Chapter 10

Using Budgets for Planning and Coordination

After completing this chapter, you will be able to:

1. Explain the role of budgets and budgeting in organizations.
2. Demonstrate the importance of each element of the budgeting process.
3. Explain the different types of operating budgets and financial budgets and the relationships among them.
4. Describe the way organizations use and interpret budgets.
5. Develop and use what-if and sensitivity analyses—budgeting tools used by budget planners.
6. Compute and interpret common variances used by managers.
7. Identify the role of budgets in service organizations and not-for-profit organizations.
8. Understand the criticisms leveled against traditional budgeting and the "beyond budgeting" approach.

California Governor Prepares "Terrible Cuts" to Close Budget Deficit

Determining California's state budget seems to be harder every year. In August, 2010 the headlines reported that California Governor Arnold Schwarzenegger will seek "terrible cuts" to eliminate an $18.6 billion budget deficit facing the U.S. state through June 2011.

Schwarzenegger, who introduced his revised budget plans on May 14, said that he will not seek tax increases to bolster California's finances. The main problem was the shortfall in income tax revenue, which was $3.6 billion, or 26 percent less than expected.

Schwarzenegger's newest plan will revise proposals introduced earlier in the year to account for the tax-collection shortages. In January, the governor stated that California may have to eliminate entire welfare programs, including the main one that provides cash and job assistance to families

below the poverty line. Legislation adopted during the emergency session ordered by Schwarzenegger did reduce the $1.4 billion from the deficit.

In September 2010, Democrats introduced a series of bills to raise as much as $2.9 billion annually by imposing a 10% severance tax on oil production in the state. This would repeal the corporate-tax breaks approved last year to encourage job growth. During 2009–2010, the governor and lawmakers have had difficulty redrawing the budget fast enough to make up for revenue lost amid rising unemployment.

The financial strains have left California with the lowest credit rating among U.S. states.

The State Capitol building in Sacramento has been the site of one of the most contentious budgeting processes in California in recent years.

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Determining the Levels of Capacity-Related and Flexible Resources

Thus far in this book, we have focused on how costs are created by short- and long-term decisions. We called costs that varied with the activity level in the firm *variable costs*; costs that did not change with changes in activity levels we called *fixed*, or *capacity-related*, *costs*. For decisions affecting the short term, the firm's fixed costs are considered to be given and fixed. So the costs that are relevant to the firm in the short run, since they are the only ones that are controllable, are variable costs.

In this chapter, we discuss the **budgeting process**, which determines the planned level of most variable costs. Chapter 5 illustrates forecasting and planning for intermediate-term capacity resources in conjunction with activity-based costing (ABC). Specifically, in the Madison Dairy ice cream plant example, the firm's controller used a

time-driven ABC model to understand how different products used the factory's resources in different quantities. This led to insights about possibilities for process improvements and repricing in order to generate higher sales and profit. The ABC model enabled the controller to accurately forecast the personnel and equipment resources needed to handle the planned increase in sales and production. Budgeting also includes discretionary spending, such as for machine maintenance, research and development, advertising, and employee training. These discretionary costs do not supply the firm with capacity to produce, but they do provide support for the organization's strategy by enhancing its performance potential. For example, systematic maintenance increases machine reliability and lowers the lifetime costs of equipment, successful research and development increases the organization's future profit potential by developing new products, advertising increases profit potential by making products more attractive to customers, and employee training enhances employees' ability to undertake their assigned roles as expected. Once authorized, discretionary spending **budgets** are committed or fixed—that is, they do not vary with levels of production or service.

The Budgeting Process

The Role of Budgets and Budgeting

Most families have developed a financial plan to guide them in allocating their resources over a planning period. Usually the plan reflects spending priorities and demands, including specific spending categories such as the mortgage, utilities, property taxes, and essential items such as food and clothing. Family budgets often are the result of negotiations among parents, children, and others such as relatives and creditors reflecting their different priorities and objectives. For example, money left over after required spending on food, clothing, medicine, insurance, and shelter may go into savings or be used for other purposes; one parent may want to use most of the disposable income for a vacation, while another may want to use the money to paint the house. Within the same household, teenagers may ask their parents for help in

The budgeting process involves a great deal of input and negotiation with many people in an organization.

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financing the purchase of a used car. The family budget is a planning tool, but it also serves as a control on the behavior of family members by setting limits on what can be spent in each budget category. Without a budget, the family would not have a way to monitor and control its spending by categories of spending. Without such monitoring and control, a family can easily succumb to unexpected debt and severe financial difficulties.

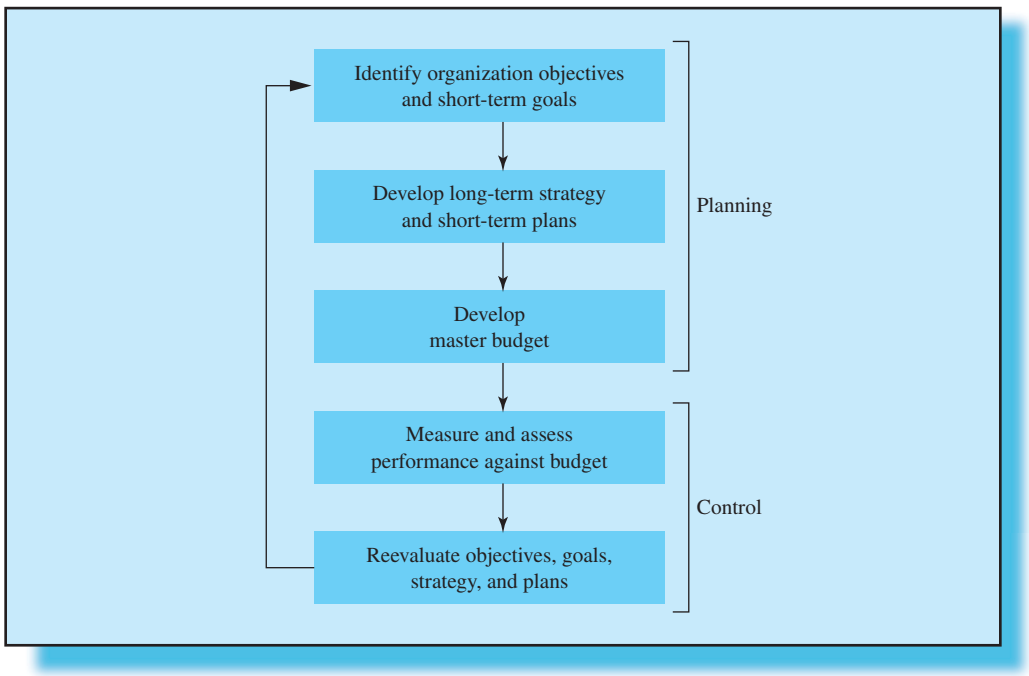
Budgets serve the same purpose for managers within the business units of an organization and are a central part of the design and operation of management accounting systems. Exhibit 10-1 shows the central role budgets play and the relationship between planning and control. Note the distinct but linked steps for each function—three for planning and two for control.

As in households, budgets in organizations reflect in quantitative terms how to allocate financial resources to each part of an organization—each department or division or other distinct part—based on planned activities and short-run objectives of that part of the organization. For example, a bank manager may want to increase the bank's local market share, which may require a larger spending budget than the previous year's for local advertising, implementing a staff training program to improve customer service, and renovating the building to make it more appealing to customers.

