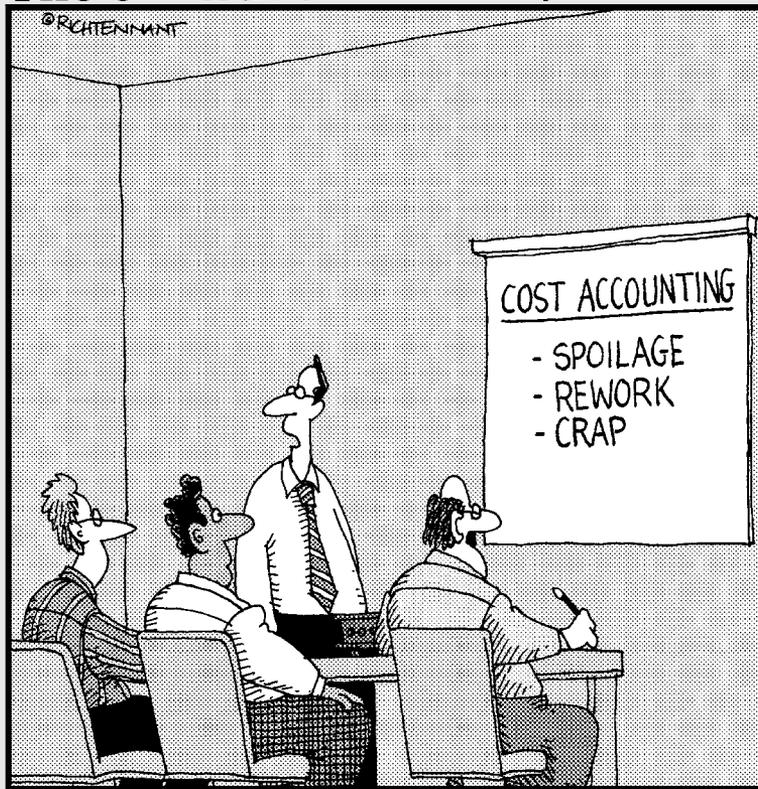


Part IV

Allocating Costs and Resources

The 5th Wave

By Rich Tennant



"Yes, it's normally 'spoilage, rework, and scrap,'
but we've got a crap surplus as well."

In this part . . .

After you make decisions, you then have to allocate costs. And that's what Part IV is all about. The all-important topic of profit is examined, as is how sales affect profit. This part also delves into support and common costs, joint costs, process costing . . . at all cost, read this part!

Chapter 13

Analysis Methods to Improve Profitability

In This Chapter

- ▶ Justifying your cost allocation
 - ▶ Relating cost hierarchy to cost allocation
 - ▶ Allocating corporate costs to products and services
 - ▶ Tracking customer revenue and costs
 - ▶ Calculating sales variances
-

Cost accounting analysis is a balancing act between costs and profit. It's not enough to produce a product or service at the lowest possible cost. To be profitable, you must perform analysis to compute a sale price that generates a reasonable profit. Finally, customers must be willing to *pay* your sale price. At this point, you need to spend some time on cost allocation, pricing issues, and sales analysis.

In this chapter you spend some quality time with sales and profits. The chapter starts by taking another look at cost allocation and how it relates to cost hierarchy, including allocating corporate costs — expenses you incur for the head office. And there's a section that adds to what you've learned about customer revenues and costs. The chapter wraps up with a detailed look at several sales-related variances. (See Chapter 7 for an introduction to variances.)

Processing Cost Allocation

The process of allocating indirect costs to a product involves judgment. Unlike direct costs (which are *traced*), indirect costs are *allocated*, and that requires estimates. The process isn't easy, but it's vital. You need to allocate indirect costs carefully to understand the cost of an object, such as a product or service.



Getting a handle on allocations may appear difficult, but you can master the subject and then apply it to support the assumptions you use for cost allocations.

Why bother? Purposes of cost allocation

You need to spend about two seconds deciding if the cost allocation process is necessary. Yes, it is. Consider whether or not your company will benefit by using the process. Yes, it will. You need to do it, and the information you create will benefit your company. Here are several reasons why cost allocation is important:

- ✓ The process helps you make economic decisions — for example, whether or not to accept a special order.
- ✓ The information helps you evaluate and motivate your staff.
- ✓ Cost allocation supports the costs you report to customers when making bids for jobs.
- ✓ The information is used in financial reports you send to external parties.

Over in Chapter 11, you can read that decisions (economic decisions) about special orders and outsourcing require indirect cost information — generated, of course, by cost allocations. You can't make a management decision about costs without allocating indirect costs.

Many companies reward employees based on company profit or by meeting other financial goals. It works like this: In order to forecast profit — and review the results — you need to allocate indirect costs. These indirect costs affect your bottom line. Careful allocation of indirect costs helps you calculate financial goals. You then use those goals to evaluate and reward employee performance.

Many industries sign contracts with customers, particularly for long-term projects. Say you're building a factory for someone. Your contract states that you receive payments based on a percentage of completion; for example, you're due a payment when the work is 25 percent complete. One way to measure completion is to calculate the costs you've incurred. (After all, if you've spent 25 percent, you must be 25 percent done, right?) Cost allocation supports costs you report to fulfill a contract requirement.

Finally, cost allocation provides documentation regarding costs you use for financial reporting. For example, Chapter 9 addresses costs for inventory. A portion of those costs is allocated to the product. When you report inventory on your balance sheet, you're using cost allocation.

Justifying cost allocation decisions

Justifying cost allocation decisions is important. Your justification verifies that you're selecting the method that allocates costs most accurately. If you can defend your choice of an allocation method, it's likely that you've selected the best one.

Consider these four criteria that support your cost allocation decisions. Most organizations use one of these four criteria to support their cost allocation decisions:

- ✓ Document the activity that caused the costs to be incurred.
- ✓ Identify the benefits received as a result of incurring the cost.
- ✓ Justify that the cost is reasonable or fair with the other party in a contract.
- ✓ Show that the cost object has the ability to bear the cost.

The cause-and-effect criterion relates to activity-based costing concept (see Chapter 5). Say you make several kinds of ovens. You pay labor costs to change machinery setups to switch from making one model of oven to making a different model. The activity (setups) is driving the cost (labor hours). You then allocate more cost to the model oven that requires the most machinery setups.

Consider who might benefit from your spending. Say your product engineers make design changes to the ovens you produce. As a result, you notice that oven repairs under warranty decrease, and that reduces your warranty expense (repair costs). The lower cost of the change should be assigned to the new products, because they benefited from the change.

Businesses might sign contracts with customers. Think about that factory-building contract earlier in this chapter. Every industry has cost levels that are considered reasonable or fair. We may assign costs to the customer based on these levels that typically occur in the industry.

Think about a fixed overhead cost for insurance. You pay insurance premiums to cover a job site against theft or damage. Every builder incurs that cost. So everyone in the industry has an idea about a fair and reasonable cost of insurance. That's how you can justify your cost to the customer.

The more revenue and profits your division generates, the more costs you can bear (incur). Say you're deciding how to allocate the cost of your corporate headquarters (building, insurance, and salaries of head-office staff) to each company division. You might decide to allocate costs based on the percentage of total profit each division produces. If, for example, the Midwest division generates 30 percent of the profit, it would get 30 percent of the head-office cost.

The biggest arguments I've seen in companies have been over indirect cost allocations. Compensation, bonuses, and promotions are calculated on costs and profits, so there's a lot riding on the cost allocations to a division or department. If a cost allocation is increased, the manager might miss a profit goal and take a hit on his own personal compensation. You can imagine the conversations. "Why should we get that large cost allocation? We're the ones who are carrying the company. You're punishing our division for being successful! What's the motivation for increasing revenue and profit — you're just going to allocate more costs." I've been in the room when those very words were said.

As an owner, you need to consider how you evaluate managers. In particular, how do you fairly judge the manager who gets a big allocation of head-office costs? You see more on head-office allocations later in this chapter, but the short answer is to evaluate the manager's profit *before* counting the corporate-office cost allocation. In that way, the division manager isn't "punished" for a large cost allocation based on his or her division's profit total.

Implementing Cost Allocation

Now it's time to use a cost hierarchy to implement cost allocation. Your goal is to allocate costs more accurately, and a cost hierarchy can help you accomplish that goal. Typical cost hierarchies are costs at the division, batch, or unit level (see Chapter 5 for more). As the book keeps emphasizing, the more specific you make your analysis, the better. Cost hierarchies help you get more specific about your costs. After cost hierarchies, this section moves on to allocating corporate costs to units produced.

Using cost hierarchy to allocate costs

Cost hierarchy is a methodology that allows you to allocate costs more specifically, and that's good. Think of it this way: you have a "bucket" of costs. When you start taking costs out of the bucket, where do they end up? Maybe they end up attached to a unit. Or it might be broader. You could attach the costs to a batch (a group of units), and that's often a more accurate way to allocate. You could expand the allocation even more broadly to an entire company division.



One theme is all over this book: The benefit of performing any cost analysis should be greater than the cost to obtain it. Cost allocations may become complex. Complexity costs more, and you need to educate managers on how the cost allocations were derived. The managers will be concerned about how the cost allocation impacts their performance. You need to be prepared to justify your cost allocations. (That's why the company chief financial officer makes big money.)

Say you manage a company that makes refrigerators. You have a residential division and a commercial division. Your commercial customers are grocery stores that need refrigeration. Each division sells three different models. You have determined the cost hierarchies and cost allocation bases for your three largest indirect costs (see Table 13-1). (Recall that a cost allocation base is the type of activity you use to allocate costs.)

<i>Activity</i>	<i>Cost</i>	<i>Cost Hierarchy</i>	<i>Allocation Base</i>
Manufacturing	Plant utility cost	Unit level	Machine hours
Machine setup	Labor cost	Batch level	Setup hours
Administration	Head-office salary	Facility sustaining	Company-wide revenue

You could allocate your plant's utility cost (heating, lighting, and so forth) to each unit you produce. When you change from making one refrigerator model to another, you incur setup cost to change your machinery settings, so you'd likely allocate setup labor cost to batches.

Say you need the ongoing administrative services (such as legal and accounting) provided by the head office, and that suggests allocating the cost company-wide. However, you can likely allocate head-office administrative cost to divisions, based on each division's percentage of total revenue.

Ideally, all costs are eventually allocated down to a unit of product. After all, you don't sell batches; you sell *units* of product. So you attach all costs to a unit of product. When you sell a unit, you recover all of your product costs — as well as earn a profit.

Allocating all costs to a unit is not always possible. Keep in mind that *all* costs are totaled and posted to your financial statements. Whereas an individual unit may not absorb the cost, your overall company profit or loss is affected by the cost.

Allocating tricky corporate costs

Each division should probably bear some of the cost of the company's corporate headquarters. Why? Because without the work done by the divisions, there wouldn't be a need for the corporate headquarters at all. However, corporate (head-office) costs can be hard to allocate to divisions. You need to develop a formula you can justify. Here are some typical corporate costs that are allocated:

- ✓ Interest expense on company loans
- ✓ Salary, benefits, and other costs for human resources, accounting, and legal staff
- ✓ Salary, benefits, and other costs for administrative staff
- ✓ Head-office building costs: utilities, insurance, and maintenance

Keep in mind that each division has its own set of costs, too — both direct and indirect. Each one, presumably, makes a product and has direct costs. And each division has indirect costs of its own. Each one has production managers, whose salaries and benefits are allocated as indirect costs to products. Those costs are all separate from the corporate costs.

Thinking about allocation methods for corporate cost

Your decision about allocation boils down to three choices:

- ✓ Allocate the entire corporate cost to the divisions.
- ✓ Don't allocate any corporate cost to the divisions; use the corporate cost only to evaluate company-wide financial results.
- ✓ Allocate some of the corporate costs based on a method that justifies a partial allocation.

Say you determine that the head office exists entirely to support the divisions. To fully price each division's product, each division should receive a corporate cost allocation. You "capture" all of the costs to make your product (in this case, refrigerators).

The second choice is to not allocate any corporate costs. It argues that because the divisions have no control over the spending at corporate headquarters, they shouldn't get an allocation. Now, that doesn't mean that the costs disappear, of course, but this choice will make the division managers happy!

Here's how your financials would look if you decide not to allocate any costs to the divisions. Check out Table 13-2.

Residential profit	\$10,000,000
Commercial profit	\$7,000,000
Subtotal	\$17,000,000
Less corporate costs	\$5,000,000
Equals company-wide profit	\$12,000,000

Corporate costs are sometimes called *common costs*. Because these are costs that the firm as a whole incurs, you may not be able to readily assign them to a specific division, department, product, or unit. So you show the common costs at the bottom of your income statement. That way, readers of the profit and loss statement (P&L) can see that those corporate costs aren't directly related to either the residential or the commercial division. (See Chapter 6 for more on profit and loss statements. For this book, *profit and loss statement* and *income statement* mean the same thing.)

The final option is to allocate some of the costs. Essentially, any corporate cost you can justify allocating gets allocated. You justify the allocation by finding a cause and effect. See the section “Justifying cost allocation decisions” in this chapter for more on cause and effect. Any cost you can't justify allocating to the divisions remains an unassigned corporate cost. These unassigned costs are shown at the bottom of the income statement, similar to the costs in Table 13-2.

You can also consider allocating costs if the division has some control over those costs. For example, insurance costs for all company buildings are paid through the head office. However, say each division works with the insurance company. The division determines the amount of insurance coverage and policy details. Because the division has some decision-making ability, it's reasonable to allocate those costs to the divisions.

Considering pooling corporate costs

Cost pools are used to separate costs into groups. The pools are then used to allocate costs to a cost object. Again, the cost object is the reason you're incurring costs. A cost object can be a unit of product, a batch, or a department of your company. Notice how similar the terms *cost pool*, *cost hierarchy*, and *cost allocation base* are.

Consider cost pools and your corporate costs. Your goal is to create cost pools that have the same cause and effect on the cost object. The same activities should cause your costs to increase or decrease. In other words, the cost behavior is similar for all costs in the cost pool.

For example, combining vehicle repair, vehicle maintenance, and vehicle insurance into one cost pool makes sense. If you increase vehicle use (cause), you increase these costs (effect). So put them in the same cost pool. Then consider where in the cost hierarchy the cost pool belongs — unit, batch, division, facility, and so forth.

You've seen several types of corporate costs at the beginning of this section. What's the cost driver for these costs? Here's one example: More employees may mean a larger human resources department and more human resources costs. Legal costs are normally a head-office cost. Here's a cost driver for legal costs: If your company manufactures products that may be dangerous to use, you may incur more legal costs.

Estimating a product's litigation risk

Litigation risk is the risk that someone will sue you because they believe using your product harmed them. Well-managed companies estimate the dollar amount of this risk.

Years ago, I worked on an audit of a large company. Among its products, the company made garbage disposals for sinks. It also manufactured ladders for fire trucks and emergency vehicles. If these two products are used improperly, people can hurt themselves.

This company had a large legal department. They spent a lot of time considering their risk of litigation (lawsuits). As a public company, they were required to file periodic financial statements

for the public. Those reports included their estimate on the future legal expenses, due to litigation.

So they had a big spreadsheet. The sheet listed every case that was currently in litigation. It included the dollar amount of the lawsuit and the percentage likelihood that they would lose the suit and have to pay damages. They multiplied the dollar amounts by the percentages, added up the total, and reported that amount as their potential risk of loss.

There are many other legal risks of doing business, but they are not the focus of this book.

Allocating corporate costs to divisions

Say that you've thought about cost pools and the cause and effect relationships. (Keep your thinking cap on. Some of these ideas might occur to you while you're brushing your teeth or singing in the shower.) You decide that all head-office costs should be allocated to the divisions, because you determine that the corporate costs are incurred primarily to support each division's business activity.

