efficiency Variance Once again, the production supervisor is usually most responsible for the efficient use of employee time. Through motivation toward production goals and effective work schedules, the efficiency of employees can be maximized.

Interaction among Variances

Interactions among variances often occur, making it even more difficult to determine the responsibility for a particular variance. To illustrate, consider the following anecdote from a manufacturer of brass musical instruments. The purchasing manager obtained a special price on brass alloy from a new supplier. When the material was placed into production, it turned out to be a lower grade of material than the production employees were used to. The alloy was of a slightly different composition, which made the material bend less easily during the formation of brass instruments. The company could have returned the material to the supplier, but that would have interrupted production and kept the division from filling its orders on time. Since using the off-standard material would not affect the quality of the company's finished products, the division manager decided to keep the material and make the best of the situation.

The ultimate result was that the company incurred four interrelated variances during May. The material was less expensive than normal, so the direct-material price variance was favorable. However, the employees had difficulty using the material, which resulted in more waste than expected. Hence, the division incurred an unfavorable direct-material quantity variance.

What were the labor implications of the off-standard material? Due to the difficulty in working with the metal alloy, the employees required more than the standard amount of time to form the instruments. This resulted in an unfavorable direct-labor efficiency variance. Finally, the production supervisor had to use his most senior employees to work with the off-standard material. Since these people earned relatively high wages, the direct-labor rate variance was also unfavorable.

To summarize, the purchase of off-standard material resulted in the following interrelated variances.

Purchase of off-standard material =>
- Favorable direct-material price variance
- Unfavorable direct-material quantity variance
- Unfavorable direct-labor rate variance
- Unfavorable direct-labor efficiency variance

Such interactions of variances make it more difficult to assign responsibility for any particular variance.

Trade-Offs among Variances Does the incident described above mean that the decision to buy and use the off-standard material was a poor one? Not necessarily. Perhaps these variances were anticipated, and a conscious decision was made to buy the material anyway. How could this be a wise decision? Suppose the amounts of the variances were as follows:

$(8,500)	Favorable direct-material price variance
1,000	Unfavorable direct-material quantity variance
2,000	Unfavorable direct-labor rate variance
1,500	Unfavorable direct-labor efficiency variance
$(4,000)	Favorable net overall variance

The company saved money overall on the decision to use a different grade of brass alloy. Given that the quality of the final product was not affected, the company's management acted wisely.