Keep in mind always: A budget is a quantitative expression of the planned money inflows and outflows that reveals whether the current operating or business plan will meet the organization's financial objectives. Budgeting is the process of preparing budgets.

Budgets also provide a way to communicate the organization's short-term goals to its employees. Asking organization unit managers to undertake budgeting activities can accomplish two things: (1) reflect how well unit managers understand the organization's goals, so that they can align their activities and spending priorities with those goals, and (2) provide an opportunity for the organization's senior planners to correct misperceptions about the organization's goals. Suppose an organization recognized quality as a critical factor for its success and wanted to promote

Exhibit 10-1
Planning and Control and the Role of Budgets



quality awareness among its employees. If a department prepared a budget that reflected no expenditures for employee quality training, a senior planner would recognize that the organization's goal with respect to quality had not been communicated properly to the person who should have recognized the need for quality training.

Budgeting also serves to coordinate the many activities of an organization. For example, budgets show the effect of sales levels on purchasing, production, and administrative activities and on the number of employees that must be hired to serve customers. In this sense, budgeting is a tool that promotes coordination of the organization's activities and helps identify coordination problems. Suppose the sales force plans to significantly expand sales. By comparing selling plans with manufacturing capacity, planners might discover that the manufacturing operations are unable to meet the planned increased level of sales. The kind of coordination needed can be accomplished through powerful desktop computers and software; with the computer and software, planners can simulate the effect of different decisions on the organization's financial, human, and physical resources. Simulation analysis—which is, simply, what-if analysis—helps managers choose a course of action among many alternatives by identifying a decision's consequences in a complex system with many interdependencies.

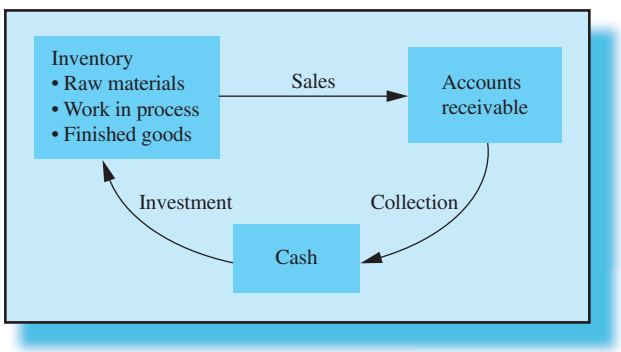
By considering the interrelationships among operating activities, a budget helps to anticipate potential problems and can serve as a tool to help provide solutions to these problems. For example, canneries engage in seasonal production, consuming large amounts of cash when they build inventory during the canning season. Throughout the year, the cannery sells its inventory and recovers cash. Budgeting reflects this cash cycle, shown in Exhibit 10-2, and provides information to help the organization plan the borrowing needed to finance the inventory buildup early in the cash cycle. If budget planning suggests that the organization's sales potential exceeds its manufacturing potential, the organization can develop a plan to put more capacity in place or to reduce planned sales. It is important for managers to anticipate problems because putting new capacity in place can take several months to several years.

The Elements of Budgeting

Budgeting involves forecasting the demand for four types of resources over different time periods:

1. *Flexible resources that create variable costs*—Flexible resources are those that can be acquired or disposed of in the short term, such as the lumber, glue, and varnish used in a furniture factory or, based on estimates of the number of automobiles to be assembled, the number of tires an automobile assembly plant needs to acquire.

Exhibit 10-2
The Cash Cycle



2. *Intermediate-term capacity resources that create fixed costs*—An example is forecasting the need for rental storage space that might be contracted on a quarterly, semiannual, or annual basis.
3. *Resources that, in the intermediate run and long run, enhance the potential of the organization's strategy*—These are discretionary expenditures, which include research and development, employee training, the maintenance of capacity resources, advertising, and promotion. These discretionary expenditures do not provide capacity, nor do they vary with the level of organizational activity.
4. *Long-term capacity resources that create fixed costs*—An example is a new fabrication facility for a computer chip manufacturer, which might take several years to plan and build and might be used for 10 years.

The framework for budgeting in organizations is discussed in the following sections. The discussion begins with the budgeting process and leads to formulation of the master budget. Two major types of budgets make up the master budget:

1. **Operating budgets** summarize the level of activities such as sales, purchasing, and production.
2. **Financial budgets**, such as balance sheets, income statements, and cash flow statements, identify the expected financial consequences of the activities summarized in the operating budgets.

Behavioral Considerations in Budgeting

As we discussed in Chapter 9, it is important to understand the behavioral issues that arise from the participants in the budget-setting process and the kinds of games that people engaged in the budgeting process sometimes play with budgets.

Game playing with budgets is inherent in the budgeting process. Budget planners solicit information from managers or employees who are in the best position to know performance potential—such as sales, production potential, and costs. This information is then incorporated into the budget that is later used to evaluate actual performance. This creates the incentive for managers to misrepresent their information—a process known as gaming the budgeting process.

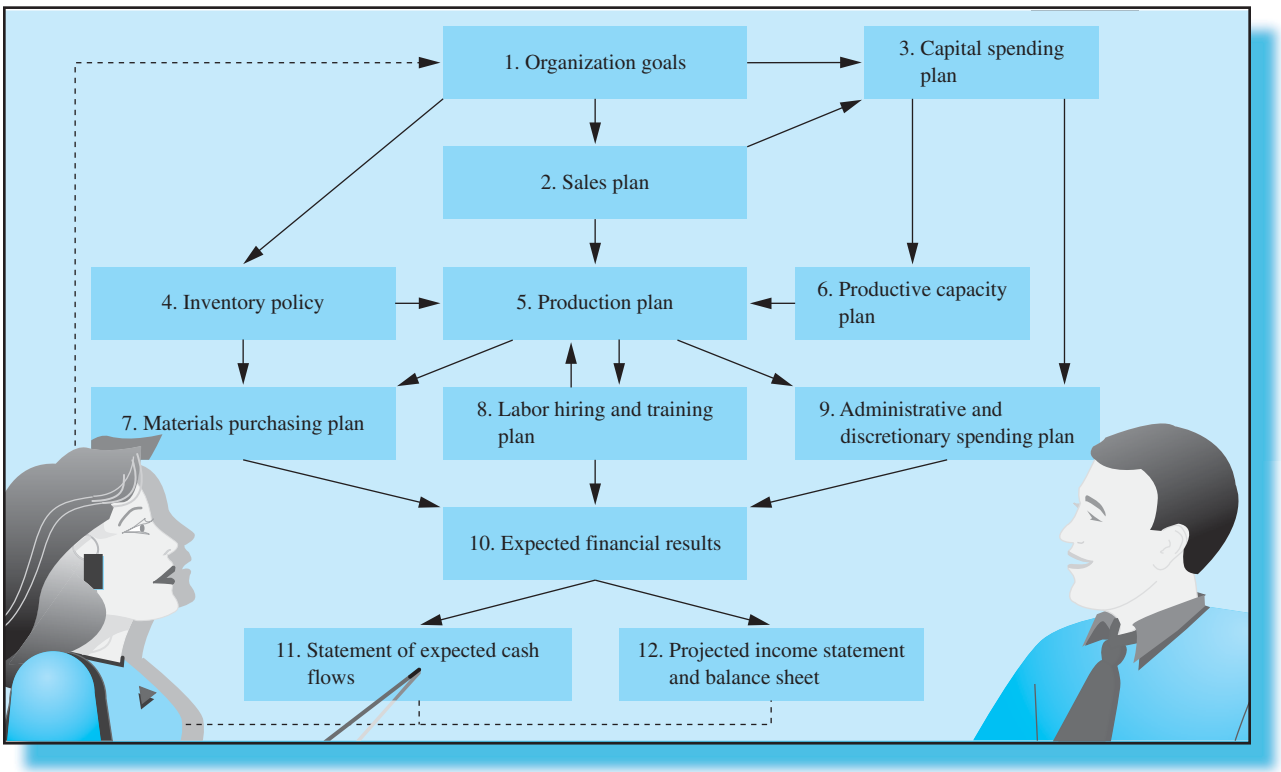
For example, a production machine operator might understate the machine's production potential in order to secure a lower budget or standard for output, thus making after-the-fact evaluations of actual performance to budget look favorable. A sales manager might understate the sales potential in a region in order to have a lower target set for sales.