Assume your firm took out a loan to finance machines. The cost pool is the interest cost on the loan. You decide to allocate the interest cost to each division, based on the percentage of the total loan proceeds each division received. Your logic is that if the residential refrigerator division got 60 percent of the loan proceeds spent on machines, it should incur 60 percent of the interest cost.

Machine costs can also be allocated to each unit produced. So you can relate the interest cost of the machines purchased to individual units.

You decide to allocate the interest cost using machine hours (activity). What you end up with is each product receiving an indirect cost allocation for interest.

Say \$50,000 of your \$5,000,000 corporate costs (see Table 13-2) is for interest. That could be a 5 percent annual interest cost on a \$1,000,000 loan. The residential division used 60 percent of the loan proceeds for machines, so it gets 60 percent of the interest cost:

Residential division interest cost allocation = company interest cost \times 60 percent of loan proceeds used for machines

Residential division interest cost allocation = $\$50,000 \times 0.60$

Residential division interest cost allocation = $\$30,000$

Now you need to allocate the $\$30,000$ interest cost allocated to each unit of product. You do that using machine hours. Assume 2,000 machine hours for the year:

Residential division interest cost per machine hour = interest cost \div machine hours

Residential division interest cost per machine hour = $\$30,000 \div 2,000$

Residential division interest cost per machine hour = $\$15$

If a unit of product requires less than 1 machine hour (say, 20 minutes of time — $\frac{1}{3}$ of an hour), the interest cost for that product would be $\$15 \div 3$, or $\$5$ of interest cost. And there you are! Each unit of product has $\$5$ more attached to the product cost due to the interest paid on the machines.

Because interest cost took a lot of effort, it's a relief to look at simpler items. Otherwise, you'll fall asleep with this book in your hands.

Say you make a judgment that $\$2,000,000$ in salary and other costs for corporate legal and accounting staff is a facility-sustaining cost, needed to support the business company-wide. That means that the cost should be allocated on a broad basis, not by unit or by batch. Consider the divisions.

You decide to allocate the legal and accounting costs based on percentage of total profit. Table 13-2 indicates that the residential division generated $\$10,000,000$ of $\$17,000,000$ in profit (before allocating corporate costs). It turns out to be 59 percent (rounded). Here's the cost allocation to the residential division:

Residential division legal and accounting cost allocation = $\$2,000,000 \times 0.59$

Residential division legal and accounting cost allocation = $\$1,180,000$

Interest costs and the legal and accounting costs were allocated. Each used a different level in the cost hierarchy. Some of the $\$5,000,000$ in corporate cost still needs to be allocated, but you get the idea of how to allocate the costs.

Again, your goal is to allocate all costs down to a unit of product. If you can't do that, any costs not allocated to a unit should still be posted to your profit and loss statement.

Keeping track of customer revenues and costs

So far, this chapter has discussed allocating costs to units, batches, and company divisions. Now change your thinking. Consider allocating costs to *customers*. In addition to costs, you allocate revenue to customers and compute the profit you earn.

Customer profit comes up in Chapter 11. In that chapter, you define your ideal customer as a client who generates a profitable business for you, is willing to pay a sales price that generates a reasonable profit, doesn't make unreasonable demands, and doesn't create unnecessary costs.

Now for more detail about customer profit analysis. Kick it up a notch! Your goal is to determine who your most profitable clients are. When you know who they are, you can focus on getting more business from that group.

Boning up on profit analysis

Customer profit analysis states that if client A generates a higher income for you than client B, client A should receive a higher level of attention. This is good for profits, but it's easier said than done. To understand the profitability of each client, you need to understand the costs that they create for your business.

Here's a classic case of implementing customer profit analysis. In the last decade, many large investment management firms made pretty radical changes in how they do business. First, they identified the investment clients that are the most profitable. They considered current profitability and potential growth in profit.

Next, the firms changed the service level they offered clients, based on their profitability. For the more desirable (higher-profit) clients, not much changed. They still dealt with the same investment representative. Less profitable clients saw a big change in service. Their accounts were transferred to newer, less-experienced investment professionals, and got less skilled attention. Customers at the bottom of the profit pile were given an 800 number. They lost the ability to contact a specific investment rep. Is that cool, or what? NOT!

As you can imagine, many low-profit customers were angry. "Why don't I get the same level of service anymore?" the client might ask. "Well, Mr. Customer, the profit you generate doesn't justify the level of service we were giving you." Now, I doubt the customer service rep would say it in those words. That's the same as saying; "You ain't worth it to us, buddy!" That, however, is the reason that the service level went down for some people.

If you choose to change the level of service you provide, expect some fallout. When you change how you treat customers, you may lose some business. These large firms were perfectly willing to accept that risk. I heard that story from several friends who worked for them. In the end, they started spending more time with the most profitable clients. That's one goal of profit analysis.

Breaking down purchase discounts

A discount is a price reduction. It's used to encourage the buyer to increase purchases. A discount should be a rare and wonderful thing, so be careful how you use it.

Remember that when you offer a discount, you're reducing your revenue per unit sold. If you don't get an increase in unit sales (and that's the point), offering a discount decreases your profit over time.

Imagine a discount conversation between a salesperson and the chief financial officer (CFO). The salesperson explains that a new client will place an order if it can get a discount. The CFO asks, "Will the new client place orders down the road? How large a client will they be? Does the client currently order a lot of product from a competitor, and is it business that could come to us if we offer a discount?" That's the conversation that should happen before you approve a discount.

Isolating customer costs

Recall that you categorize customer costs by cost pools. For example, you've seen how vehicle costs (repair, maintenance, and insurance costs) are combined into a cost pool. Next, you *trace* or *allocate* the cost pool, based on a cost level (unit, batch, or company division). Finally, you consider the activities that lead to costs. Ultimately, your goal is to understand what activities are causing costs for the company. You use that knowledge to reduce or eliminate the activities that create those costs for you — not that you can always do this. Now let's isolate some of those activities and costs.

Say you own a catering business. (The two hardest-working people I know owned catering companies.) You're reviewing three clients who all purchased the same catering product in December — a dinner with dessert, served to 50 people. You charged \$30 per person. Table 13-3 lays out three cost variables that differed among these customers.

Table 13-3 Catering Business — Isolated Costs and Activities

<i>Activity</i>	<i>Cost Driver</i>
Purchase discount	Judgment by owner
Food delivery	\$3 per delivery mile
Staff at event	\$30 per hour per person

Table 13-4 displays the dollar amount of costs for three customers.

<i>Client</i>	<i>A</i>	<i>B</i>	<i>C</i>
Revenue	\$1,500	\$1,500	\$1,500
Food cost	-\$1,000	-\$1,000	-\$1,000
Discount	-\$75	\$0	-\$150
Delivery	-\$60	-\$120	-\$75
Staff time	-\$120	-\$150	-\$135
Profit	\$245	\$230	\$140

Huh? What’s happening? Client C received the largest discount (10 percent) but generated the least profit (\$140). Start to pull apart Table 13-4. The revenue and food costs are the same for each client. That makes sense, because you’re providing the same product (50 meals at \$30 per meal).

Consider the discount. Client A received a 5 percent discount; Client C was given a 10 percent discount. Why? The salesperson’s goal was to get the order from Client C — that’s one reason. The other motivation is to get more (or larger) orders in the future.

You can’t look at one catering event and determine if the discount paid off. Consider the whole year, or the next year. Does the client purchase more catering services (hopefully, yes)? Do those events generate any extra costs (hopefully, no)? These questions illustrate why offering a discount is a risk. You give up profit now in the hope that you’ll make it up with more business down the road.

Your delivery cost is driven (no pun intended) by cost per mile. You can’t control how far away an event is; however, consider whether or not you need to make any extra trips. If so, you need to coach or train your client in advance to be prepared for an additional cost. That can be explained and put into your catering contract. Something like “Any extra trips to the catering event will be assessed a cost of . . .” You get the idea.

You’ve determined that this type of event typically lasts two hours and requires two staff people to handle the catering. So you’d expect a staff cost of \$120 (\$30 per hour × 2 hours × 2 people). Two clients required more time. Again, ask, “Why?” Did the customer make unusual demands? (My catering friends tell me some clients expected them to perform light cleaning after events, even though that’s not what the catering company agreed to.)

Labor cost is another opportunity to train your client in advance. Explain and document in the catering contract how you handle extra time incurred. At what point is a customer billed for that service? Can your staff stay an extra 15 minutes without charging? Thirty minutes? Think through all of this before you market to clients.

Client A was the most profitable. That client was given a small discount (\$75). It happened to generate the lowest food delivery cost (\$60). Well, it might just be luck that it was the closest location. Finally, it had the lowest staff cost (\$120).

There's a lot of food for thought (again, no pun intended) in Table 13-4. Think about that discount issue and how to recover costs for extra delivery and staff time expense, with no "ups" and "extras."

Going Over Sales Mix and Sales Quantity Variances

Recall that a variance is a difference between your budget and your actual results. There are two basic reasons for a cost variance: You either *spent* more or less than planned, or you *used* a different amount than planned (see Chapter 7).

There's a third factor that produces a variance — a difference between your budgeted and actual sales. One of these sales variances is the *sales mix* variance. The *sales mix* is the percentage of each product you sell, compared to total sales. If you sell less of product A, maybe you can sell more of product B and still reach your sales and profit goals. (I seem to always use A and B, but I admit that they aren't very sexy product names.) Refer to Chapter 4 for more on sales mix.

Remembering Variances and Contribution Margin

The challenge with sales mix is that each product is likely to have a different sale price and different costs. You need a tool to compare two products and their profitability. Contribution margin per unit should help. Then you're able to say, "Product A is a high-profit item, but product B isn't that big a deal."

For this section, you use contribution margin per unit because you'll undoubtedly sell a different number of units of each product, and taking a look at per-unit amounts eliminates the issue of selling different amounts of product.

There's another reason for using contribution margin. The amount represents what you have left to cover fixed costs. Whatever's left after paying fixed costs is your profit. (Yes, profit is "in there" somewhere.) So contribution margin is calculated *before* considering fixed costs. In fact, contribution margin is also called *contribution to profit*.

Sales and variable costs are attached to a product, with rare exceptions. If you're comparing product profitability, focus on sales and variable costs. They are the best way to judge an individual product's profit.

Getting the story about sales mix variance

Connect the sales mix concept to variance analysis. The goal is to use the completed variance work to improve your overall company profit.

Say you own a hardware store that sells two types of ceiling fans: a 52-inch bronze fan and a 54-inch pewter fan. You created an April budget for both products. The bronze fan's budget has a \$180 selling price (\$150 variable cost and \$30 contribution margin) per unit. The pewter fan's budget is a \$450 selling price (\$350 variable cost and \$100 contribution margin per unit).

Table 13-5 shows the budgeted contribution margin in dollars for both products.

<i>Product</i>	<i>Margin/Unit</i>	<i>Sales in Units</i>	<i>Margin in Dollars</i>
Bronze	\$30	120	\$3,600
Pewter	\$100	80	\$8,000
Total	N/A	200	\$11,600

Note that Table 13-5 doesn't list a total contribution margin per unit (see N/A). That's because you consider contribution margin per unit *by individual product* (bronze versus pewter fans). Because the sales mix changes, you add each product's total contribution margin in dollars to get a total.

You budgeted to sell 200 ceiling fans and generate a total contribution margin of \$11,600. Bear in mind that fixed costs aren't part of the contribution margin calculation. I'm just talking basics here.

Now you take a look at the April actual results. You sold 110 bronze fans (not so good) and 100 pewter fans (good). Table 13-6 shows the *actual* contribution margin in dollars. Note that the contribution margin per unit is the same as Table 13-5 for both products.

<i>Product</i>	<i>Margin/Unit</i>	<i>Sales in Units</i>	<i>Margin in Dollars</i>
Bronze	\$30	110	\$3,300
Pewter	\$100	100	\$10,000
Total	N/A	210	\$13,300

Connecting sales mix to contribution margin

You sold ten more units in April than budgeted (200 versus 210). Your actual sales mix is also different than budgeted. Table 13-5 indicates that 60 percent of your budgeted sales were bronze ceiling fans (120 of 200 units). Your actual sales were 52.4 percent (110 of 210 units). Okay, so you sold fewer bronze fans, based on the percentage of total sales.

The difference (variance) in bronze fan sales is important, because bronze sales are less profitable than pewter fans. You just saw that contribution margin per unit should be used to judge profit, so you'll use that calculation. (The amazing thing is that people bought more of the costly pewter fan. Go figure!)

To fairly compare profit for both fans, take a look at contribution margin as a percentage of the sale price per unit. Contribution margin per unit doesn't change between budgeted and actual amounts. That means that the sale price per unit and variable cost per unit (the components of contribution margin) don't change.

Here's the contribution margin percentage for the bronze fan:

$$\text{Bronze fan contribution margin in sale price} = \$30 \div \$180 \times 100$$

$$\text{Bronze fan contribution margin in sale price} = 16.7 \text{ percent}$$

The contribution margin of \$30 per unit, divided by the sale price per unit of \$180, gives you the percentage. Here's another way to saying it: For every \$1 of sales, about 17 percent (17 cents) of contribution margin is generated. Now compare that to the pewter fan:

$$\text{Pewter fan contribution margin in sale price} = \$100 \div \$450 \times 100$$

$$\text{Pewter fan contribution margin in sale price} = 22.2 \text{ percent}$$

Based on contribution margin as a percentage of the sale price per unit, the pewter fan is more profitable.

The investment management business generates some of the highest contribution margins of any industry. Think about this: How much more cost do you incur to move from \$1 billion under management to \$10 billion? Not much. With technology, you can perform analyses and make investment decisions without adding much cost. Better technology also allows you to generate client statements quickly. (One of the biggest marketing keys to an investment management firm is an easy-to-read customer statement.)

In an investment management firm, the largest cost of growth is adding staff to serve the clients. But if the same client base is adding investment dollars, you don't need to add many people. The contact person may be the same, whether he or she manages \$10 million of investments or \$50 million. Conclusion: Billionaires make the best investors.

Introducing the sales mix variance

You've seen the rest; now see the best! Look at the sales mix variance.

Recall from the last section that your actual sales mix was slightly different from budgeted. Note that the \$13,300 actual contribution margin in dollars (Table 13-6) is higher than the \$11,600 budgeted total (Table 13-5). Your sales mix shifted to the more profitable product.

The pewter product's contribution margin as a percentage of the sale price is higher than the bronze product (22.2 percent versus 16.7 percent). You saw in the previous section, "Connecting sales mix to contribution margin," that the bronze sale percentage declined (from 60 percent to 52.4 percent). That means that the pewter sales percentage increased (up from 40 percent to 47.6 percent). You increased sales of your more profitable product.

Here's the formula for sales mix variance:

$$\text{Sales mix variance} = \text{actual units sold} \times (\text{actual sales mix percent} - \text{budgeted sales mix percent}) \times \text{budgeted contribution margin per unit}$$

Yikes! That looks complex. Now pull apart some of the components, and you can make sense of it.

Consider the difference between actual and budgeted sales mix. For the bronze fan, that total is 52.4 percent – 60 percent, a 7.6 percent decline. Because the bronze fan went down 7.6 percent, the pewter fan's percentage increased by 7.6 percent.

Now multiply the sales mix difference by the budgeted contribution margin per unit. For the bronze fan, you have $\$30 \times -7.6$ percent, and that's $-\$2.28$. The pewter fan is $\$100 \times 7.6$ percent, and that's $\$7.60$. Finally, you can plug the calculations into the sales mix variance formula, as shown in Table 13-7. I don't know about you, but I definitely want an extra $\$7.60$ each time I sell a product than an extra $\$2.28$.