To avoid this potential for managers to misrepresent their information, many students of budgeting have proposed that the information that managers provide not be used later to evaluate their performance.

Budget Components

Exhibit 10-3 summarizes different components of the budget. The dashed lines from the expected financial results (boxes 11 and 12) show how the estimated financial consequences from the organization's tentative budgets can influence the organization's plans and objectives. The dashed lines illustrate a recursive process in which planners compare projected financial results with the organization's financial goals. If initial budgets prove infeasible (because the organization does not have the capacity to produce or sell the planned level of output) or financially unacceptable (because the

Exhibit 10-3
The Master Budget



proposal plan does not yield the desired target level of profits), planners repeat the budgeting cycle with a new set of decisions until the results are both feasible and financially acceptable.

The budgeting process describes the acquisition, production, selling, and logistical activities performed during the budget period. Planners can select any budget period, but they usually choose one year to conform to the organization's external reporting cycle. A one-year budget period is assumed in the following discussion.

The master budget process in Exhibit 10-3 includes two broad sets of outputs: (1) the plans or operating budgets that operating personnel use to guide operations (sales plan [box 2], capital spending plan [box 3], production plan [box 5], productive capacity plan [box 6], materials purchasing plan [box 7], labor hiring and training plan [box 8], and the administrative and discretionary spending plan [box 9]), and (2) the expected or projected financial results [boxes 11 and 12]. Planners usually present the expected, or projected, financial results, in three forms:

1. A statement of expected cash flows.
2. The projected balance sheet.
3. The projected income statement.

Managers call the projected statement of cash flows, balance sheet, and projected income statement **pro forma financial statements** (*pro forma* means provided in advance).

Operating Budgets

Operating budgets typically consist of the following six operating plans (see Exhibit 10-3):

1. The sales plan (box 2) identifies the planned level of sales for each product.
2. The capital spending plan (box 3) specifies the long-term capital investments, such as buildings and equipment, that must be made to meet activity level objectives.
3. The production plan (box 5) schedules required production.
4. The materials purchasing plan (box 7) schedules required purchasing activities.
5. The labor hiring and training plan (box 8) specifies the number of people the organization must hire or release to achieve its activity level objectives and, based on those numbers, the needed hiring, training, and counseling out policies requirements.
6. The administrative and discretionary spending plan (box 9) includes administration, staffing, research and development, and advertising.

Operating budgets specify the expected resource requirements of selling, capital spending, manufacturing, purchasing, labor management, and administrative activities during the budget period. Operations personnel use those plans represented in the operating budget to guide and coordinate the level of various activities during the budget period. At the same time, operations personnel record data from current operations that can be used to develop future budgets.

Financial Budgets

Planners prepare the projected balance sheet and projected income statement to estimate the financial consequences of investment, production, and sales plans.

Planners use the statement of projected cash flows in two ways:

1. To plan when excess cash will be generated so that it can be used to make short-term investments rather than simply holding cash during the short term.
2. To plan how to meet any cash shortages.

The Budgeting Process Illustrated

The budgeting process can be frustrating and time consuming. Some organizations invest thousands of hours over many months to prepare the budget documents just described. We will illustrate an entire budgeting process with a simplified yet comprehensive exercise that covers many of the budgeting elements that we have just described.

Oxford Tole Art, Buoy Division

Oxford Tole Art sells high-quality wood and metal objects, new and antique, painted by the owner, Gael Foster. Until recently, each object was unique and Gael did all of the work herself. Two years ago, Gael developed a new product line that she intended to sell in larger volumes because she wanted to expand her business. The new products are two models of painted fishing buoys: Santa, a buoy painted to look like Father Christmas, and Danny Buoy, a buoy painted to look like an Irish fisherman. Gael set up a new operation for this new product: Oxford Tole Art, Buoy Division (hereafter called Oxford Tole Art). Gael did the planning for this operation and hired a manager, April Cheung, to handle the daily operations of the new business.

The production process begins when Gael purchases used fishing buoys from local fishers for $2.25 each. An artist sands the used buoys to remove old paint and

Buoys serve many functions, but the ones shown above serve as markers in maritime channels to indicate where hazardous or administrative areas exist. They allow boats and ships to navigate safely.

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debris and applies a base coat of primer paint. When the base coat is dry, the artist hand paints the image of the Santa or the fisherman onto the buoy. Once the image dries, the artist applies a finishing coat of varnish. When the varnish dries, the artist wraps the finished buoy in packing material and inserts it into a specifically designed mailing container that Oxford Tole Art ships directly to the customer.

Oxford Tole Art has two types of customers: retail and dealer. Retail orders arrive by mail and are prepaid. The retail price per unit, including packing and shipping charges, is $80. If capacity exceeds retail demand, Gael sells to dealers at the lower per unit price of $55. Because dealers will buy other products from other suppliers, Gael loses dealer orders that she is not able to fill immediately.

Sales to dealers are on account; stated terms call for the dealers to pay the full amount of the invoice within 30 days of billing. Receipts from dealers, however, are often delinquent. Typically only 30% of dealers pay in the month following the sale, 45% pay in the second month following the sale, 20% pay in the third month following the sale, and 5% of sales to dealers are never collected.

Oxford Tole Art hires local artists to paint the buoys. Because of local employment conditions, Oxford Tole Art must hire artists for periods of three months. The artists receive a fixed monthly salary of $2,000 and work a maximum of 160 hours per month. April, the Oxford Tole Art manager, makes staffing decisions at the start of each quarter, beginning January 1. The total time to sand, apply the base coat, paint, and pack each buoy is 0.8 labor hour.

Paint costs $3.15 for each buoy. Other manufacturing costs, including sandpaper, brushes, varnish, and other supplies, amounts to $2.75 per buoy. Packing materials cost $1.95 per buoy, and shipping by courier costs $7.50 per buoy. Oxford Tole Art purchases for cash all flexible resources in the month they are needed.

Oxford Tole Art rents space in a local industrial park where the artists work on the buoys. The one-year lease stipulates that rent is to be paid quarterly and in advance. Oxford Tole Art can rent production space of several sizes that would provide enough space to produce the following monthly capacities in buoys: 600, 800, 1,000, and 1,200. The quarterly rents for each of these units are $3,600, $4,800, $6,000,

Shop Space Type	Shop Capacity (Number of Buoys)	Quarterly Rent
A	600	$3,600
B	800	4,800
C	1,000	6,000
D	1,200	7,200

and $7,200, respectively. All production takes place to order, and Oxford Tole Art acquires supplies only as needed.

Insurance, heating, lighting, and business taxes are $20,000 per year, and advertising expenses amount to $40,000 per year. April Cheung receives $30,000 per year to supervise the operation, manage the raw materials acquisitions, handle all of the order taking and billing, and do the accounting.

All operating expenses are incurred and paid in equal monthly installments.

Realized sales for October, November, and December 2010 and forecasted demand for 2011 appear in Exhibit 10-4. Based on this forecasted demand, Gael and April have decided to rent an 800-capacity unit for 2011 and hire two painters in the first quarter, two painters in the second quarter, one painter in the third quarter, and three painters in the fourth quarter.

Gael plans to withdraw $20,000 from the company at the start of each six-month period for a total of $40,000 per year as compensation for acting as owner and planner. She also wants to maintain the entire firm's cash in a separate bank account for her business with a minimum cash balance of $5,000 (see Exhibit 10-5). She has arranged a $50,000 line of credit with her bank to provide her with short-term funds for the company. At the start of each month, the bank charges interest at the rate of 1% on the outstanding balance of the line of credit as of the end of the previous month. The bank pays interest at the rate of 0.6% on any cash in excess of $5,000 held in the account. The bank pays interest on the first day of each month based on the balance in the account at the end of the previous month.

Exhibit 10-4
Oxford Tole Art: Forecasted Unit Demand, 2010–2011

	Demand		
Month	Retail	Dealer	Total
October 2010*	275	510	785
November 2010*	420	425	845
December 2010*	675	175	850
January 2011	100	375	475
February 2011	105	400	505
March 2011	95	425	520
April 2011	115	350	465
May 2011	75	300	350
June 2011	60	250	310
July 2011	50	300	350
August 2011	55	325	380
September 2011	75	300	375
October 2011	150	300	450
November 2011	290	350	640
December 2011	350	400	750

*Actual

Exhibit 10-5
Oxford Tole Art: Proposed Balance Sheet, January 2011

Cash	$5,000	Owner's equity	$34,948
Accounts receivable	29,948		
Total assests	$34,948	Total liabilities and owner's equity	$34,948

Demand Forecast

An organization's goals provide the starting point and the framework for evaluating the budgeting process (see Exhibit 10-3, box 1). At Oxford Tole Art, the goals are to produce high-quality products and to be profitable. To assess the plan's acceptability, Gael compares the tentative operating plan's projected financial results with the organization's financial goals.

The budgeting process in Exhibit 10-3 is influenced strongly by the demand forecast, which is simply an estimate of sales demand at a specified selling price. Organizations develop demand forecasts in many ways. Some use market surveys conducted either by outside experts or by their own sales staff. Other organizations use statistical models to generate demand forecasts from trends and forecasts of economic activity in the economy and the relation of past sales patterns to this economic activity. Other companies simply assume that demand will either grow or decline by some estimated rate over previous demand levels.

Regardless of the approach used to develop the demand forecast, the organization must prepare a sales plan for each major line of goods or services (see Exhibit 10-3, box 2). The sales plan provides the basis for acquiring the necessary factors of production, such as labor, materials, production capacity, and cash. Production plans are sensitive to the sales plan; therefore, most organizations develop budgets on computers so that planners can readily explore the effects of changes in the sales plan on production plans.

Choosing the amount of detail to present in the budget involves making tradeoffs. A greater level of detail in the forecast improves the chances that the budgeting process will identify potential bottlenecks and problems by specifying the exact timing of production flows in the organization. However, forecasting and planning in great detail for each item among thousands of items in production can be extremely expensive and overwhelming to compute. Most organizations rely on the judgment of their production planners to strike a balance between the need for detail and the cost and practicality of detailed scheduling. Planners do this by grouping products into pools so that each product in a given pool places roughly equivalent demands on the organization's resources so that planning is simplified. Because Oxford Tole Art has one product, a painted buoy with only two variations, its budget can be detailed and comprehensive. Organizations with many products and services may choose, however, to budget at a more aggregated level, such as by product line. For example, production in a plant making headache capsules might budget by the product line rather than by individual stock-keeping units.

The Production Plan

Planners match the completed sales plan with the organization's inventory policy and capacity level to determine a production plan (Exhibit 10-3, box 5). The plan identifies the required production in each of the interim periods making up the annual

budget period. Budget periods, such as a year, may have interim periods comprised of days, weeks, or months, depending on the information needs of the people managing the acquisition, manufacturing, selling, and distribution activities.

Planners use the inventory policy (Exhibit 10-3, box 4) and the sales plan (Exhibit 10-3, box 2) to develop the production plan (Exhibit 10-3, box 5). Therefore, the inventory policy is critical and has a unique role in shaping the production plan. Some organizations have a policy of producing goods for inventory and, therefore, attempt to keep a predetermined, or target, number of units in inventory at all times. This inventory policy often reflects a level production strategy that is characteristic of an organization with highly skilled employees or equipment dedicated to producing a single product. A level production strategy reflects a lack of flexibility. Highly skilled production workers cannot be used to do various jobs in the organization; therefore, they must be kept busy in the job they know. Similarly, dedicated equipment that can be used for only one job must be kept busy to justify its expense. In such organizations, monthly sales draw down the inventory levels, and the production plan for each month attempts to restore inventory levels to their target levels.

Other organizations have an inventory policy of producing for planned sales in the next interim period within the budget period. Organizations moving toward a just-in-time inventory policy produce goods to meet the next interim period's demand as an intermediate step along the path to moving to a full just-in-time inventory system in which only an order can trigger production, as does Toyota. Each interim period becomes shorter and shorter until the organization achieves just-in-time production. In this setting, the inventory target is the level of next week's or next month's planned sales, and the scheduled production is the amount required to meet the inventory target. Implementing a just-in-time inventory policy requires flexibility among employees, equipment, and suppliers and a production process that has little potential for failure. In organizations using a just-in-time inventory strategy, demand drives the production plan directly—that is, the production in each interim period equals the next interim period's planned sales. This is the inventory policy that Oxford Tole Art uses (Exhibit 10-3, box 4).

The just-in-time manufacturing process requires just-in-time delivery which means that direct materials are delivered to a facility just when they are needed. Trucks such as these can make up to 12 deliveries a day to the same plant.
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Developing the Spending Plans

Once planners have identified a feasible production plan, they can make tentative resource commitments. The purchasing group prepares a materials purchasing plan to acquire the raw materials and supplies that the production plan requires (Exhibit 10-3, box 7). Materials purchasing plans are driven by the cycle of the organization's production plans (which may be hourly, daily, weekly, monthly, or even longer) and the suppliers' production plans. The organization's production plans notify suppliers of the quantity of materials they should supply and when those materials must be delivered. Because sales plans and production plans change during the year, the organization and its suppliers must be able to quickly adjust their plans based on information received during the operating period. For example, a manufacturer of a fashion item might find that demand is far outpacing expectations and supply. The manufacturer would have to signal to its suppliers that it will require more raw materials. At some point, however, the production and materials supply plans have to be locked in place and no additional changes made. For example, commitment to a production schedule in a large automotive assembly plant happens about eight weeks before production takes place. This gives suppliers and the assembly plant managers the time to put raw materials supply in place and schedule the production.