Table 13-7		Sales Mix Variance	
<i>Product</i>	<i>Actual Units</i>	<i>Mix Percentage and Contribution Margin</i>	<i>Variance</i>
Bronze	110	-\$2.28	-\$251
Pewter	100	7.60	\$760
Total	N/A		\$509 favorable

The Mix Percentage and Contribution Margin amounts were calculated in the paragraphs before Table 13-7. The table multiplies actual units by the mix percentage and contribution margin column to compute the variance.

A positive number for a sales variance is a good thing. It means that the contribution margin in dollars was higher than planned. So the \$509 sales mix variance is a favorable variance. Because you sold more of the more profitable product, you generated more profit.

Calculating sales quantity variance

The sales mix variance focuses on the shift in sales mix. The percentage of sales of the pewter fan increased. The *sales quantity variance* reflects the difference between actual and budgeted units sold. Here's the formula:

$$\text{Sales quantity variance} = (\text{actual units sold} - \text{budgeted units sold}) \times \text{budgeted sales mix percentage} \times \text{budgeted contribution margin per unit}$$

Pull the formula apart to understand it, and use Tables 13-5 and 13-6. Actual sales of bronze fans were 10 units lower than budgeted (110 - 120). Actual sales of the pewter fan were 20 fans higher than planned (100 - 80).

Even if you kept the sales mix the same at 60 percent and 40 percent, the volume of each product sold had an impact on your profitability. Table 13-8 explains that impact.

Table 13-8 computes the sales quantity variance.

Table 13-8		Sales Quantity Variance	
<i>Product</i>	<i>Change in Units and Budgeted Mix</i>	<i>Budgeted Contribution Margin Per Unit</i>	<i>Variance</i>
Bronze	(110-120) x.60	\$30	-\$180
Pewter	(100-80) x.40	\$100	\$800
Total			\$620 Favorable

The variance is favorable, which means more profit. The bronze fans sold went down by 10 units, but the pewter fan sales increased by 20 units. The increase in total units sold (going up from 200 to 210) had the biggest impact on the favorable sales quantity variance.

Last, consider *sales volume variance*. This variance measures how much impact a change in the number of units sold had on your profit and loss statement, either because the sales mix was different or the sale quantity in units was different. This variance is the sum of the sales mix variance and the sales quantity variance. Those amounts are listed in Tables 13-7 and 13-8. Here's the sales volume variance calculation:

$$\text{Sales volume variance} = \text{sales mix variance} + \text{sales quantity variance}$$

$$\text{Sales volume variance} = \$509 + \$620$$

$$\text{Sales volume variance} = \$1,129 \text{ favorable variance}$$

Both components of the sales volume variance are favorable variances. You improved your sales mix by shifting sales to the product with a higher contribution margin per unit. The sales quantity variance is favorable, because your actual sales were higher than budgeted. Favorable + favorable = favorable!

Chapter 14

Behind the Scenes: Accounting for Support Costs and Common Costs

In This Chapter

- ▶ Distinguishing between single rate and dual rate cost allocation
 - ▶ Considering support cost allocation methods
 - ▶ Allocating common costs
 - ▶ Thinking about customer contracts
 - ▶ Working with government customers and costs
-

Many vital business activities happen behind the scenes. These are known as *support activities*, and they reinforce the departments that make products or deliver services.

The work isn't visible to the customers, but it can make or break your business. If you perform this work poorly or overspend on the process, your business may incur a loss. Allocating the costs of these activities correctly is critical. The allocation affects accurate product costing and better product pricing.

There are several types of behind-the-scenes costs. *Support costs* are costs incurred for activities that assist other company departments. *Common costs* are costs shared by multiple departments. This chapter discusses methods for assigning these costs.

There's also a discussion of customer contracts. The issue of contracts comes up in several chapters of this book; in this chapter, you see how to handle contract costs. The chapter wraps up with tips on working with federal, state, or local governments.

A customer contract may dictate how you handle support costs and common costs. When you negotiate a contract with a customer, you need to understand how support and common costs affect your business.

Not Everyone Generates Revenue: Support Costs

Support costs are incurred to provide a product or service to a company operating department. An *operating department* is a department that makes a product or provides a service for customers — something for “the outside world.” You may see the term *operating manager* or *line manager* to refer to someone who manages an operating department.

A *support department* exists to help operating departments. Support departments can also provide services to one another. That makes the cost allocation to the product or service that goes out the door a little more complicated. Your goal is to properly allocate costs, so you know the full cost of your product.

Introducing single rate cost allocation method

The concept of allocating a cost is in practically every chapter of this book, so you probably have bumped into it before. The *single rate cost allocation method* uses one cost rate to dictate the dollars that are allocated from a cost pool to a unit, batch, department, or division. In the case of support departments, the rate allocates dollars to another department or division.

The single rate method doesn’t distinguish between fixed and variable costs. Now, if it strikes you that this kind of allocation doesn’t seem very specific, you’re right.

Of course, more specific cost analysis leads to more precise cost allocations (a recurrent theme in cost accounting). But for now, you use one rate to allocate costs. The principle is incredibly simple: When you compute the single cost allocation rate, *you multiply it by actual usage* (activity) to apply the cost to the cost object.

Check out the example in the following sections.

Figuring out the cost allocation rate

Say you manage an online tutoring business. Your instructors serve two markets — high school students and adult continuing education students — so your firm has a high school division and an adult ed division. Both company departments use technology in a big way. Your computer department (called *information technology*, or *IT*) installs software, trains staff, backs up data, and repairs computers.

The IT department has fixed costs that include the salary and benefits for five employees and the equipment (hardware and software) they use each day. The department also incurs variable costs, incurred when staff spends time working on technical issues (see Table 14-1). The variable expense can include hardware and software costs, as well as the expense of outside experts.

Table 14-1 IT Department — Budgeted Cost Pool	
Fixed costs	\$2,000,000
Variable costs	
Variable cost per hour	\$200
Budgeted hours	3,200
Total variable costs	\$640,000
Total cost pool	\$2,640,000

Your single rate budgeted cost allocation rate is

$$\text{Single rate budgeted cost allocation rate} = \text{cost pool} \div \text{budgeted hours}$$

$$\text{Single rate budgeted cost allocation rate} = \$2,640,000 \div 3,200$$

$$\text{Single rate budgeted cost allocation rate} = \$825 \text{ per hour}$$

The single cost allocation rate is \$825 per hour.

Pulling apart the single rate cost allocation

Fixed costs should be viewed in total dollars. From the IT department's point of view, the job is to allocate \$2,000,000 in fixed costs. But consider the high school division manager's view of the IT cost allocation rate. He sees that \$625 of the \$825 allocation rate is to cover fixed costs. If the manager uses the department for an hour, he is billed \$825, and that's going to be upsetting.

In the high school division manager's world, the cost for computer services looks too high. The manager might consider going outside the company to get help at a lower price. Say the division manager gets outside computer help at \$500 per hour. The division saves \$325 per hour ($\$825 - \500).

Like many things in life, there's good news and bad news with such a decision. When a manager goes outside the company to save \$325 an hour, he lowers costs of the division and increases divisional profit. However, the company as a whole must still cover the entire \$2,000,000 fixed cost of the IT department. If both divisions go outside the company for computer help, overall company profit goes down. The company's still incurring a fixed cost for the IT department — a department that not being fully utilized.

As you might expect, companies have various policies to prevent this from happening. For example, they may tell the division managers they'll be charged for the fixed cost portion of the IT department, whether they use the services or not.

Sure, the division can use an outside service for computer support, but that decision may not make sense, because it still pays a share of the fixed cost of the IT department. If the manager adds the fixed cost plus the cost of an outside vendor, the division is worse off financially.

Looking at actual results

At the end of the year, you take a look at actual hours of use. The high school division used 1,300 hours. The adult education division used 1,800 hours. Table 14-2 applies the budgeted cost allocation rate to actual hours of usage.

High school division		
Allocated rate		\$825
Actual usage hours		1,300
High school allocation		\$1,072,500
Adult ed division		
Allocated rate		\$825
Actual usage hours		1,800
Adult education allocation		\$1,485,000
Total allocation		\$2,557,500
Total usage hours		3,100

The actual allocation is less than budgeted (\$2,557,500 actual versus \$2,640,000 budgeted), because 3,200 budgeted hours were more than the 3,100 actual hours.

Your actual results rarely agree with your budgeted amounts. The difference between budgeted amounts and actual results is called a *variance*. Stroll over to Chapter 7 for more. So variances are to be expected.

It's critical that you understand your costs and that you can explain the cause of any variances. That's because your division managers will ask you to justify your budgeted amounts — and explain any differences between budget and actual numbers. A manager's performance review and compensation are affected by these results.

Checking out dual rate cost allocations

The preceding section addressed the single rate cost allocation method. You saw that this method put your costs into one bucket for analysis. You noted that the cost information was more useful when it was separated between fixed and variable costs.

The *dual rate cost allocation method* categorizes cost into two types of cost pools: fixed costs and variable costs. You calculate a different cost allocation rate for each cost pool. A more specific review of costs leads to more precise cost allocations. (You can check out Chapter 5 for specifics.) The dual rate allocation method is more specific than the single rate allocation. See for yourself in a minute.

In the section “Pulling apart the single rate cost allocation,” you see that the budgeted fixed cost allocation rate for the IT department was \$625 per unit. Continuing that example, here's a two-step process to calculate the *dual* rate cost allocation of the IT department:

- ✓ Multiply the budgeted fixed cost allocation rate by the budgeted usage
- ✓ Multiply the budgeted variable cost allocation rate by the actual usage

Note that the cost allocation rates are multiplied by different usage amounts. Here's a way to keep the difference straight: It's possible that your budgeted fixed cost come in as planned. In fact, your fixed cost may involve a contract (lease agreement, insurance premiums) that *cannot change* after budgeting. That's a way of remembering that you use budgeted usage for fixed cost allocations.

Variable costs are harder to pin down in planning, so you use actual usage for the variable cost allocations.

Table 14-3 show the total budgeted fixed cost for the IT department.

<i>Fixed Allocation Rate</i>	<i>Budgeted Usage Hours</i>	<i>Budgeted Fixed Costs</i>
High school division		
\$625	1,500	\$937,500
Adult education division		
\$625	1,700	\$1,062,500

The next step for a dual rate calculation is to compute the variable costs. Using the IT department example, you see the related info in Table 14-4.

<i>Variable Allocation Rate</i>	<i>Actual Usage Hours</i>	<i>Budgeted Fixed Costs</i>
High school division		
\$200	1,300	\$260,000
Adult education division		
\$200	1,800	\$360,000

Using the dual rate method of allocation, the *total* IT department cost allocated to the high school division would be

High school division IT department cost allocation = fixed costs + variable costs

High school division IT department cost allocation = \$937,500 + \$260,000

High school division IT department cost allocation = \$1,197,500

The adult education division's cost allocation is \$1,422,500 (\$1,062,500 fixed cost + \$360,000 variable cost). The data come from Tables 14-3 and 14-4. If you add the two allocations, you get \$2,620,000, the total IT department allocation.

Table 14-1 shows budgeted costs of \$2,640,000. No actual usage amounts were used. In Table 14-2, applied costs total \$2,557,500. That table takes the \$825 budgeted rate per hour and multiplies by the actual hours.

Consider why the dual rate cost allocation total is different from both Table 14-1 and 14-2. It's because the fixed portion of the allocation is based on budgeted information only. The fixed cost rate and usage are both budgeted amounts. You calculate variable costs as budgeted variable cost rate \times actual hours of usage.

The dual rate method allocates your costs more precisely than the single rate process. That's because the dual rate method separates the analysis of fixed and variable costs. A more precise allocation means that your full product cost is more accurate.

Using practical capacity to determine cost allocation rates

Practical capacity is the maximum level of capacity you can handle, taking into account unavoidable delays. Unavoidable delays might include the facts that your production staff takes vacation and that you need to schedule repair and maintenance to maintain your equipment. After you account for those types of production stoppages, you can calculate practical capacity. Take a gander at Chapter 9 for more info.

The IT department example in the previous sections considered usage based on demand. The 3,200 hours of usage in Table 14-1 is based on demand. Practical capacity is different.

Practical capacity views your production level from the supply side — not the demand side. “What if my department had all of the work it could handle? How would that level of production look?” That's what you ask yourself when you're using practical capacity to determine cost allocation rates.

This section considers the impact of using practical capacity for single rate and dual rate cost allocations. There is some fallout, because cost allocations may change. Those changes may affect decisions your managers make.

Budgeting with practical capacity and single rate allocations

Say you operate a marketing company. You service clients in the financial services market and the medical market, and you have separate divisions to service each of them. The printing and web services department supports both divisions, providing all printed ads, marketing pieces, and websites designed for clients.

Costs are allocated based on each division's usage in hours. In planning, you determine that the financial services division needs 2,000 hours and the medical division needs 1,800 hours.

Table 14-5 shows the budgeted cost pool, using budgeted usage (hours).

Fixed costs		\$2,500,000
Variable costs		
	Variable cost per unit	\$210
	Budgeted hours	3,800
	Total variable costs	\$798,000
Total cost pool		\$3,298,000

Your single rate budgeted cost allocation rate is

Single rate budgeted cost allocation rate = cost pool ÷ budgeted hours

Single rate budgeted cost allocation rate = \$3,298,000 ÷ 3,800

Single rate budgeted cost allocation rate = \$868 per hour (rounded)

Now consider just the fixed cost portion of the cost allocation. The cost allocation rate is \$658 per hour (\$2,500,000 ÷ 3,800 rounded).

Next, you take a look at the same calculation, using practical capacity in Table 14-6. You “put the pedal to the metal” by maxing out your available hours for providing marketing support. You determine that the financial services division can generate 2,500 hours, and the medical division can generate 2,000 hours.

Fixed costs		\$2,500,000
Variable costs		
	Variable cost per unit	\$210
	Practical capacity hours	4,500
	Total variable costs	\$945,000
Total cost pool		\$3,445,000

Consider what's changed. The practical capacity hours are higher than budgeted hours (4,500 versus 3,800). It should make sense that the total variable cost goes up (\$945,000 versus \$798,000), because you multiply the variable cost per unit by the practical capacity hours.

Your single rate budgeted cost allocation rate is

$$\text{Single rate budgeted cost allocation rate} = \$3,445,000 \div 4,500$$

$$\text{Single rate budgeted cost allocation rate} = \$766 \text{ per hour (rounded)}$$

Now consider just the fixed cost portion of the cost allocation. The cost allocation rate is \$556 per hour ($\$2,500,000 \div 4,500$ rounded).

The single cost allocation rate is multiplied by actual hours (usage) to apply costs to each division. Multiply the practical capacity rate of \$766 by the actual hours used to calculate the cost allocation for each division.



What you've just seen is a reminder of the risks of looking at fixed costs per unit. The practical capacity fixed cost allocation (\$556 per hour) is lower than the fixed rate at budgeted capacity (\$658 per hour). Hey, I'll take it! Lower costs are always better. Keep in mind, however, that the only reason the fixed cost per unit is lower is because you're spreading the same dollar amount (\$2,500,000 in fixed costs) over a higher number of hours. You have to cover your fixed costs, come what may. If you don't, you can't generate a profit.

Considering practical capacity and dual rate allocations

Recall that *budgeted hours* are used to calculate the dual rate cost allocation. In this section, the *practical capacity hours* are used. So the fixed cost rate is \$556 per unit (see the previous section). Here's the first part of the dual rate cost allocation method:

Dual rate method, fixed cost portion = budgeted fixed cost per unit \times budgeted hours

$$\text{Dual rate method, fixed cost portion} = \$556 \times 4,500$$

$$\text{Dual rate method, fixed cost portion} = \$2,500,000$$

To finish the dual rate calculation, you need the \$210 variable cost per unit from Table 14-6. Assume your actual hours used by both divisions total 4,200. Here's the variable cost for the dual rate method:

Dual rate method, variable cost portion = budgeted variable cost per unit \times actual hours

$$\text{Dual rate method, variable cost portion} = \$210 \times 4,200$$

$$\text{Dual rate method, variable cost portion} = \$882,000$$

Your dual rate cost allocation (to both divisions) is \$3,382,000 (\$2,500,000 fixed cost + \$882,000 variable cost).