The personnel and production groups prepare the labor hiring and training plan (Exhibit 10-3, box 8). This plan works backward from the date when the personnel are needed to develop hiring and training schedules that will ensure the availability of these personnel. This plan can include both expansion and contraction activities. For example, when an organization is contracting, it will use retraining plans to redeploy employees to other parts of the organization or will develop plans to discharge employees from the organization. The discharge plans for laid-off employees may include retraining and other activities to help them find new jobs. Because discharging employees reflects moral, ethical, and legal issues and may involve high severance costs, many organizations attempt to avoid layoffs unless no other alternative can be found.

Other decision makers in the organization will prepare an administrative and discretionary spending plan that summarizes the proposed expenditures on such activities as research and development, advertising, and training (Exhibit 10-3, box 9). Discretionary expenditures provide the infrastructure required by the proposed production and sales plan. Discretionary, as used here, means the actual sales and production levels do not drive the amount spent; rather, the senior managers in the organization determine the amount of discretionary expenditures. Once determined, however, the amount to be spent on discretionary activities becomes fixed for the budget period because it is unaffected by product volume and mix.

If a fast-food restaurant plans to make 3,000 hamburgers during some budget period, it knows the quantity of materials it will use because there is a physical, or engineered, relationship among ingredients such as meat, buns, condiments, packages, and the number of hamburgers made. However, no direct physical, or engineered, relationship exists among the number of hamburgers sold and the discretionary amounts spent on items like advertising and employee training.

Finally, the appropriate authority in the organization approves the capital spending plan for putting new productive capacity in place (Exhibit 10-3, box 3). Because capital spending projects usually involve time horizons longer than the period of the operating budget, a long-term planning process rather than the one-year cycle of the operating budget drives the capital spending plan. The spending plans for material, labor, and support resources are based on a forecast of the activities the organization must complete to achieve the production targets identified in its production plan. As

the planning period unfolds and time reveals the actual production requirements, production planners make commitments to detailed production schedules and the required related purchasing requirements.

Choosing the Capacity Levels

At Oxford Tole Art, the following three types of resources determine the monthly production capacity:

1. ***Flexible resources that the organization can acquire in the short term, such as paint and packing supplies***—If suppliers either do not deliver these resources or deliver unacceptable resources, production may be disrupted. This problem was not identified as an issue for Oxford Tole Art, but it is a practical concern for many organizations. Organizations such as Wal-Mart spend a great deal of time and money developing supplier relationships so that they can purchase inventory if and only when needed and so that they will receive zero-defect materials.
2. ***Capacity resources, such as painters, that the organization must acquire for the intermediate term***—Between July 1 and September 30, Oxford Tole Art plans to employ one painter. Because each painter works 160 hours per month and because each buoy requires 0.8 hour to complete, the monthly capacity provided by intermediate-term activity decisions between July 1 and September 30 is 200 (= 160/0.8) units.
3. ***Capacity resources, such as building a factory, that the organization must acquire for the long term***—Gael plans to rent a shop that provides a monthly capacity of 800 units. Gael needs just a simple setting with a relatively short commitment period. Other organizations may take several years to acquire long-term capacity that may last for 10 years or longer, and the cost is justified only if it is used that long. Consider the amount of time an oil company takes to build an oil refinery or the time that a municipality needs to build a hospital. Capacity resources are expensive and are called *committed* because they are the same regardless of how much of the facility is used and because the level of capacities and fixed costs are very difficult to change in the short term. Therefore, capacity resources impose financial risk on the organization.

As indicated in Exhibit 10-6, the nature of the resources determines whether they are short term, intermediate term, or long term. Many organizations develop sophisticated approaches to choose a production plan that balances the use of short-term, intermediate-term, and long-term capacity to minimize committed resource idle time.

Exhibit 10-6
Summary of Capacity Types and Commitment Time

Term	Type of Capacity Acquired	Examples
Flexible resources required in short term (less than several weeks)	Provides the ability to use existing capacity	Raw materials, supplies, casual labor
Committed resources acquired for the intermediate term (several weeks to six months)	General purpose capacity that is transferrable among organizations given time	Employees, general-purpose equipment, specialty raw materials
Committed resources acquired for the long-term (more than six months)	Special purpose capacity that is customized for the organization's use	Buildings, special-purpose equipment

For example, the size and number of service areas in a bank represent the capacity available for use during any period provided by long-term building decisions. The level of long-term capacity chosen reflects the organization's assessment of its long-term growth trend. For Oxford Tole Art, which is renting capacity, long-term capacity is defined by the lease stipulations and equals one year. If Oxford Tole Art were building this capacity, its long-term capacity would be defined by the time needed to plan and build the facility.

The number of full-time staff employed by a bank determines the long-term capacity available for the intermediate term. For example, if the plan were to acquire capacity that the organization could use increasingly as sales grew, the intermediate-term capacity decisions would put in place other elements that require intermediate-term commitments. These would include defining the number of people and banking equipment necessary to allow the bank to use its long-term capacity. The intermediate-term capacity decision reflects the longer of either the duration needed to put intermediate-term capacity in place or the duration of the contracting period for intermediate-term capacity. For Oxford Tole Art, this is the contracting period for artists, which is three months.

The number of part-time or temporary staff employed by a bank determines its capacity on a day-to-day basis. Such short-term capacity decisions reflect the cyclical demands that the bank may face daily, weekly, monthly, or annually. The short-term capacity decision reflects the time needed to put short-term capacity in place. For Oxford Tole Art, this is the time that suppliers require for delivery, which is assumed to be nearly instantaneous. However, if Oxford Tole Art had to order and wait for supplies, it would become very important to plan acquisitions so that in the very short term, such as hourly, Oxford Tole Art would not have to stop production while it waited for supplies to arrive. In this sense, supplies provide the short-run capacity to use longer term capacity.

Organizations use many different approaches to plan capacity, and it is important to understand how production planners choose capacity levels. The process that Oxford Tole Art used was to choose a level of shop capacity (either 600, 800, 1,000, or 1,200 units) and then to hire the number of painters in each quarter that, given the forecasted demand and chosen shop capacity, provided the highest level of expected profits.

The resource-consuming activities for Oxford Tole Art can be classified into three groups that are common to most organizations:

1. ***Activities that create the need for resources and, therefore, resource expenditures in the short term***—For Oxford Tole Art, these short-term activities include the purchasing, preparation, painting, packing, and shipping of buoys. Acquiring the resources for these short-term activities requires expenditures that vary directly with the production levels because the inventory policy is to produce only to order.
2. ***Activities undertaken to acquire capacity for the intermediate term***—For Oxford Tole Art, this is the quarterly acquisition of painting capacity, that is, hiring the painters to paint the buoys.
3. ***Activities undertaken to acquire or support capacity needed for the long term***—For Oxford Tole Art, this includes annually choosing the level of shop capacity, the level of advertising, the manager and manager's salary, and expenditures for such items as insurance and heat.

Planners classify activities by type because they plan, budget, and control short-, intermediate-, and long-term expenditures differently. Analysts evaluate short-term activities by considering efficiency: Did we accomplish this task with the fewest

possible resources and effectiveness? Did we achieve what we set out to accomplish? They also ask questions such as the following:

1. Is this expenditure necessary to add to the product value perceived by customers?
2. Can the organization improve how it performs this activity?
3. Would changing the way this activity is done provide more satisfaction to customers?

Analysts evaluate intermediate- and long-term activities by using efficiency and effectiveness considerations and asking questions such as these:

1. Are alternative forms of capacity available that are less expensive?
2. Is this the best approach to achieve our goals?
3. How can we improve the capacity selection decision to make capacity less expensive or more flexible?

Choosing the capacity plan—making the commitments to acquire intermediate- and long-term capacity—commits the firm to its intermediate- and long-term expenditures. Choosing the production plan—that is, choosing the level of the short-term activities—fixes the short-term expenditures that the budget summarizes.

Handling Infeasible Production Plans

Although the relationship between planning and production at Oxford Tole Art is a simple one, the company's planning process reflects how planners use forecasted demand to plan activity levels and provide required capacity. If planners find the tentative production plan infeasible because projected demand exceeds available capacity, they must make provisions to acquire more capacity or reduce the planned level of production. For example, if the labor market is tight and Oxford Tole Art can hire only two artists between January and June, Gael would have to revise her capacity and production plans to reflect this constraint.

Interpreting the Production Plan

Exhibit 10-7 summarizes the production plan that Oxford Tole Art has developed for 2011. Three factors drive planning:

1. Demand, which is the quantity customers are willing to buy at the stated price.
2. The capacity levels chosen.
3. Production output quantity.

Oxford Tole Art starts no production until it receives an order. Therefore, production is the minimum of total demand and production capacity. In equation form, we write this in general form as follows:

$$\text{Production} = \text{Minimum (total demand, production capacity)}$$

The general form can be applied to Oxford Tole Art:

$$\begin{aligned}\text{Production capacity} = \text{Minimum (shop capacity,}\\ \text{painting capacity, supplies capacity)}\end{aligned}$$

Remember that for Oxford Tole Art,

$$\text{Total demand} = \text{Retail demand} + \text{Dealer demand}$$

In Oxford Tole Art's case, the production capacity is the minimum of the long-term capacity (the productive capacity of the shop), the intermediate-term capacity

Exhibit 10-7
Oxford Tole Art: Demand, Capacity, and Sales Data, 2011

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Retail demand	100	105	95	115	75	60	50	55	75	150	290	350
Dealer demand	375	400	425	350	300	250	300	325	300	300	350	400
Total demand	475	505	520	465	375	310	350	380	375	450	640	750
Shop capacity	800	800	800	800	800	800	800	800	800	800	800	800
Painting capacity	400	400	400	400	400	400	200	200	200	600	600	600
Production capacity	400	400	400	400	400	400	200	200	200	600	600	600
Total units made and sold	400	400	400	400	375	310	200	200	200	450	600	600
Retail units made and sold	100	105	95	115	75	60	50	55	75	150	290	350
Dealer units made and sold	300	295	305	285	300	250	150	145	125	300	310	250

(the painting capacity provided by hiring artists), and the short-term capacity (the capacity provided by the short-term acquisition of materials). For example, in August the retail demand is 55 units and the dealer demand is 325 units, totaling 380 units. The shop capacity is 800 units, and the painting capacity is 200 units. Therefore, production capacity, which is the minimum of the shop capacity and painting capacity, is 200 units. Planned production and sales of 200 units represents the minimum of total demand (380 units) and production capacity (200 units).

The Financial Plans

Once the planners have developed the production, staffing, and capacity plans, they can prepare a financial summary of the tentative operating plans. The financial results for Oxford Tole Art implied by the production plan developed in Exhibit 10-7 appear in the following exhibits:

- Exhibit 10-8 presents the cash flows expected from the production and sales plan.
- Exhibits 10-9 and 10-10 summarize the projected balance sheet and income statement, respectively, expected as a result of the production and sales plans.

(These exhibits are examples of the elements in boxes 11 and 12 in Exhibit 10-3.)

Planners use the projected balance sheet as an overall evaluation of the net effect of operating and financing decisions during the budget period and the income statement as an overall test of the profitability of the planners' proposed activities. To keep it simple, this example ignores taxes. Taxes are part of the budgeting and cash flow estimation process of all organizations.

Understanding the Cash Flow Statement

The cash flow statement in Exhibit 10-8 is organized into three sections:

1. *Cash inflows* from retail cash sales and collections of dealer receivables.
2. *Cash outflows* for flexible resources that are acquired and consumed in the short term (buoys, paint, other supplies, packing, and shipping) and cash outflows for capacity resources that are acquired and consumed in the intermediate term and long term (painters, shop rent, manager's salary, other shop costs, interest

Exhibit 10-8
Oxford Tole Art Cash Flow Forecast, 2011

Cash inflows	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Retail sales	$8,000	$8,400	$7,600	$9,200	$6,000	$4,800	$4,000	$4,400	$6,000	$12,000	$23,200	$28,000
Dealer collections												
1 month	$2,887	$4,950	$4,868	$5,033	$4,703	$4,950	$4,125	$2,475	$2,392	$2,062	$4,950	$5,115
2 months	10,519	4,331	7,425	7,301	7,549	7,054	7,425	6,188	3,713	3,589	3,094	7,425
3 months	5,610	4,675	1,925	3,300	3,245	3,355	3,135	3,300	2,750	1,650	1,595	1,375
Total cash inflows	$27,016	$22,356	$21,818	$24,834	$21,497	$20,159	$18,685	$16,363	$14,855	$19,301	$32,839	$41,915
Cash outflows												
Flexible resources:												
Buoys	$900	$900	$900	$900	$844	$698	$450	$450	$450	$1,013	$1,350	$1,350
Paint costs	1,260	1,260	1,260	1,260	1,181	977	630	630	630	1,418	1,890	1,890
Other manufacturing costs	1,100	1,100	1,100	1,100	1,031	853	550	550	550	1,238	1,650	1,650
Packing costs	780	780	780	780	731	605	390	390	390	878	1,170	1,170
Shipping costs	3,000	3,000	3,000	3,000	2,813	2,325	1,500	1,500	1,500	3,375	4,500	4,500
Committed resources:												
Painters' salaries	$4,000	$4,000	$4,000	$4,000	$4,000	$4,000	$2,000	$2,000	$2,000	$6,000	$6,000	$6,000
Shop rent	4,800	0	0	4,800	0	0	4,800	0	0	4,800	0	0
Manager's salary	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500
Other shop costs	1,667	1,667	1,667	1,667	1,667	1,667	1,667	1,667	1,667	1,667	1,667	1,667
Advertising costs	3,333	3,333	3,333	3,333	3,333	3,333	3,333	3,333	3,333	3,333	3,333	3,333
Interest paid	0	163	127	95	81	48	17	208	177	160	231	145
Total cash outflows	$23,340	$18,703	$18,667	$23,435	$18,181	$17,006	$17,837	$13,228	$13,197	$26,382	$24,291	$24,205
Net operating cash flow this month	**$3,676**	**$3,653**	**$3,151**	**$1,399**	**$3,316**	**$3,153**	**$848**	**$3,135**	**$1,658**	**$(7,081)**	**$8,548**	**$17,710**
Financing operations:												
Opening cash	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000
Cash withdrawn	(20,000)	0	0	0	0	0	(20,000)	0	0	0	0	0
Cash available	(11,324)	8,653	8,151	6,399	8,315	8,155	(14,152)	8,134	6,658	(2,079)	13,548	22,710
Opening loan	0	16,324	12,671	9,520	8,121	4,806	1,652	20,803	17,669	16,010	23,089	14,541
Borrowing made	16,324	0	0	0	0	0	19,152	0	0	7,079	0	0
Borrowing repaid	0	3,653	3,151	1,399	3,315	3,155	0	3,134	1,658	0	8,548	14,541
Ending loan	16,324	12,671	9,520	8,121	4,806	1,652	20,803	17,669	16,010	23,089	14,541	0
Ending cash	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$8,168