Is using practical capacity practical?

Yeah, these calculations are a lot of work, so it's good to ask yourself if the extra effort is worth it. Consider what, if anything, you gain by collecting more information. Well, there is a method to the practical capacity madness.

Walk through it in your mind one more time. If you use practical capacity, the hours (or any activity) will be higher. Again, practical capacity assumes your customers need everything you produce. Practical capacity spreads your costs over more hours, so your cost per hour declines.

Here's the benefit of using practical capacity: Because you're allocating a lower cost per unit, less gets allocated to each division. Using practical capacity helps you avoid overburdening. *Overburdening* is defined as allocating too much cost to a division (or to anything). The downside is that more costs aren't allocated — they stay at the corporate level.

Essentially, using practical capacity requires corporate management — not division management — to figure out whether the cost allocations are reasonable. Even more important, corporate management has to justify “keeping” the costs that aren't allocated to the divisions.

Once more, with feeling: You'd prefer to allocate all costs to a unit of product. If you can't, the cost ends up on your profit and loss statement.

Going Over Variance Analysis and Department Costs

A *variance* is a difference between budgeted and actual costs. See Chapter 7 for an extensive discussion. When you analyze variances, you learn from them. Understanding a variance can help you reduce costs and possibly eliminate them.

In this section, you perform variance analysis at the department level. Variance analysis will identify areas in each department where you can reduce or even eliminate costs. All of this effort can improve company-wide profit.

Passing the cost allocation buck

I once worked for a large insurance company. The company name is being withheld to protect the innocent (an old TV-show reference). One company division (tech division) was paid by another (sales division) to create software. The software was designed to help the sales division account for some very complex insurance data for clients.

The project went \$5 million over budget. In fact, the software never worked correctly, even with an extra \$5 million in spending. So who posts the

expense? The CEO called both division heads to a 7 a.m. meeting. (He wasn't happy, which is why he had them meet so early.) He decided that each division was equally to blame.

The sales division didn't know what was needed well enough. In the CEO's view, it didn't give the tech division proper guidance. The tech division was blamed for mismanaging the project, when it should have been completed correctly. Each division had to take half of the loss.

Choosing budgeted versus actual rate of usage

A usage variance occurs when you *use* more or less of something (material or labor) than you planned. If your budgeted usage is different from your actual usage, you have a variance. You see an amazing discussion of variances in Chapter 7.

You have some choices about the usage rate (hours) that you use for budgeting cost allocation. For example, you estimate a level of usage in planning a budget. That estimate could be based on a sales and production forecast or based on the same level of production in the prior year. You can use that budgeted level of usage to allocate costs to divisions.

The production capacity level that you choose has an impact on your usage. Are you producing your product 24/7, or do you expect some downtime, due to a lack of orders? This section helps you consider the impact of the usage rate you choose.

Looking once more at practical capacity

Practical capacity generates a low cost per unit. That leads to a lower total cost allocation to each division. Less cost allocated to the division means more costs sitting in the head office — unallocated.

The company recognizes all the expense, whether it gets allocated to a division or not. Once the head-office managers decide on a cost allocation method, it should be fixed for the year. If the head office sets an allocation rate per hour that applies too little cost to each unit, it's stuck with it. It's unreasonable for the head office to ask division managers to take on more cost because the head office made a poor cost allocation decision.

If the head office uses budgeted usage for cost allocation, it's committed to those estimates. If there's an unfavorable variance (not enough expense allocated), that amount isn't passed on to the division after the fact. The head office incurs the cost. The divisions are not penalized for the head office's poor estimate.

Now, it's possible to use actual usage to allocate costs. It's a tricky process, however. By definition, none of the actual amounts are known until the *end* of the period. If you use this method, the division managers won't know their cost allocation until after the end of the period.

I don't know about you, but I'd prefer not to have surprises in my business — good or bad. It's better to manage your business with as much upfront planning as possible. A division manager would have to come up with some cost allocation number to budget at the beginning of the year anyway. But there would be a problem at the back end of the year. As a division manager, you may need to adjust your cost allocation expense number to match the allocation you get from the head office. This affects your divisional profits and likely your compensation at the end of the year. Therefore, you may conclude that using actual usage for cost allocations can lead to a lot of frustration.

Gaining or losing allocated fixed costs

If you use actual usage to allocate costs, one division's change in usage has an impact on another division's cost. If one division has higher or lower actual usage than budgeted, the cost allocations can change.

As a division manager, when you're dealing with actual costs, you're dealing with two unknowns. You won't know your actual cost until the end of the period. And your cost allocation may be higher or lower, depending on the actual usage of other divisions.

Now be a CEO or CFO, not a division manager. Say you manage a business with a residential and commercial division. You allocate all \$1,000,000 of your actual shipping department fixed costs. The allocation is based on the percentage of total hours used by each division. Table 14-7 lists the shipping department fixed cost allocation for the *previous* year.

Table 14-7 Shipping Department —
Fixed Cost Allocation, Previous Year

<i>Budgeted Usage (Hours)</i>	<i>Percent Usage Hours</i>	<i>Cost Allocation</i>
Residential division		
1,500 hours	45.45	\$454,545
Commercial division		
1,800 hours	54.55	\$545,555
Fixed costs allocated		\$1,000,000

Take a look at the residential division. That division's percentage of the total usage hours is 45.45 percent (1,500 hours ÷ 3,300 hours). The table then computes 45.45 percent of \$1,000,000 in fixed costs, which is \$454,545.

You decide to allocate fixed cost using actual costs this year. The residential-division manager needs some sort of cost allocation total to plan for the year. After all, the division manager can't price the product without knowing all the costs.

One of those costs is the division's cost allocation for the shipping department. After staring out the window for a minute, the division manager decides to budget using last year's allocation.

Now consider what would happen if the commercial division uses fewer shipping department hours than last year. At year-end, you determine that the commercial division used 1,200 hours. The residential division used 1,500 hours, the same as last year. The results are shown in Table 14-8.

Table 14-8 Fixed Cost Allocation —
Current Year (1,200 Actual Commercial Hours)

<i>Budgeted Usage (Hours)</i>	<i>Percent Usage Hours</i>	<i>Cost Allocation</i>
Residential division		
1,500 hours	55.56	\$555,556
Commercial division		
1,200 hours	44.44	\$444,444
Fixed costs allocated		\$1,000,000

Over at the residential division, the manager pulls up the shipping cost allocation report — and nearly chokes on a breakfast bagel. The residential division's allocation is over \$100,000 higher than last year! “Wait a minute. My division had the same 1,500 hours of usage as last year,” the manager says (to no one in particular). Then he realizes what happened.

The entire \$1,000,000 fixed cost is allocated between two divisions. The cost allocation is based on total actual usage for both divisions. If one division uses less (in usage hours), the other division is allocated more costs. At that point, the residential manager's blood pressure starts to go back down. He isn't any happier, but at least nobody's going to have a stroke.

Implications for the rate of usage selected

Using actual hours as the rate of usage for cost allocation causes problems. You're better off allocating costs using planned or budgeted amounts of usage. Again, if you use actual amounts, you have to wait until the end of the period to know what levels are.

So what to do? First, consider using a budgeted amount of usage cost allocations. Get input from your division managers. Ask them to estimate how much support (in hours) they will use. Use those estimates to create your budget.

Next, a little motivation can help. Provide a financial incentive for division managers whose actual usage is close to the budgeted level they provided. If those amounts are close, your company benefits. If each division actually uses the amount of support hours they budgeted, each area gets the cost allocation they expect.

Say the residential division manager's budget was for 45 percent of total support costs for the shipping department. If each division's actual use is close to budget, the residential division will get 45 percent of the cost actually allocated — which is what the manager expected. Everyone breathes a sigh of relief. Maybe there's a division-wide bonus for incurring the support costs that were budgeted.

As you sip your cup of coffee, consider this: Using budgeted amounts of usage to allocate costs can prevent a lot of heartaches.

Allocating to multiple departments

Every department in your business needs to budget to control costs. That rule applies, whether the departments create a product, provide a service, or support other departments.

When it comes to support costs, you should have a goal in mind. Figure out which departments exist to support other departments or divisions. Select a method to allocate the support costs to those departments. This section explains the methods you can consider to allocate costs to multiple departments.

Say you manage a chain of fast-food restaurants. (I'm getting hungry, so I thought I'd go with fast food.) The human resources department supports each restaurant. It does so by advertising open positions, performing background checks, and ordering drug testing for job candidates. The restaurants sell the product (fast food) to customers, so restaurants are an operating department. The human resources department is a support department.

Your company's legal department provides services to human resources. It assists with any potential legal issues that come up with employees (hiring, terminations, promotions, and so forth). The legal department is a support department providing services to *another support department*.

Now move on to allocating costs. Consider the fast-food restaurant example, and you may start to see some complications with support cost allocation.

The legal department provides support to human resources, but also to the restaurants directly. For example, the legal department reviews and negotiates contracts for the restaurants. You read earlier how HR supports the restaurants. All this makes sense, but you have to be prepared to slice up the cost allocation pie correctly.



The restaurant industry experiences high levels of employee turnover. *Employee turnover* refers to the process of losing employees (either voluntarily or through termination) and replacing them. In particular, the fast-food industry hires many young people, many of whom don't stay very long. It's a constant process of hiring. As a restaurant owner explained to me, "I'm not in the food business. I'm in the human resources business." Turnover is understandable, because there's not much future for fast-food employees, whose only bright moment is to ask, "Would you like a nice hot apple turnover with your order?"



Ideally, all support costs should be fully allocated to operating departments. That makes sense, because operating department costs get allocated to the products or services. If you don't allocate all support costs, those costs never get allocated to the customer (in the product price). Because all costs are allocated to the operating departments, any allocation method should zero out each support department's cost.

Kicking around the direct allocation method

The *direct allocation method* allocates support costs directly to each operating department. It's simple, because you allocate every dollar out of the support department to an operating department. Because all costs are allocated, none of the support costs remain at the head office. Ta-DAH!

Here's a direct allocation example. Say your human resources and legal departments support two operating departments: assembly and shipping. After some analysis, you conclude that 80 percent of your HR costs and 90 percent of your legal costs are incurred to support the assembly area. The remainder is allocated to shipping.

Table 14-9 shows that all support costs are allocated to the two operating departments. The assembly area gets 80 percent of the human resources cost ($\$100,000 \times 0.80 = \$80,000$) and 90 percent of the legal costs ($\$200,000 \times 0.90 = \$180,000$). The "leftover" support costs are allocated to shipping. Both support departments have a zero balance after costs are allocated.

		<i>Assembly</i>	<i>Shipping</i>
Beginning balance	\$300,000	\$1,000,000	\$75,000
HR cost allocation			
\$100,000		\$80,000	\$20,000
Legal cost allocation			
\$200,000		\$180,000	\$20,000
Total allocation	-\$300,000	\$260,000	\$40,000
Ending balance	\$0	\$1,260,000	\$115,000

There's a downside to this method, however. Direct allocation doesn't allow you to allocate support department costs to other support departments. That's likely to happen, depending on your business.

Consider an HR department and a legal department. Assume that all of the HR and legal department support costs are allocated to an operating division using direct allocation. So the bucket of HR and legal department costs is empty. All costs have been allocated out.

But (there's always a "but") during the same time period, human resources provides support for the legal department (it helps the legal area interview and hire an attorney). Naturally, some human resources costs should be allocated to the legal department. But the legal department costs have already been fully allocated to an operating division.

Consider where those new costs from human resources should go and *when* they should go. They need to be allocated to the legal department first, and *then* to an operating department. If the costs don't end up somehow allocated to an operating department, they never get attached to a product or service. The direct allocation method would be fairly inaccurate in this situation.

Moving to the step-down allocation method

The *step-down allocation method* allows support departments to allocate costs to each other — and ultimately to the operating departments. To accomplish this, the support departments are ranked. The ranking is often based on the percentage of costs that a support department incurs to support *other support departments*.

The support department with the highest percentage is allocated first. All of its costs are allocated out — whether to an operating department or to another support department. After that, the support department with the second-highest percentage is allocated. Step by step, the costs for each support department are fully allocated. In the end, the calculation "goes flat," because all costs are allocated.

To keep things simple, use the data from Table 14-9. Say \$10,000 of the human resources cost is allocated to the legal department. Legal doesn't allocate any costs to human resources. So you rank the HR department higher than legal. That's because HR allocates support costs to another support department and legal doesn't. Table 14-10 shows that allocation.

Table 14-10		Step-down Allocation Example		
		<i>Legal</i>	<i>Assembly</i>	<i>Shipping</i>
Beginning balance	\$300,000		\$1,000,000	\$75,000
HR cost allocation				
\$100,000	\$10,000	\$10,000	\$80,000	\$10,000
Legal cost allocation	-\$10,000			
\$200,000 + \$10,000			\$189,000	\$21,000
Total allocation	-\$310,000		\$269,000	\$31,000
Ending balance	\$0	\$0	\$1,269,000	\$106,000

Note that the HR cost allocation shifted. In this scenario, \$10,000 is allocated to the legal department for services provided by HR. The legal costs are now \$10,000 higher, so you have to allocate \$210,000 out of legal (not \$200,000) to get an ending balance of zero. Ninety percent of the \$210,000 (\$189,000) is allocated to assembly, and the remaining 10 percent (\$21,000) is allocated to shipping. It's important to note that the total dollars allocated to the two operating departments *are the same* (\$1,375,000). It looks like more money was allocated (\$310,000), but that's not true; it's just a matter of showing an "extra" \$10,000 going into the legal department and going right back out again.

All good, except there's a drawback. This allocation method doesn't allow costs to be allocated between multiple support departments. For example, what if legal also provides services to the HR department? When you rank the support departments and allocate out the costs, you can't allocate costs back in. It's the same issue you saw with the legal and HR departments in the last section.

Exchanging services: the reciprocal method

Enter the reciprocal method. The *reciprocal method* of cost allocation allows you to allocate costs *between* support departments in full. You can allocate costs back to a support department that you've already addressed. Say that you allocated costs out of the HR support department. When you get to the legal department's allocation, you find that some of its support costs should be allocated to HR support. The reciprocal method can make that happen.

That's the good news. The bad news is that the process is so complex that it might not be worth using for your business. You're right back to the cost versus benefit discussion — a concept that comes up often in this book. How much analysis is worth doing? You may find that your time investment to separate and assign support costs just isn't worth the benefit you receive. The benefit, in this case, is a more precise allocation of your costs, but (as Mark Twain said) there's no point in being a darned fool about it.

To summarize the cost versus benefit issue: If you have multiple support departments, consider the reciprocal method. Then, if those support departments incur a lot of costs, by all means give the reciprocal method a shot. Finally, consider the complexity of your business and the dollars involved, and give it up if it's all too much.

Say you choose one of the other methods instead of the reciprocal method. And say you have a cost that needs to be allocated back to a support department. You can't allocate it back, but consider the dollar amount. If the amount doesn't significantly affect your total product cost, it's not worth switching to the reciprocal method.



The cost versus benefit discussion relates to *materiality*, a term that comes up in the auditing process. Go online and check out the annual report of any large company. The report almost always includes the audited financial statements for the year just ended. Scroll through the report, and read the auditors' opinion. It's the letter supplied by the CPA firm that performed the audit. In the audit opinion letter, you see a statement that the financial statements are "free of material misstatement." The language changes slightly over time, but that's the heart of it. A material misstatement is an error in the financials that would cause the reader to change her opinion about the company. The phrase "free of material misstatement" means "we didn't find any large errors that would change your view of this company's financials this year." Keep that in mind as a yardstick.