Exhibit 10-9
Oxford Tole Art Projected Balance Sheet, December 31, 2011

Cash	$8,168		
Accounts receivable	27,445	Owner's equity	$35,613
Total assets	$35,613	Total liabilities and owner's equity	$35,613

Exhibit 10-10
Oxford Tole Art Projected Income Statement, December 31, 2011

Revenue		$279,134
Flexible resources expenses:		
Buoys	$10,204	
Paint	14,285	
Other suppliers	12,471	
Packing	8,843	
Shipping	34,013	$79,816
Contribution margin		$199,318
Committed resource expenses:		
Painters' salaries	$48,000	
Shop rent	19,200	
Other shop costs	20,000	
Manager's salary	30,000	117,200
Other expenses:		
Advertising	$40,000	
Interest paid	1,452	41,452
Net income		$40,666

paid, and advertising costs). The difference between cash inflows from revenues and cash outflows from expenditures is called the net cash flows from operations.

3. *Results of financing operations.* For each month, the format of the cash flow statement is as follows:

$$\text{Cash inflows} - \text{Cash outflows} = \text{Net cash flow}$$

In January, for example, ending cash was as follows:

$$\begin{aligned}\text{Ending cash} &= \text{Operating cash flow} + \text{Opening cash} \\ &\quad + \text{Effects of financing operations} \\ &= \$3{,}676 + \$5{,}000 + (-\$20{,}000 + \$16{,}324) \\ &= \$5{,}000\end{aligned}$$

To understand the derivation of the numbers in Oxford Tole Art's cash flow statement, study the numbers for July to ensure that you can follow the calculations.

Cash Inflows Section

Recall that the pattern of collections at Oxford Tole Art is as follows:

1. Retail orders are paid for with the order at a retail price per unit of $80.
2. Sales to dealers for $55 per unit are on account with a typical collection pattern being 30% in the month following the sale, 45% in the second month following the sale, 20% in the third month following the sale, and 5% never collected.

Exhibit 10-11
Oxford Tole Art: Summary of Cash Collections, July 2011

Item	Calculation	
Retail sales from July (see Exhibit 10-7)	50 × $80 =	$4,000
30% of June dealer sales*	30% × 250 × $55 =	4,125
45% of May dealer sales	45% × 300 × $55 =	7,425
20% of April dealer sales	20% × 285 × $55 =	3,135
Total		$18,685

*Sales equals units sold multiplied by the selling price of $55 per unit.

Therefore, in July, Oxford Tole Art will collect (1) all of the retail sales for July, (2) 30% of the dealer sales from June, (3) 45% of the dealer sales from May, and (4) 20% of the dealer sales from April. Exhibit 10-11 summarizes these July collections.

Cash Outflows Section

Exhibit 10-12 summarizes the cash outflow numbers for July. Because Oxford Tole Art pays cash for flexible resources, this equation applies for each flexible resource purchased:

$$\text{Cash outflow} = \text{Units of flexible resource purchased} \times \text{Price per unit of flexible resource}$$

For expenditures on capacity resources—that is, resources acquired in the intermediate or long term—the following equation applies for each resource:

$$\text{Cash outflow} = \text{This month's expenditure for that capacity resource}$$

Financing Section

The financing section of the cash flow statement summarizes the effects on cash of transactions that are not a part of the normal operating activities. This section includes the effects of issuing or retiring stock or debt and buying or selling capital

Exhibit 10-12
Oxford Tole Art: Cash Outflow Calculations, July 2011

Item	Amount	Formula	Calculation
Flexible resources:			
Buoy cost	$450	July production × Price per buoy	200 × $2.25
Paint cost	630	July production × Paint cost per buoy	200 × $3.15
Other supplies cost	550	July production × Other supplies cost per buoy	200 × $2.75
Packing costs	390	July sales × Packing cost per buoy	200 × $1.95
Shipping costs	1,500	July sales × Shipping cost per buoy	200 × $7.50
Committed resources:			
Painters' salaries	$2,000	Number of painters in July × Monthly salary	1 × $2,000
Shop rent	4,800	Units of capacity × Capacity cost per unit	800 × $6
Manager's salary	2,500	Annual salary ÷ 12	$30,000 ÷ 12
Other shop costs	1,667	Annual other costs ÷ 12	$20,000 ÷ 12
Interest paid	17	June ending loan balance × 1%	$1,652 × 1%
Advertising costs	3,333	Annual advertising ÷ 12	$40,000 ÷ 12

Exhibit 10-13
Format of Financing Section of Cash Flow Statement

	Net cash flow from operations	$848
+	Opening cash	15,000
±	Cash invested or withdrawn*	–20,000
±	Cash provided or used in issuing or retiring stock or debt	0
=	Cash available before short-term financing	–14,152
±	Cash used or provided by short-term financing	19,152
=	Ending cash	$5,000

*In the case of a private business such as Oxford Tole Art, this refers to the capital transactions by the owner.

assets. Exhibit 10-13 shows a common format used in the financing section of the cash flow statement with the corresponding numbers for July. Note that the format of the financing section of the cash flow statement is as follows:

Net operating cash flow + Opening cash ± Cash from financing activities = Ending cash

The major sources and uses of cash in most organizations are (1) operations, (2) investments or withdrawals by the owner in an unincorporated organization, (3) long-term financing activities related to issuing or retiring stock or debt, and (4) short-term financing activities.

Short-term financing often involves obtaining a line of credit, secured or unsecured, with a financial institution. The line of credit allows an organization to borrow up to a specified amount at any time. The line of credit is secured if the organization has pledged an asset that the financial institution can seize if the borrower defaults on any of the bank's requirements. The financial institution sets a limit on the line of credit, and the borrower, in the example of Oxford Tole Art, pays the specified interest at specified periods, such as monthly, on the outstanding balance borrowed. See the "Ending loan" row in Exhibit 10-8 and note that Oxford Tole Art's line of credit balance varies between $0 and $23,089 during the year, well within the limit of $50,000 that Gael negotiated with the bank.

The format of the financing section of the cash flow statement in Exhibit 10-8 for Oxford Tole Art does not follow the format used in Exhibit 10-13. The financing section of Oxford Tole Art's cash flow statement provides information about the line-of-credit balance. Many organizations include the line-of-credit information in the cash flow statement because financial statement readers should be aware of the limits that can potentially constrain operations.

Using the Financial Plans

Oxford Tole Art's cash flow statement, shown in Exhibit 10-8, contains a short-term financing plan that suggests that, if events unfold as expected, Oxford Tole Art's cash balance increases only modestly during the year because of the $40,000 withdrawal that Gael will make from the business. Therefore, the company will use its line-of-credit agreement heavily. It will be borrowing from the bank for 11 of the 12 months in the year.