Focusing on Common Costs

Common costs are costs that are shared by more than one department. They are costs that can't be assigned completely to any one department. In Chapter 13, corporate costs (costs incurred for the head office) are defined as common costs.

It's difficult to distinguish between common costs and support costs, both of which were discussed earlier. Support costs focus on activities that assist other departments, other departments that are making products, selling, and marketing.

You can think of a common cost as a necessary evil. It's a cost you pay to be in business. You have to insure assets (buildings, equipment, for example). When you sell something, you have to ship it. Common costs aren't exciting and are harder to connect to a department's activity.

This section discusses two allocation methods for common costs. As always, you need to consider whether the time to implement a method is worth the benefit of more precise cost information. One method is simpler to use, and one is harder to use.

Mulling over stand-alone cost allocation

The *stand-alone cost allocation method* collects information from the users of a common cost. You assess how much of the total common cost is used by each entity and then you make the cost allocation based on how much each party uses. This is relatively simple.

Say your clothing company has two divisions — the department store division and the small shops division. You sell clothing to stores in both markets. The two divisions use the shipping department to get products to customers. Whenever possible, the divisions work together to put goods on the same truck for shipment. The cost for shipping is based on the weight of the product in the truck.

The department store was quoted \$300 to ship 200 pounds of goods from St. Louis, Missouri, to Chicago, Illinois, in two days. The small shops division has a quote of \$190 to ship 100 pounds of goods from St. Louis to Milwaukee, Wisconsin, in two days. The two destination cities are relatively close to each other. You can easily calculate the cost allocation. But wait! There's more!

The divisions combined their orders and asked for a quote from the shipping department. The combined quote was \$420 to ship all 300 pounds to the two cities. (What the Dickens? I guess this is a tale of two cities. That's a savings of \$70 — \$490 versus \$420). Consider how the stand-alone method would allocate the \$420 common cost (check out Table 14-11).

This method says to allocate the common cost on the same percentage basis as the costs that would have been paid by each entity alone. For example, the percentage allocation for the department store division would be 61.2 percent ($\$300 \div (\$300 + \$190)$). The small shops division gets an allocation of 38.8 percent ($(\$190) \div (\$300 + \$190)$).

<i>Division</i>	<i>Percent Allocation</i>	<i>Common Cost</i>	<i>Cost Allocated</i>
Department store	61.2	\$420	\$257.04
Small shops	38.8	\$420	\$162.96
Total Allocated			\$420.00

Multiply the common cost (\$420) by the allocation percentages, giving you the amount to be allocated to each division.

Pretty simple. Costs are shared proportionally based on use in terms of dollars. Anyway, your division managers will probably judge the allocation process to be fair.

Stepping up to incremental cost allocation

The *incremental cost allocation method* is more complex than the standalone cost allocation method. The method ranks users of the common cost by their use of the cost, or alternatively, uses other references to explain why users rank in order of *those most responsible* for creating the costs. Same idea: You establish a list of users by priority.

The *primary party* is ranked first. That user gets the first allocation of common costs. The first incremental user receives the next allocation, then the second incremental user (if needed), and so forth. Typically, the primary party gets the largest cost allocation.

Making a Commitment: Contracts

A *contract* may set guidelines for costs, outlining specifically which costs apply to the contract. The contract may also define which costs are direct and which are indirect. It might define the cost allocation base for allocating overhead.

The contract may (and often does) dictate payments. It may determine when a cost you incur can be billed and reimbursed. Normally, being reimbursed for a cost requires written evidence that the cost was incurred. That information is used to justify partial payment (a *progress payment*) for the work completed.

Contracting with the government

Many companies generate a majority of their business through *government contracts* (contracts with federal, state, and local governments). It can be a consistent and profitable business, but if you want to contract with the government, you need to educate yourself on the process.

There are several methods for computing the price of your product or service, which are billed to the government. The price may be the cost you incur, plus a markup or fee to allow for a profit (a *cost-plus contract*). If that's the case, it's critical to understand what costs are allowed and reimbursable. If the government has purchased the product or service before, you should be able to find data on the costs other companies incurred. Say you're contracted to build a municipal swimming pool. Because such projects are fairly common, you could research the costs incurred by other companies who've built pools.

If the project is new or unique, there's a bigger risk. If you can't find comparable projects, it may be hard to know what costs should be included. That makes it hard to negotiate which costs should be in the contract. You might miss some costs. Maybe it's difficult to estimate the labor cost for the project, as would be true if no one else has done it before.

There are other methods for pricing government work. See the section on markups in Chapter 12. Your price may also be a fixed price contract, which is a price driven by market competition. Finally, your price may include a share of cost savings generated.

Say you build a solar building for a city. Your compensation might include some of the energy savings. The city calculates the energy cost savings for the new building and then pays some of that to the builder. Such payments are for a fixed time period.

Thinking about reasonable and fair costs

To consider what may be a reasonable and fair price, you need to consider the cost for the product or service you provide. That's your starting point: Consider whether or not the costs are fair. After you and the other party agree, you can discuss a fair profit and price.

Many government entities require *competitive bidding*. That means that multiple vendors provide confidential bids for the work. The government then selects a vendor to perform the work.

The party selected normally is the low bidder; however, there may be other factors that affect the selection of the vendor. The government usually wants an experienced vendor who can meet a deadline. The contract likely requires vendors to provide references. So the lowest bid might not necessarily be selected.

Competitive bidding is most appropriate for work that's *not unusual or unique*. There are a few reasons why. If the work is common, the government is able to find multiple bidders. Also, bidders have enough data from other work to submit well-planned bids.

In the case of the municipal swimming pool, the city or state should be able to find multiple bidders. The work is fairly common. The bidders (also called *vendors*) likely have all built municipal pools before.

Things get tougher for both parties when the work is unusual or unique. Say the federal government wants bids on a manned spaceship to fly to Mars.

There aren't many companies that have the staff and expertise to build spacecraft, much less a vehicle that could go to Mars. Even having built a spacecraft that can go to the Moon won't provide all the experience needed for a Mars mission.

There's a lot at risk for a potential bidder. It is difficult to know all the costs that need to be incurred. After all, you can't go to the web and research other companies that have built a similar product. Given the dollar amount involved and the uncertainty, companies may not be willing to bid.

Ultimately, both parties need to agree on what's reasonable and fair. For common work that goes through competitive bidding, there's historical data to determine what's reasonable and fair. For unique work, the process is harder. If you could take time negotiating, you can nail down your definitions of reasonable and fair costs and prices. The trouble is that sealed, competitive bids don't allow for negotiating. At best, there is a "question and answer" process, where all bidders' questions — and the answers — are available for all bidders to see.

Chapter 15

Joint Costs, Separable Costs, and Using Up the Leftovers

In This Chapter

- ▶ Distinguishing between joint costs and separable costs
 - ▶ Finding the splitoff point
 - ▶ Determining costs and product values at splitoff
 - ▶ Thinking about stopping or continuing production
 - ▶ Understanding byproducts
-

Different products may go through the same production process, making it difficult to differentiate costs among products early in production. During this stage, your firm is incurring *joint costs*.

At some point, however, the products in production become separate and distinct from one another. For example, when you drill for oil, you eventually separate the crude oil from the other materials you take out of the ground. Then you apply costs to each product to better compute a sale price and your profit. Accountants call this the *splitoff point*. After splitoff, you consider each product's costs separately. Then you work with *separable costs*.

Ultimately, most production processes have some output that's a *byproduct*. It's not the primary product you produce — it's a "leftover" — but it might have some value to a customer. Smart business owners, like my parents, try to make use of the leftovers.

This chapter takes a look at these costs and what can be done with any byproducts.

Working with Joint Costs

You can imagine many products that start off in production together. If you make three models of blue jeans, you may cut and sew the same type of denim at the beginning of production. For a while, the three types of jeans look the same. You're in joint production, and you're incurring joint costs.

At some point, you separate production. One model of jeans can be distinguished from the models. As you produce jeans separately, you incur costs separately.

This section starts to explain joint costs.

Explaining joint cost terms

It's time to connect three terms. *Joint costs* are production costs incurred in creating two (or more) products. The *splitoff point* is the point when the costs of two or more products can be separately identified. After splitoff, each product incurs *separable* (or independent) costs.

Figuring a product's total cost

When your production involves some joint costs, you need to change your thinking about total costs. To compute total costs, you use a before-and-after process. The product's total cost are a portion of the joint costs (incurred before splitoff point) plus the separable costs (incurred after splitoff point).

Say you make two types of leather purses. Both purses go through the same production process. Each product incurs a portion of the joint costs of production. But the process doesn't end there. In this case, you'd expect to have costs after splitoff.

Sure, both purses go through a process to treat and shape leather — that's in joint production. But they each have different straps and different metal pieces added. That work (the separable costs) occurs after splitoff. To price both purses, you need to add the joint costs incurred to the separable costs.

It's possible that two products incur no additional costs after splitoff. At first, that may seem unlikely, but it happens all the time. In food production, for example, joint production costs can stop at splitoff. A dairy farmer milks cows. The raw milk can generate cream and skim milk. The same input (raw milk) creates two outputs. After the products reach the splitoff point, production and costs stop. The farmer has two products to sell.

Setting the sales value of a byproduct

In the cost accounting world, a *byproduct* is a product that is produced during joint production. It's something produced while you're making something else. Call it an *extra* or a *side effect* of production. Even though producing the byproduct isn't your main goal, it shares joint costs with the real product.

A byproduct has a lower *sales value* than other products in joint production. Sales value? Here's how to calculate a product's sales value:

$$\text{Product sales value} = \text{Number of units produced} \times \text{sale price per unit}$$

You can tell a byproduct because it isn't the primary reason you're running production. The revenue produced (product sales value) is typically so small that you wouldn't run production for just the byproduct. But the sales value of the byproduct (just like any other product) can change. Over time, your byproduct's revenue may become more attractive. (Well, it can also become less attractive, too.)

Appreciating the importance of allocating joint costs

In addition to computing a product's total cost, there are other important reasons why you spend time figuring and allocating joint costs:

- ✔ **Financial reporting:** Joint costs need to be computed and allocated for inventory and cost of goods sold. *Financial accounting* is the process of creating financial reports for external users (for example, shareholders, creditors, or regulators). Of course, there are standards of financial reporting — rules of the road for explaining financial results — and many books have been written about them.
- ✔ **Product pricing:** Joint costs are used to compute total product costs. Product costs are then used to determine a profit and a sale price. You need to calculate joint costs to calculate *inventoriable costs*. Those costs are attached to inventory and expensed when the product is sold. Check out Chapter 9 for more on the concept. So you need joint costs to calculate inventory values and the cost of goods sold. This information ends up in your financial reports, too.

It's a mantra you may grow tired of hearing: You need total product costs to decide on a profit level and figure out a sale price. If you have joint production, you need the joint costs to compute total product costs.

- ✔ **Contracts:** Joint costs are part of cost reimbursement under contracts. Contracts come up in Chapter 14. Under many contracts, you need to justify your costs and document them to receive reimbursement. Essentially, you're proving that your spending met the guidelines in the contract. If you have joint costs, they need to be part of this process.
- ✔ **Insurance settlements:** Insurance settlements for damage claims include joint costs. If you file an insurance claim regarding damaged assets, you need to document each asset's value. Say you produce inventory using a joint production process. And say some of that inventory was damaged when your warehouse was hit by a storm. To justify the inventory cost for your insurance claim, you need details on the joint costs in that inventory.
- ✔ **Regulated products:** A regulated product or service may require joint cost allocations to compute a price. Some industry prices are set and controlled by federal or state regulation. Utility companies are the best example. Because it's a process of justifying costs, you need to provide your total costs (including joint costs) to the regulator.
- ✔ **Litigation:** Litigation documentation and support may require joint cost allocations. Unfortunately, litigation is a cost of doing business. Every company, to some extent, has to deal with litigation. Whether your company is initiating a legal action or defending itself against an action, you need good documentation.

Often, the issue in corporate litigation is a product or service. The value of the product must be determined so that the court knows the dollar amount in dispute. If you use joint production, you need to include the joint costs in your total.

Considering joint cost allocation methods

The *matching principle* matches revenue with the expenses related to it. You tie the revenue from selling a unit to the cost of making a unit. The concept pops up throughout the book, and it's also used to allocate joint costs.

You can allocate joint costs based on the revenue the units generate. Accountants refer to this as the *market-based approach*. *Market* refers to the market value (sales value) of the product. The section "Setting the sales value of a byproduct" defines product sales value. Use that formula to allocate joint costs. The two market-based methods you see are the *sales value at splitoff method* and the *net realizable value (NRV) method*. You also see the *physical measures method* of allocating joint costs.

The sales value at splitoff method

One method of allocating joint costs is to allocate costs based on the benefits received from the expense. Take a peek at Chapter 13 for more info. Revenue is a benefit received from incurring joint costs. That's the basis for using a market-based approach.

In the section "Figuring a product's total cost," the dairy-farmer example doesn't include any costs after splitoff. The farmer uses joint production and then has two products (cream and skim milk) to sell. So you allocate costs using the relative sales value of each product.

Say you own a lumber company and mill. Your crews cut down trees and produce two types of lumber for the construction industry. Both types are two-by-fours (two inches by four inches by eight feet in length). Winter Pine is the more expensive product; the all-year-use two-by-fours are cheaper. Table 15-1 explains how to allocate \$208,000 in joint costs using the relative sales value method.

	<i>Winter Pine</i>	<i>All-Year-Use</i>	<i>Total</i>
Production	10,000	16,000	26,000
Unit price	\$12	\$8	
Relative sales value	\$120,000	\$128,000	\$248,000
Percent sales value	48.39	51.61	100
Cost allocated	\$100,645	\$107,355	\$208,000
Cost per unit	\$10.06	\$6.71	

A product's relative sales value is unit price \times production. The total sales value for both products is \$248,000, and about 48 percent of the sales value is for Winter Pine. The joint cost allocation for Winter Pine is \$100,645 (48.39 percent, or $0.4839 \times \$208,000$). To check your work, add the two joint cost allocations and verify that they sum up to \$208,000. Here's the cost per unit for Winter Pine:

Cost per unit, Winter Pine = cost allocation \div units produced

Cost per unit, Winter Pine = $\$100,645 \div 10,000$

Cost per unit, Winter Pine = \$10.06

The physical measure method

The *physical measure method* allocates cost by the weight, volume, or some other measurement of the product that's produced. It's a contrast to relative sales value. In this case, assume that the weight or volume for each two-by-four is the same. (Well, yeah. They are both two-by-fours.) So you allocate joint costs based on the *number of units* produced. Check out Table 15-2.

	<i>Winter Pine</i>	<i>All-Year Use</i>	<i>Total</i>
Production	10,000	16,000	26,000
Percent production	38.46	61.54	100
Cost allocated	\$80,000	\$128,000	\$208,000
Cost per unit	\$8	\$8	

Winter Pine's 10,000 units of production are 38.46 percent of the total. The cost allocated is \$80,000 (38.46 percent or $0.3846 \times \$208,000$). The all-year-use product gets the rest, \$128,000. The total cost allocated sums up to \$208,000. The new version of cost per unit for Winter Pine is

Cost per unit, Winter Pine = cost allocation \div units produced

Cost per unit, Winter Pine = $\$80,000 \div 10,000$

Cost per unit, Winter Pine = \$8

In Table 15-2, the cost per unit is the same for both products. That's because the joint cost allocation isn't related to cost because it uses the physical measure method. Because you're allocating based on number of units, the cost attached to all units is the same. You're not weighting the cost allocation based on sales value.

Continuing Production: Computing Separable Costs After Splitoff

Separable costs are incurred after you pass the splitoff point. In many cases, the product won't be sellable at splitoff, because the product isn't finished yet. In the section "Explaining joint cost terms," you see a mention of leather purses. At splitoff, the purses aren't complete; you need to add straps and metal accessories to complete the product for sale.

Because many products require production after splitoff, it's important that you review two of these methods: the *net realizable value method* and the *constant gross margin percentage method*.

Exploring the net realizable value method

The *net realizable value method* allocates joint costs on the basis of the *final sales value* less separable costs. Final sales value is simply the price tag — the price paid by the customer. That price is paid after all production costs, whether they are joint costs or separable costs incurred after splitoff.

What you *realize* on a sale is usually your profit. You see this term used many times in business. But in this case, realizable value means sale price less separable costs. That doesn't equal profit. You have to subtract joint costs from the subtotal to get profit. It's not a perfect comparison, but it's close.

Computing total costs and per unit amounts

Use the leather-purse example for working through the net realizable value method. Say you sell two types of purses: The Sassy purse line is more expensive than the Everyday model. The separable costs per unit for Sassy purses, as you see, are higher than those of Everyday purses.

Table 15-3 calculates the net realizable value for each product.

<i>Purse Type</i>	<i>Sassy</i>	<i>Everyday</i>	<i>Total</i>
Production	20,000	24,000	44,000
Unit price	\$50	\$35	
Sales value (A)	\$1,000,000	\$840,000	\$1,840,000
Separable costs (B)			
Per unit	\$12	\$10	
Total	\$240,000	\$240,000	\$480,000
Net realizable value (A – B)	\$760,000	\$600,000	\$1,360,000

Work your way down the Sassy purse column. The sales value of \$1,000,000 is based on the production multiplied by the unit price ($20,000 \times \$50$). Then here's the separable cost calculation:

Separable cost = units produced \times cost per unit

Separable cost = 20,000 \times \$12

Separable cost = \$240,000

The net realizable value is the \$1,000,000 sales value less \$240,000 separable costs = \$760,000. Next, you use net realizable value to allocate joint costs. Take a gander at Table 15-4.

	<i>Sassy</i>	<i>Everyday</i>	<i>Total</i>
Net realizable value (NRV)	\$760,000	\$600,000	\$1,360,000
Percent of NRV total	55.88	44.12	
Joint cost allocation	\$502,941	\$397,059	\$900,000
Total costs			
Separable costs	\$240,000	\$240,000	
Joint costs		\$502,941	\$397,059
Total costs	\$742,941	\$637,059	
Cost per unit	\$37.15	\$26.54	

Table 15-4 starts with the net realizable value (NRV) amounts from Table 15-3. The *Percent of NRV total* is the percentage of the total NRV for each product. The \$760,000 of NRV for Sassy purses is 55.88 percent of the total of \$1,360,000. Then you multiply \$900,000 in total joint costs by the percentage, and that allocates joint costs to each purse. Simple, no? No.

What about separable costs? Table 15-4 displays the separable costs from Table 15-3. Add the separable and joint costs to get total costs. It makes sense that Sassy purses have a higher total cost per unit (\$37.15). The Sassy's per unit separable cost of \$12 (from Table 15-3) is higher than that of the Everyday product (\$10), so the Everyday unit's cost is \$26.54. The \$502,941 joint costs allocated to the Sassy in Table 15-4 are also higher than the joint costs for Everyday purses.

Mulling over issues with the NRV method

One issue with the *net realizable value* (NRV) method is that amounts may change. For starters, your production process after splitoff may change. Hopefully, you're able to review variance results and improve the process. (Variances are brilliantly explained in Chapter 7.) If you change your production after splitoff, your separable cost totals change.

You may not be able to price your product until after production ends. And in a market with heavy competition, to maintain your sales levels, you have to keep your price competitive (for the Sassy purses, say \$50 per unit or lower). If your total costs come in lower than expected, maybe you can price the product lower than \$50, and that might increase sales.

If you can't determine a sales price in advance, you can't calculate relative sales value.

Introducing the constant gross margin percentage NRV method

The *constant gross margin method* expands on the NRV method. Before you get there, consider gross margin. *Gross margin* is defined as sales less cost of sales. You might recall that cost of sales isn't total cost, but the cost to make the good. Gross margin is the price of the asset less the cost to make it. There are other costs (marketing and sales, for example) that aren't part of the gross margin calculation. They come up later.

You can express gross margin as a percentage:

$$\text{Gross margin percentage} = \text{gross margin dollar amount} \div \text{sales} \times 100$$

For example, if your gross margin for a pair of shoes is \$10 and your sales price is \$80, your gross margin percentage is 12.5 percent ($\$10 \div \80×100).

The constant gross margin method assigns joint costs after assigning each product the same gross margin percentage. It's a method that *works backward*. Here are the steps for using the constant gross margin method:

1. Compute the gross margin percentage for the entire company.
2. For each product, compute sales less gross margin as a percent of sales for the entire company to compute cost of goods.
3. Deduct separable costs from cost of goods for sale to calculate joint costs.
4. Subtract total costs from sales value to get gross margin.
5. Verify that the gross margin percentage calculation is correct.

Here's what working backward means: Normally, you use sales and cost of sales to compute gross margin. This new method uses a desired gross margin percentage to compute cost of goods available for sale. The reason the process uses cost of goods available for sale is that you don't know how much of the production will be sold. You know sales *value* but not actual sales.

Starting with total gross margin percentage

Assume you manufacture leaf blowers. Your two products are heavy-duty blowers and yardwork blowers. You start by computing the gross margin percentage for both of your products together. Total gross margin is \$428,000 (\$3,440,000 in sales value less total costs of \$3,012,000). Here's the gross margin percentage:

$$\text{Gross margin percentage} = \text{gross margin} \div \text{total sales value} \times 100$$

$$\text{Gross margin percentage} = \$428,000 \div \$3,440,000 \times 100$$

$$\text{Gross margin percentage} = 12.442$$

The gross margin percentage is 12.442 percent.

Calculating goods available for sale by product

Now that you have the gross margin percentage for the whole company, you can calculate the gross margin percentage for each product. That amount allows you to come up with the cost of goods available for sale. Table 15-5 has the details.

Table 15-5	Goods Available For Sale by Product		
	<i>Heavy-Duty</i>	<i>Yardwork</i>	<i>Total</i>
Sales value (A)	\$2,000,000	\$1,440,000	\$3,440,000
Gross margin (B)	\$248,837	\$179,163	\$428,000
Cost of goods available for sale (A – B)	\$1,751,163	\$1,260,837	\$3,012,000

The gross margin for each product equals the sales value multiplied by the gross margin percentage of 12.442 percent. For example, the heavy-duty blower's gross margin percentage is \$248,837 ($2,000,000 \times .12442 \div 100$ with a small rounding difference). Heavy-duty then subtracts the \$248,837 gross margin from \$2,000,000 sales value to get \$1,751,163, the cost of goods available for sale.

Your cost of sales is sales value less gross margin. The formula in Table 15-5 rearranges the components. Again, you use cost of goods *available for sale* — at this point, you're only planning results.

Figuring out joint cost allocations

Cost of goods available for sale represents the product's total costs. One more time: Total costs have two components — joint costs and separable costs.

Assume the separable costs are \$1,200,000 for the heavy-duty blower and \$912,000 for the yardwork blower. If you know the separable costs and the cost of goods available for sale, you can compute the joint cost allocation. Table 15-6 shows the process.

Table 15-6	Joint Cost Allocation		
	<i>Heavy-Duty</i>	<i>Yardwork</i>	<i>Total</i>
Cost of goods available for sale	\$1,751,163	\$1,260,837	\$3,012,000
Less separable costs	\$1,200,000	\$912,000	\$2,112,000
Equals joint cost allocation	\$551,163	\$348,837	\$900,000

Each company division provides the separable costs. So altogether, Table 15-6 gives you a joint cost allocation.

Verifying the gross margin percentage

You need multiple steps to get from a gross margin percentage to a joint cost allocation. This is tough stuff — a fairly complex process. So you should check your work. That's the purpose of Table 15-7. The goal is to use the traditional formula for gross margin. This last step lets you see if the gross margin percentage is really correct.

Table 15-7	Verifying Gross Margin Percentage		
	<i>Heavy-Duty</i>	<i>Yardwork</i>	<i>Total</i>
Sales value (A)	\$2,000,000	\$1,440,000	\$3,440,000
Total cost (B)	\$1,751,163	\$1,260,837	\$3,012,000
Gross margin (A – B)	\$248,837	\$179,163	\$428,000
Gross margin percentage	12.442	12.442	

The sales value comes from Table 15-5. The total cost is the cost of goods available for sale from Table 15-6. The gross margin percentage is the gross margin divided by the sales value. For each product, the gross margin percentage is the same (12.442 percent) as the company's overall gross margin.

Here's the point of Table 15-7: The table uses the traditional formula to compute gross margin and gross margin percentage. The table verifies that the calculations in Tables 15-5 and 15-6 are correct. You gotta admit that there are a lot of numbers flying around in these tables. It helps to have a tool to verify the calculations, which is what Table 15-7 is supposed to do.

Go back through the tables, and take a look at some overall trends in the data. In Table 15-5, the heavy-duty product has the higher sales value. As a result, it ends up with a higher gross margin *in dollars* than the yardwork product. However, both sale values are multiplied by the same gross margin *percentage*.

Both products have a gross margin of about 12.5 percent (rounded). That means that about 87.5 percent of sales value represents cost of goods available for sale.

The difference between the products occurs with separable costs. Take a spin (or a slog) through Table 15-6. The "Cost of goods available for sale" number comes from Table 15-5. To make the company-wide gross margin percentage hold true, the total costs have to be \$3,012,000.

Reducing separable costs

Assume that the heavy-duty blower division is able to sharply reduce its separable costs to an amazingly low \$500,000. Table 15-6 listed heavy-duty separable costs of \$1,200,000. Consider what now happens to heavy-duty's joint cost allocation. Take a look at Table 15-8.

	<i>Heavy-Duty</i>	<i>Yardwork</i>	<i>Total</i>
Cost of goods available for sale	\$1,751,163	\$1,260,837	\$3,012,000
Less separable costs	\$500,000	\$912,000	\$1,412,000
Equals joint cost allocation	\$1,251,163	\$348,837	\$1,600,000

Heavy-duty's joint cost allocation *increases* to \$1,251,163 (from \$551,163). That doesn't seem right. The point throughout this book is to analyze costs to reduce or eliminate them. If you do, supposedly you increase your profits.

In this case, the heavy-duty division's reducing separable costs *increased* its joint cost allocation. There doesn't seem to be a benefit to operating more efficiently.

Here's an explanation: The gross margin percentage method *locks in* total costs as a percentage of sales value. If the gross margin is about 12.5 percent of sales value, it means that costs must be about 87.5 percent of sales value. For heavy-duty, that 87.5 percent total cost number is \$1,751,163, like it or not. Those costs are either separable or joint costs. If one increases, the other decreases.

The heavy-duty manager may (may?) have a problem with this process. The manager works hard (using good old cost accounting) to lower the separable costs. The manager's "reward" is a higher joint cost allocation. The heavy-duty division has lowered costs but doesn't get any savings in total costs.

The constant gross margin percentage method clarifies the revenue and profit calculations company-wide. This method eliminates some of the variation between company divisions. Although some managers may complain, each division has the same gross margin percentage. The process makes managing company profit easier.



This is one of those "Here's why the chief financial officer (CFO) makes the big bucks" moments. As CFO, you explain the gross margin percentage method to the heavy-duty division manager. The goal is to allocate joint costs so that each product maintains the same gross margin percentage of about 12.5 percent. If a division reduces separable costs, it *must* get a bigger joint cost allocation — *otherwise, the gross margin percentage would increase*. Now heavy-duty's manager should be evaluated based on the successful cost reduction. The manager had a success, and you want to encourage more cost savings. Although the gross margin percentage process requires a bigger joint cost allocation, that must not take away from the manager's good performance.

Choosing a Joint Cost Allocation Method

You want to select a method to plan and budget for joint costs. This section considers the costs and benefits of different joint cost allocation methods.

Choosing a method helps you know where you stand during joint production. You can assess if your actual joint costs are on track with your budget. If you're off track, you can make changes.

Making the case for sales value at splitoff

Allocating joint costs using sales value at splitoff may be the most effective method for planning and budgeting for joint costs. Here are several reasons why:

- ✔ The method relates the benefit of production (revenue of sales value at splitoff) to the related expenses.
- ✔ No information on separable costs is required.
- ✔ The sales value at splitoff may be the best comparison of the products. At that point, you're making an apples-to-apples comparison.

Sale value at splitoff isn't affected by other production or costs after splitoff. A product's sales value after separable costs have been incurred may be very different. If you spend time and money after the splitoff point, you charge a higher price to recover those costs. So it's fair to say that the sales value at splitoff method is simple, compared with the others.

Falling back to other joint costing methods

There's a possibility that sales values aren't available at splitoff. The product's production may not be far enough along to come up with a price. If there's no price, you can't compute sales value. In that case, consider a different method.

The next best method may be the *net realizable value* (NRV) method. In the "Considering joint cost allocation methods" earlier in this chapter, you see how this method uses final sales value (the price tag on the product) less separable costs. The NRV method also does a good job of matching the benefit received (final sales value) with the costs incurred (separable costs). The calculation happens at the end of all production. Contrast that with sales value at splitoff. The difference is a matter of timing.

Making a calculation after production ends has some other benefits. The NRV method accounts for all separable costs, regardless of how much higher or lower they are than your plan. NRV also handles any change to the final sales value (price tag) due to a change in market conditions. NPV captures any changes to costs and sale price that might occur as products are produced separately.

The other methods have their challenges. The constant gross margin percentage method assumes that each department has the same level of profitability. The gross margin percentages and total costs (as a percentage of sales) are the same for everything produced. In the real world, different products produce different levels of profit.

Finally, the physical measure method doesn't relate revenue to expenses at all. You may find that this method is the least useful.



Many manufacturers make a big array of products. Two classic examples are automobiles and computer printers. Each manufacturer in each industry offers many makes and models in order to reach slightly different buyers, usually through different price points. Some products are “high volume/low margin,” while others are “low volume/high margin.” To give you a food analogy, you can make money selling 3,000 \$1 hamburgers per day or 100 \$30 filet mignon dinners per night. Same sales revenue.

Deciding to sell or process further

A *sell or process further* decision is a decision to sell a product “as is” at the splitoff point, or to process it further. There are two criteria you use to justify further processing (and more costs):

- ✓ If the product has a sales value at splitoff, maybe it's better to sell it.
- ✓ If the incremental revenue from further processing is greater than the incremental cost of further processing, maybe it's better to continue processing.

You saw in the preceding section that some products simply don't have a sales value at splitoff. The product's production isn't far enough along for it to be sold yet. No customers (or not enough customers) would consider buying the product at splitoff. Think about selling blue jeans without zippers or belt loops; it's probably not a good idea.

If you can't calculate a sales value at splitoff, there's no “sell or process further” decision to make. To have a viable product to sell, you need to keep processing.

But wait! There are times when a partially completed product at splitoff has value to *someone*. Say you make cabinets. You've run production on two types of products, and you're now at splitoff. Neither type of cabinet is ready to be sold to a customer because you have to complete the sanding and finishing on the wood. You also have to install metal handles.

The product is clearly not ready for a regular customer (likely a retail store that sells to the public). However, another business may ask you for a price quote for the partially completed goods. Maybe another cabinetmaker is having trouble filling a large order. It might be willing to buy your partially finished cabinets. In that scenario, you essentially become an industry supplier.



Keep your thinking cap on! Maybe you can build a business selling unfinished cabinets without hardware to the do-it-yourself (DIY) market. In that case, there *is* sales value at splitoff.

Joint costs are irrelevant for your “sell or process further” decision. Those costs are the same, whether you sell the product at splitoff or process further. In this case, joint costs are sunk or past costs. They’ve already been paid. Slip and slide on over to Chapter 3 for more on past and sunk costs.

Incremental revenue is the additional revenue you get from selling one more unit that has been processed further. *Incremental cost* is the additional cost. If you spend \$5 more per unit, and earn \$7 more from selling that unit, your incremental revenue is \$2 higher than the incremental cost. *Incremental*, in this case, refers to the production from splitoff to a completed product.

Holding a Garage Sale: Making the Most of Byproducts

Byproducts are produced during the joint production of other products (see “Setting the sales value of a byproduct,” earlier in this chapter). The byproduct’s sales value is usually less than that of the “real” products in joint production; however, don’t underestimate the value of a byproduct, because the revenue from byproduct sales may be used to reduce total joint costs.

When you consider byproducts, visualize a garage sale. The money you make from the garage sale isn’t (hopefully) your primary source of income. However, that revenue can be used to cover other costs — maybe the month’s air conditioning bill. (I know people love garage sales. When I ride my bike early on weekends, I have to weave my way around the cars parked at garage sales.)

There are two methods to account for joint costs that include a byproduct:

- ✓ The *production method* recognizes the byproduct in the financial statements when it’s produced. The production method deducts the byproduct revenue from cost of sales at the time of production.
- ✓ The *sales method* delays recognition of the byproduct until it’s sold. The sales method adds the byproduct revenue to the main product revenue. Revenue is slightly higher using the sales method. The net cost of sales, however, is also higher. In fact, the higher revenue is offset by the higher cost of sales.

Gross margin is defined as sales less cost of sales. The total gross margin in dollars is the same using both methods. Using the sales method, the slightly higher revenue is offset by an equally higher increase in cost of sales.

Chapter 16

Tracing Similar Products with Process Costing

In This Chapter

- ▶ Understanding when process costing should be used
 - ▶ Using equivalent units to assign costs
 - ▶ Applying the weighted average method of process costing
 - ▶ Implementing the FIFO method of process costing
 - ▶ Putting standard costs into process costing
-

process costing is a costing methodology that traces costs as they move from one process or stage of manufacture to another. Along the way, you need to track the partially completed units — and the costs they incur. Process costing can be a big challenge, but in this chapter, you see several methods of tracking both the units and the costs.

You use process costing when the products you produce are similar or identical.

Process costing has the same goal as other types of costing in this book: to help you understand what is driving costs. In this chapter, you focus on the value of your inventory and computing cost of sales. You also use that info to generate financial reports, which educate the “outside world” (shareholders, creditors, regulators) about what’s going on in your business.

Good costing helps you manage costs and assess performance. The goal is to cut costs and *improve profitability*, which is the big reason you go through the blood, sweat, and tears of using process costing.

Process Costing: Presenting the Basic Approach

You need to *trace* or *allocate* all of the costs attached to a product so you know the full cost of the product. After you know the full cost, you can compute a reasonable profit level and set a sale price for the product. That's easy to say, but getting it done takes a little work.

To fully price the product, each unit must absorb material, labor, and overhead costs. Because the goods are identical, the costs you eventually assigned to each unit are identical. Note the word used was *eventually*. As this chapter shows you, the process takes time.

Process costing is all about moving costs from one production department to another. Take a peek at Chapter 4. That part of the book discusses the flow of manufacturing costs.

Say you manufacture blue jeans. Denim material goes to the cutting room and is cut from patterns. The cut material then goes to the sewing department. After the blue jeans are sewn, they move to the dyeing department to add color. As the blue jeans move, so do the costs accumulated along the way.

So as you can see in the blue-jeans example, as a product moves through production, it accumulates costs. Now consider *when* the costs are incurred.

Leading off with direct material costs

In most cases, material costs go into production *before* labor and overhead costs. You need material before you can perform most of your work. The employee can't run the sewing machine if there isn't any denim to sew. At any point in production, you'll probably see a higher percentage of material costs incurred, compared with labor and overhead costs.

Material costs are often incurred all at once. Consider the blue jeans. You decide to put all the denim you need into production at once. Because the first production area is the cutting department, all of the material cutting happens as soon as possible. If the denim is brought into production gradually, the cutting department may have to stop and wait for more denim. That would slow up your production, and you're unlikely to do that.



Material costs lead most of the time, but not all of the time. Keep your eyes open for exceptions. For example, auto bodywork is labor-intensive. So's the work of plumbers. Service businesses, of course, sell services.

Following up with conversion costs

Conversion costs are all costs other than material costs. They are costs you incur to “convert” material into a final product. So labor and overhead are conversion costs.

Also, keep in mind that conversion costs are put into production gradually. Maybe your product moves through several stages of production. If you make baseball gloves, for example, you have a department that cuts the leather for the baseball gloves and another department that sews the leather. Because there are workers and machines in each department, you add costs as the product moves through production — gradually.

Sitting on the Factory Floor: Dealing with Work in Process

When you open the door of your factory on the first day of the month, you may see partially completed goods sitting on the factory floor. Those goods are considered *work in process* (WIP). The goods are partially completed, so you’ve incurred some costs, but not all costs.

Your *finished goods inventory* affects process costing. The costing process becomes more complicated when you have inventory. Both WIP inventory and finished goods inventory may have a beginning balance. Each account may also have an ending inventory balance.

A manufacturer doesn’t usually start the month without partially completed products or end the month with all products sold. It can happen, but generally, it’s expected that manufacturing is a continuous process. So most firms always have a work in process balance (costs posted to the account).



This chapter uses the term *percentage completed*, which means work completed and costs incurred.

It’s a given that WIP at different stages has incurred different amounts of costs. Here are scenarios that may be in play:

- ✓ Say your items in April beginning WIP inventory are 10 percent complete. During April, you complete them. This means that you spend the remaining 90 percent of their costs during April. Beginning inventory WIP has a different amount of costs to complete (90 percent to go) than items *started during the period* (100 percent to go), which are 0 percent complete and may or may not be complete when the period ends.

- ✓ If you start and complete an item in April, it accumulates 100 percent of its costs of production during the month, and that's that.
- ✓ When you lock the factory doors at the end of April, any partially completed items are considered ending WIP. There's bound to be WIP, because an efficient manufacturer usually starts making new units as soon as the machines and staff free up. Your April ending inventory is also the *beginning inventory* for May. Say the April ending inventory has incurred 30 percent of its costs. To complete the goods in May, you need to spend another 70 percent in costs.

Using Equivalent Units to Compare Apples to Apples

Products at different stages of production require different amounts of costs to complete them. The *total* product costs are (eventually) the same for each unit because the goods that use process costing are usually homogeneous (or all the same).

The section “Counting the units for equivalent units” shows that you may start a period with WIP, start and complete some product 100 percent during the period, and end a period with WIP. In two out of three scenarios, the work done on the units is spread over *two periods*.

The costing process seems complicated, but it's not. It's just that when you transfer units from one department to another, you're dealing with varying quantities. And units leaving different departments have a different amount of costs incurred to date. This is not a good thing for costing. You need an apples-to-apples comparison.

Enter *equivalent units of production*, a solution! Equivalent units of production is a calculation computed by multiplying each unit in production by its percentage of completion. In that way, all units are comparable, and there's your apples-to-apples comparison.

Counting the units for equivalent units

The first step in calculating equivalent units is to correctly account for the units. When you have the movement of units figured out, you can attach costs to the units. Table 16-1 displays an accounting for units.

Table 16-1 Equivalent Units — Physical Flow of Units (April)

	<i>Units</i>
Work in process, beginning inventory (4/1)	50
Units started during April	100
Units to account for	150
Completed and transferred out during April	120
Work in process, ending inventory (4/30)	30
Units accounted for	150

It's simple. Start with beginning WIP units (50 units). Add units you start during April (100 units). The total (150 units) amounts to the "units to account for."

Now, those units you worked on end up in one of two places. Look at the next two lines in the table. When you finish units, they're transferred out (120 units). They move to finished goods inventory, and are ready to be sold to a customer. Units that aren't yet completed are in ending inventory WIP as of April 30th (30 units). The "units to account for" equal the "units accounted for."

To account for the units correctly, this formula must hold true:

$$\text{Beginning inventory WIP} + \text{units started during the month} = \text{units completed and transferred out} + \text{ending inventory WIP}$$

At this point, it isn't possible to determine which items (beginning inventory WIP or units started during the month) *were completed in April*. You get an answer to that question later.

Hunting down the total costs of production

You need to add costs to complete production on the units. Material costs are generally easy, but a department will add conversion costs. For example, you pay labor costs to an employee, so the worker will operate a sewing machine. That's labor, and there's overhead as well.

The goal is to isolate the costs added during the period. After you do that, separate the cost total between direct material and conversion costs.

You've seen percentage completion several times in this chapter. As a manager, you need to estimate the percentage of work completed on each unit.

Deriving direct material costs

Estimating direct material costs is easier than estimating labor and overhead costs. In fact, it may be an exact figure, because you probably know how much material you moved into production. Say you make men's cotton dress shirts. Your records indicate that you've moved 125 linear yards of cotton fabric into production. You know how much fabric you use in each shirt, and you also know the number of shirts in production.

With that info, you can compute the percentage of completion for units in production. Assume that 100 shirts are in production, but the cotton fabric moved into production will make only 50 shirts. At that point, you're 50 percent complete (50 shirts ÷ 100 shirts) in terms of direct materials.

Figuring out labor and overhead costs

Labor and overhead percentage completion estimates are harder. That's because there is less hard data to grab and analyze. Also, the labor estimate typically drives the overhead allocation.

You can estimate labor completion based on the percentage of total tasks complete. If you're making blue jeans, you have production departments to dye, cut cloth, sew, finish, and package. You can judge your percentage completion by adding your estimates for each department in the production process. If dyeing is 10 percent and cutting is 20 percent, the product is 30 percent complete when it arrives in the sewing department. If work in the sewing department is 40 percent of the process, the product is 70 percent complete before it goes to finishing.

A level of activity usually drives overhead allocations. (Jump over to Chapters 4 and 5 for more info.) Those levels of activity are usually based on labor hours or machine hours. If sewing the jeans amounts to 40 percent of the labor, you can usually use the same percentage for overhead costs.



Estimating by percentage completion requires your experience, as well as math. It's both an art and a science.

Putting units and costs together

After you count the physical units and figuring a method of costing them, put them together. You use equivalent units to assign real dollar costs to products.

Laying out physical units and total costs

Say you're a candy manufacturer. You make inexpensive pieces of candy that sell for 20 cents each. So a piece of candy is your product unit. Table 16-2 displays the movement of physical units for a period.

Table 16-2 Candy — Physical Flow of Units (September)

	<i>Units</i>
Work in process, beginning inventory (9/1)	400,000
Units started during September	800,000
Units to account for	1,200,000
Completed and transferred out during September	600,000
Work in process, ending inventory (9/30)	600,000
Units accounted for	1,200,000

The formula is

$$\text{Beginning inventory WIP} + \text{units started during the month} = \text{units completed and transferred out} + \text{ending inventory WIP}$$

The total units to account for agrees with the total units accounted for. (And it's a good thing all the WIP candy went out the door, because candy doesn't improve with age.)



If the formula for units to account for doesn't balance, stop your analysis and find the error. Otherwise, there's no point in attaching dollar amounts to the units.

Here are the costs of making candy for the period:

$$\text{Total costs} = \text{cost of beginning inventory} + \text{costs added during the period}$$

$$\text{Total costs} = \$48,000 + \$53,800$$

$$\text{Total costs} = \$101,800$$

Computing equivalent units

Equivalent units are the units in production multiplied by the percentage of those units that are complete (100 percent) or those that are in process. That covers everything.



If a unit is completed and transferred out, *it's 100 percent complete*. Now, that may seem obvious, but it's a point that gets lost when accountants start this analysis. Your approach to complex analysis should be to account for the easy stuff first. The completed and transferred out units are easier to address than work in process.

Say you've mixed enough sugar to make 600,000 units. Assume that ending work in process is 25 percent complete for all components of production (material, labor, and overhead). Table 16-3 shows the computation of equivalent units.

	<i>Units</i>	<i>Complete</i>	<i>Equivalent Units</i>
Completed and transferred	600,000	100 percent	600,000
Work in process, ending	600,000	25 percent	150,000
Equivalent units			750,000

Although 25 percent of the units are unfinished, in “equivalent unit talk” you can treat them as 150,000 *completed* units. Add them to the really completed units to get 750,000 units, which represents the number of *equivalent whole units* you have produced. It's a lot easier to talk about a whole unit than some whole units and some partially completed units.

The next step is to compute the *cost per equivalent unit*. Take the total costs of \$101,800, and divide by the number of units. Remember that the total costs are the sum of the beginning inventory cost (\$48,000) and the costs added during production (\$53,800):

$$\text{Cost per equivalent unit} = \text{total costs} \div \text{number of units}$$

$$\text{Cost per equivalent unit} = \$101,800 \div 750,000$$

$$\text{Cost per equivalent unit} = \$0.1357$$

The calculation goes to four decimal places, because when you're making candy that sells for 20 cents per unit, and you're producing hundreds of thousands of units, every tiny fraction of a dollar counts.

Now assign the cost per equivalent unit to the completed work and the WIP. Table 16-4 shows the calculation (costs are rounded).

You've assigned costs to both completed work and WIP. Congratulations! Maybe you should eat a pound or two of candy to celebrate.

	<i>Units</i>	<i>Cost/Unit</i>	<i>Cost Assigned</i>
Completed and transferred	600,000	\$0.1357	\$81,440
Work in process, ending	150,000	\$0.1357	\$20,360
Equivalent units			\$101,800

Seeing different percentages of completion

Material costs typically enter the production process before conversion costs. Flip back to “Following up with conversion costs” for more. You usually need to have material before you pay people to make a product with it. So material costs accumulate sooner and faster than conversion costs.

Different conversion costs occur at different points in production, and the percentage completion changes, too. This section walks through an example with different percentage of completion amounts for material and conversion costs.

Say your company makes high-end men’s dress shoes. Your cost analysis runs through the same steps to compute equivalent units that you saw earlier. See the section “Computing equivalent units.” However, there are a few extra twists that complicate the process.

Let’s get physical: Physical units

First, you track down your units; then you account for the physical flow of units. After that, you can apply costs to each unit. Finally, you move on to computing equivalent units.

Table 16-5 displays the physical flow of units.

	<i>Units</i>
Work in process, beginning inventory (11/1)	0
Units started during November	600
Units to account for	600
Completed and transferred out during November	400
Work in process, ending inventory (11/30)	200
Units accounted for	600

The total inputs (units to account for) must equal the outputs (units accounted for), and they do. Good! Next, calculate equivalent units.

Going over equivalent units

Table 16-6 calculates equivalent units. There's something new here: The table separates percentage completion for material and percentage completion for conversion costs. Why? Because materials are all added at the beginning of the process and are 100 percent complete right away. Conversion costs, however, are added gradually and are not entirely finished at the end of the period.

Table 16-6 Shoe Company — Equivalent Units of Production

	<i>Physical Units</i>	<i>Equivalent Units</i>	
		Material	Conversion
Percent completed in WIP		100 percent	60 percent
Units completed and transferred out	400	400	400
WIP, ending	200	200	120
Equivalent total		600	520

It's no surprise that material percentage completion is higher than the conversion figure. Equivalent units are computed by multiplying physical units by percentages for *both material and conversion*. The total equivalent units is the sum of both calculations. Note that the physical units still can't be transferred out until all of the material *and* conversion costs are 100 percent complete.



No equivalent unit calculation will ever produce a number higher than the number of physical units. That's because you never multiply the physical units by a number greater than 100 percent. Keep this in mind, because it's a way to check your work as you go.

Putting in costs

The costs you incur are separated into material costs and conversion costs. In the shoe example, there's no beginning work in process. All of the costs are started during the period. Here are the costs:

Costs added during the period = material costs + conversion costs

Costs added during the period = \$30,000 + \$20,000

Costs added during the period = \$50,000

You divide costs by equivalent units to compute cost per equivalent unit. This time, however, you compute two costs (material and conversion) per equivalent unit. To allocate the two types of costs (material and conversion), you need two cost rates. Table 16-7 displays the details.

	<i>Material</i>	<i>Conversion</i>
Costs added during the period (A)	\$30,000	\$20,000
Equivalent units (B)	600	520
Cost equivalent units (A ÷ B)	\$50.00	\$38.46

The two cost rates are \$50.00 per equivalent unit for material and \$38.46 per equivalent unit for conversion. In other words, a completed single unit would cost \$88.46 (\$50 for material and \$38.46 for conversion cost). Now, that's a completed *whole* unit, one that has incurred all the necessary costs to be complete.

You wrap up cost for equivalent units by allocating costs to completed goods and ending WIP. You multiply the equivalent units (Table 16-6) by cost per equivalent units (Table 16-7).

This process is a bit complicated, because you've separated material and conversion costs. Look at Table 16-8.

<i>Material Costs</i>	<i>Units</i>	<i>Cost/Unit</i>	<i>Cost Assigned</i>
Completed and transferred out	400	\$50/unit	\$20,000
Work in process, ending	200	\$50/unit	\$10,000
Conversion costs			
Completed and transferred out	400	\$38.46/unit	\$15,385
Work in process, ending	120	\$38.46/unit	\$4,615
Total costs assigned			\$50,000

The total costs assigned (\$50,000) agree with the “costs added during the period” calculation at the start of this section. That's good!

Using the Weighted Average Method for Process Costing

You've seen two issues that make process costing complex. One issue is dealing with beginning and ending work in process (WIP). The other issue is dealing with different percentage completion rates for material and conversion costs.

The *weighted average method* includes both of these variables. Yikes! Don't worry; you'll get through it. In fact, going over this method reinforces your understand of the prior concepts in this chapter.

In accounting, taking a weighted average is thought to be an easier method than other choices. You add up all of the cost, divide by a number (like inventory units), and that's your weighted average. You use that rate to apply costs to everything.

Consider inventory valuation. For inventory, weighted average method is easier than the first-in-first-out (FIFO) method or the last-in-last-out (LIFO) method. Jump over to Chapter 9 for more on inventory methods. The same is true with process costing — the weighted average method is easier.

The *weighted average method for process costing* calculates equivalent unit costs for *all work done to date*. Work done to date means all work performed (and costs incurred) so far on the units, regardless of when the work occurred.

So here's a practical example. Assume you have units in production. Material costs for the units were incurred in October and November. The weighted average method includes the work and costs from *both months*.

October and November costs are included in the calculation of equivalent units. Here's the cost per equivalent unit for the weighted average method:

$$\text{Cost per equivalent unit} = \frac{\text{total costs for all work done to date}}{\text{total equivalent units}}$$


Material costs generally go into production before conversion costs. The percentage completion for material is almost always higher than the percentage completion for conversion costs. It might remain the same, but it won't go lower. That holds true whether you're looking at beginning WIP or ending WIP.

Handling beginning work in process

Work done to date is the beginning work in process. This month's beginning WIP is *last month's ending work in process*.

Say you make men's bow ties. (If I knew how to tie a bow tie well, I'd wear one. But because I don't, I wear standard ties.) You've decided to use the weighted average method to compute costs for process costing in February.

To start the analysis, you need to review ending work in process from January. That data is listed in Table 16-9.

	<i>Material</i>	<i>(100% Complete) Conversion (60% Complete)</i>
Equivalent units (A)	100	60
Cost per equivalent unit (B)	\$60	\$45
Total cost assigned	\$6,000	\$2,700

You have all the data you need for your beginning work in process for February. The flow of physical units (see Table 16-10) uses the *actual* units for February beginning WIP (100 units). I'm just pointing out again that *actual units* may be different from *equivalent units*. The January ending WIP costs are included in the total cost calculation for February.

Continuing with equivalent units

The next step is to figure the physical flow of units for February. See Table 16-10.

Table 16-10 Tie Company — Physical Flow of Units (February)

	<i>Units</i>
Work in process, beginning inventory (2/1)	100
Units started during February	600
Units to account for	700
Completed and transferred out during February	400
Work in process, ending inventory (2/28)	300
Units accounted for	700

Beginning WIP units (100) comes from Table 16-9. That's where you see the ending WIP from January, the previous month. Now calculate equivalent units of production. Take a look at Table 16-11.

Table 16-11 Tie Company — Equivalent Units of Production

	<i>Physical Units</i>	<i>Equivalent Units</i>	<i>Equivalent Units</i>
	Material		Conversion
Percent complete in ending WIP		100	60
Completed and transferred out	400	400	400
WIP, ending	300	300	180
Equivalent units total		700	580

The percentage of completion numbers are for completed goods and ending work in process. *You've already addressed beginning work in process.* Table 16-9 used the data from January's ending WIP. That data included equivalent units — which uses January percentage completion data. When you use the prior month (January) data for beginning work in process (February), you don't need anything more.

Also note that Table 16-9 (January's ending WIP) and Table 16-11 (February's ending WIP) use the same percentage completion amounts. Each table uses 100 percent completion for material and 60 percent completion for conversion costs. The percentage completion amounts may be different for each month.

You're making progress! Now that you've calculated total equivalent units, you assign costs. Your cost amounts come from two sources: beginning work in process and costs added during the month. The costing process is similar to Table 16-7, with one extra step. Look at Table 16-12.

	<i>Material</i>	<i>Conversion</i>
Beginning work in process costs	\$6,000	\$2,700
Costs added during the period	\$30,000	\$20,000
Total costs incurred for units (A)	\$36,000	\$22,700
Total costs — material, conversion		\$58,700
Equivalent units (B)	700	580
Cost equivalent units (A ÷ B)	\$51.43	\$39.14

The beginning work in process costs (\$6,000 and \$2,700) come from Table 16-9. Costs added during the period are new, of course. Those are your costs for February (\$30,000 and \$20,000). Cost equivalent units (700 and 580) come from Table 16-11. Now you calculate the dollar amount of costs to assign to each unit (\$51.43 and \$39.14). Hang in there, because there's only one more step! Put it all together, as shown in Table 16-13.

<i>Material Costs</i>	<i>Units</i>	<i>Cost/Unit</i>	<i>Cost Assigned</i>
Completed and transferred	400	\$51.43/unit	\$20,571
Work in process, ending	300	\$51.43/unit	\$15,429
Conversion costs			
Completed and transferred	400	\$39.14/unit	\$15,655
Work in process, ending	180	\$39.14/unit	\$7,045
Total costs assigned			\$58,700

The total cost assigned agrees with the total cost for materials and conversion in Table 16-12, and that's what you need to see. You did it! You've assigned costs using the weighted average method for process costing.

Introducing the First In, First Out Method of Process Costing

FIFO, FIFO, it's off to work we go. The first in, first out method of process costing treats beginning and ending inventory costs differently. The term *first in, first out* is used with inventory (see Chapter 9). For inventory, FIFO means that you sell the oldest units of inventory first. Your cost of goods sold starts with the oldest units sold and then adds newer units sold.

Here's the process for the first in, first out method of process costing:

1. **Determine the physical movement of units** (units to account for and total units accounted for).
2. **Divide the completed and transferred units into two groups.** The first group is all the units that were completed, which came from beginning WIP units. All the remaining units are considered started and completed during the period.
3. **Compute ending work in process.** Treat ending WIP the same way you've seen previously. It's what's left on the factory floor after most units are completed and transferred out.
4. **Calculate total equivalent units.** Add completed and transferred equivalent units to ending WIP equivalent units.
5. **Assign costs.** Assigning costs uses the same process you've seen before. Divide the current period costs by the equivalent units to compute cost per equivalent unit. Multiply each cost per equivalent unit by the applicable number of equivalent units.

As usual, and as always, start by calculating the physical flow of units. Table 16-14 shows the physical flow of units, using February as the month analyzed.

Table 16-14 FIFO Method — Physical Flow of Units (February)

	<i>Units</i>
Work in process, beginning inventory (2/1)	100
Units started during February	600
Units to account for	700
Completed and transferred out during February	

	<i>Units</i>
From beginning work in process	100
Started and completed in February	300
Total completed and transferred out	400
Work in process, ending inventory (2/28)	300
Units accounted for	700

Notice that completed and transferred items are split into two categories. Of the 400 completed items, 100 units are “from beginning work in process.” The 100 units in beginning WIP are considered to be *completed first*. After that, the remaining 300 completed items are started during the month.

That’s why this is called the FIFO method. Beginning WIP items are considered to be completed first. First-in units are the first units out. No, nobody’s going to go to the factory floor and tag each unit to track its age. It’s theoretical, and it works.



Imagine you open your factory doors at the beginning of the month. You note that 100 units are partially completed (beginning WIP). If you’re cranking up production for the month, you probably complete those WIP items first. That’s the fastest way to get more finished goods. Instead of starting an item from zero, finish up those that are partially completed.

Scan down Table 16-15. The completion percentages for beginning WIP (0 percent material and 40 percent conversion) are percentages completed in the current month (February). Again, percentage completed really means work completed and costs incurred. For example, if 80 percent of the material was added in January, you add 20 percent in February (the current month).

Table 16-15 FIFO Method — Equivalent Units of Production

	<i>Physical Units</i>	<i>Equivalent Units</i>	
		Material	Conversion
Completed			
From beginning WIP		0 percent	40 percent
	100	0	40
Started in period		100 percent	100 percent
	300	300	300
Total completed (A)	400	300	340
WIP, ending (B)		100 percent	60 percent
	300	300	180
Total (A – B)		600	520

The units completed and transferred out are allocated between beginning WIP (100 units) and units started in the period (300). The 300 units started and completed in the period are 100 percent complete for material and conversion costs.

Total equivalent units are the completed units plus ending WIP. Material costs amount to 600 equivalent units; conversion costs amount to 520 equivalent units.

Finish the FIFO method of cost assignment by computing all of your costs. Those costs are divided by equivalent units to get cost per equivalent unit. Then you end by multiplying the equivalent units by cost per equivalent unit. The result is your cost allocation. (I'd put the calculations here, but you've seen them before.)

Comparing Processing Costing Methods

You've plowed through some very complex examples of process costing. Some methods calculate separate percentages of completion for material and conversion costs; others don't.

If your process costing includes work in process (beginning or ending), your cost allocations will change. This section considers how your process costing method affects your profit.

Mulling over weighted average and FIFO methods

The weighted average method will very likely result in different cost allocations than the FIFO. The best way to digest the differences is to consider how weighted average and FIFO differ when you value *inventory*, as opposed to manufacturing process costs.

Kicking around inventory costing methods

In Chapter 9, you see the impact of a selected inventory costing method on profit. You use a few assumptions and two inventory methods:

- ✓ Assume the prices rise over time.
- ✓ Say you don't have any beginning inventory, but you make two purchases of 100 units each to stock up.

- ✔ You paid \$6 per unit for the first purchase on the first of the month, and \$8 per unit for the second purchase on the 15th.
- ✔ You sell 50 units on the 25th. You need an inventory costing method to compute cost of sales (for 50 units) and ending inventory (for 150 units).

The *weighted average method* price is \$7 per unit ($(\$6 + \$8) \div 2$). You sell 50 units. Your cost of sales is \$350 ($\7×50 units). What remains in ending inventory is 150 units with an average cost of \$7. Your ending inventory value is \$1,050.

The FIFO method assumes that the oldest units are sold first. You sell 50 units with a cost of sales of \$6 per unit. Your cost of sales is \$300 ($\6×50 units). Ending inventory is 150 units. In this case, you have 50 units that remain at \$6 per unit and the additional 100 units purchased on the 15th at \$8. Your ending inventory using FIFO is \$1,100 ($\$300 + \800).

And that's how inventory valuation methods affect the cost of goods sold.

There's a reason why an inventory cost of goods sold (COGS) calculation appears here. The cost behavior in this example is the same behavior you see with the weighted average and FIFO process costing methods. Here's what you'll notice:

- ✔ **FIFO sells cheaper units:** Prices generally increase over time (due to inflation), but FIFO sells the cheapest units first. That's because the cheapest units are the *oldest units*. By contrast, a weighted average cost will be an average. The average will be a combination of the cost of older and newer items.
- ✔ **Cost of sales and ending inventory:** Selling the older FIFO items first will generate a lower cost of sales in earlier periods than weighted average. Because the newer, more expensive inventory items remain in FIFO inventory, FIFO's ending inventory will be more expensive.
- ✔ **FIFO profit:** The FIFO method creates a lower cost of sales than weighted average. As a result, FIFO profit must be higher than weighted average profit.
- ✔ **Profit in future years:** Over time, the newer, more expensive FIFO inventory is sold. It follows that FIFO's cost of sales *in the future* is higher, and profits are lower. Because weighted average uses the same unit cost throughout, the weighted average profit calculation will be the roughly the same each year. (Don't worry. In real life, whether you're stocking inventory for a store or buying material for manufacturing, future purchases are likely to be even higher than your current numbers.)

✔ **Total profit on all units:** When all units (200, in this example) are sold, the total profit and total cost of sales *are the same* over time, regardless of which method you choose. This can affect your profit and therefore your pricing: If you use the FIFO method, remember that higher costs are coming down the road. Eventually, you have to sell the more expensive inventory items.

These concepts are the same whether you're analyzing inventory methods or process costing methods.

Checking on standard costs and process costing

Standard costing can be used with process costing, just as it is with other costing methods. *Standard costs* are budgeted or planned costs that are estimated at the beginning of the year. You compare standard costs to actual costs and compute a *variance* (which occurs when actual results differ from your plan). Take a peek at Chapter 7 for an amazingly clear discussion of variances.

Until now, this chapter has discussed actual costs. You compiled those actual costs, divided them by equivalent units, and computed cost per equivalent unit. But wait! There's more! It's a good bet that you used your cost accounting skills to come up with some very good standard costs. You have some budgeted amounts in mind for material and conversion costs.

Seeing a variance is pretty straightforward. Backpedal to Table 16-7. There, you use actual costs added during the period to calculate a cost per equivalent unit. You could replace those total actual costs (\$50,000) with your standard cost total.

After you plug in your standard cost total, you can calculate a standard cost per equivalent unit. You know by now that you multiply cost per equivalent unit by the number of equivalent units. Those physical units *don't change*. The same units move in and out, regardless of what costs you apply to the units.

If you have a difference between your standard costs and actual costs, you have a variance. You can investigate the variance in order to make better decisions to reduce your costs. And that's the name of that tune.

Debating transferred-in costs

Transferred-in costs are costs transferred from one department to another. That should make sense, because most businesses need more than one department to complete a product. As the product moves through each department, the costs incurred to date move along with each unit. Each department treats an incoming cost as a cost incurred at the beginning of the period.

If you use standard costing to transfer costs between departments, the accounting is easier. Your costs won't be a moving target. You plan your standard costs in planning meetings, and they remain the same throughout the year. You accumulate standard costs in department A, and those costs move through department B with the units that are partially complete.

On the other hand, using weighted average or FIFO costing may make the accounting more complex. (May? It will!) As you've seen, those two methods require you to track different percentage completion amounts, and different units in beginning and ending WIP. The goal is for you to find a process costing method you can live with — and stick to it.



Financial statements that are generated for the “outside world” have a set of rules. One rule is that if you change an accounting method, you must disclose the financial impact of that change. It's a heads-up to the statement reader. So if you change a process costing method (for example, changing from the weighted average method to the FIFO method) that affects the cost of sales in your income statement, you need to declare it.