Organizations can raise money from outsiders by borrowing from banks, issuing debt, or selling shares of equity. A cash flow forecast helps an organization identify if

and when it will require external financing. The cash flow forecast also shows whether any projected cash shortage will be temporary or cyclical, which can be met by a line-of-credit arrangement, or whether it will be permanent, which would require either or all of a long-term loan from a bank, further investment by the current owners, or investment by new owners. Based on the information provided by the cash flow forecast, organizations can plan the appropriate mix of external financing to minimize the long-run cost of capital.

The projected income statement and balance sheet provide a general assessment of the operating efficiencies at Oxford Tole Art. If Gael feels that these projected results are unacceptable, she must take steps to change the organizational processes that create the unacceptable results. For example, if the employees consistently use more quantities of any factor of production than competitors use, such as paint, labor, or capacity, Gael should attempt to modify procedures and, therefore, resource use to be able to compete profitably with competitors.

Suppose April has studied the projected financial results in the initial budget plans and has decided that the 14.6% profit margin on sales ($40,666 ÷ $279,134 from Exhibit 10-10) is too low. April has reached this conclusion because Oxford Tole Art is in the craft industry, in which competitors often duplicate attractive products quickly, resulting in short periods of product profitability. After determining that this profit margin on sales is too low, the manager may develop a marketing program or a cost reduction program to improve the cost/revenue performance at Oxford Tole Art.

Using the Projected Results

The operating budgets, like the production plan, hiring plan, capital spending plan, and purchasing plan for materials and supplies, provide a framework for developing expectations about activity levels in the upcoming period. Planners also use the operating budgets to test the feasibility of production plans. As the budget period unfolds, production and operations schedulers will make more accurate forecasts and base their production commitments on them. Thus, planners use the budget information to accomplish the following:

1. ***Identify broad resource requirements***—This helps develop plans to put needed resources in place. For example, April can use the activity forecast to plan when the organization will have to hire and train temporary help.
2. ***Identify potential problems***—This helps to avoid problems or to deal with them systematically. For example, April can use the statement of operating cash flows to identify when the business will need short-term financing from its bank. This will help April negotiate with a bank lending officer for a line of credit that is both competitive and responsive to Oxford Tole Art's needs. The forecasted cash flows also will identify when the buoy business will generate cash that Gael can invest in other business opportunities.
3. ***Compare projected operating and financial results***—These comparisons within an organization serve as a measure for comparison with the operating and financial results of competitors. Such a comparison to plan can be used as a test of the efficiency of the organization's operating processes. The differences between planned and actual costs at Oxford Tole Art will focus April's attention on understanding whether the plans were unrealistic or whether the execution of a sound business plan was flawed. This signals the need for improved planning, better execution, or both.

What-If Analysis

The cost–volume–profit analysis discussed in Chapter 3 provided insights into how revenues, costs, and profits respond to changes in the quantity of product made and sold. However, that analysis assumed a constant product mix. Now, powerful desktop computers and electronic spreadsheet software make it possible to consider product mixes (and much more) so that managers can evaluate alternative strategies.

Using a computer for the budgeting process, managers can explore the effects of alternative marketing, production, and selling strategies. For example, at Oxford Tole Art, April may consider raising prices, opening a retail outlet, or using different employment strategies. Such alternative proposals can be evaluated in a **what-if analysis**.

April may ask, "What if I decrease prices on my retail products by 5% and then sales increase by 10%? What will happen to my profits?" The answer: Oxford Tole Art profits will fall from $40,666 to $39,103. (This revised profit number was found by inserting the revised price and demand schedule in the spreadsheet that was used to prepare the original budget figures.) Therefore, this proposed price adjustment is undesirable.

April may also wonder, "What if retail sales would increase by 50% if Oxford Tole Art opened a retail outlet that would cost $40,000 per year to operate (including all costs). The retail outlet orders would be shipped by courier to the customer's address. What would happen to my profits?" In this case, Gael would use the same shop capacity; the painters hired in the year's four quarters would be three, two, two, and four, respectively; and projected profit would increase to $56,553.

The structure and information required to prepare the master budget can be used easily to provide the basis for what-if analysis. (It took only several seconds to answer April's questions using the spreadsheet developed to prepare the Oxford Tole Art cash flow forecast. This spreadsheet is available from this text's website for you to try what-if analysis on your own.)

Evaluating Decision-Making Alternatives

Suppose April is considering renting a machine to automatically sand the buoys and apply the primer coat. The capacity of the machine is 1,300 buoys per month. This machine will reduce the painting time per buoy from 0.8 to 0.5 hour but will increase other shop costs from $20,000 to $35,000. The reduction in painting time per buoy allows Oxford Tole Art to reduce the number of painters needed for any level of scheduled production.

Exhibit 10-14 shows the revised estimated income statement reflecting the rental of the sanding and priming machine. Renting this machine will increase projected net income from the original level of $40,666 to $57,490, a 41% increase of $16,824.

Sensitivity Analysis

What-if analysis is only as good as the model used to represent what is being evaluated. The model must be complete, it must reflect relationships accurately, and it must use accurate estimates. A model that is incomplete, fails to reflect relationships accurately, or uses unreasonable estimates will not provide good estimates of a plan's results. If the model is complete and reflects capacity, cost, and revenue relationships accurately, the remaining issue is the accuracy of the data used. Planners test planning models by varying the model estimates. Suppose one machine represents a bottleneck for manufacturing operations. Then the productivity (output per hour) of that machine is a key estimate for the production plan. The production planner could test the effect of errors in the estimate of the machine's productivity on the production plan

Exhibit 10-14
Oxford Tole Art: Projected Income Statement, December 31, 2011

Revenue		$326,943
Flexible resources expenses:		
Buoys	$12,263	
Paint	17,168	
Other suppliers	14,988	
Packing	10,628	
Shipping	40,875	$95,920
Contribution margin		$231,023
Committed resource expenses:		
Painters' salaries	$48,000	
Shop rent	19,200	
Other shop costs	35,000	
Manager's salary	30,000	132,200
Other Expenses:		
Advertising	$40,000	
Interest paid	1,332	41,332
Net income		$57,490

by varying the productivity number by 10% or 20% above and below the estimate used in the planning budget.

If small forecasting errors of an estimate used in the production plan change the plan, we say that the model is sensitive to that estimate. If the performance consequences (for example, profits) from a bad estimate are severe, planners may want to invest time and resources to improve the accuracy of their estimates. For example, suppose an organization has the production capacity to accept only one of two possible orders. Order 1 promises revenues of $1,000,000 and expected costs of $750,000. Order 2 promises revenues of $800,000 and has costs of $600,000. Based on this information, order 1—with an expected profit of $250,000—looks like a better prospect than order 2, which has a profit of $200,000. Note, however, that the profit associated with order 1 is uncertain, whereas the profit associated with order 2 is certain. Suppose that, with further investigation, planners decide that the costs associated with order 1 could be anywhere between $720,000 and $780,000. This would not affect the decision because even if the worst costs are realized for order 1, profits will still be $220,000, which is more than the $200,000 associated with order 2. However, if the costs associated with order 1 could be anywhere between $680,000 and $820,000, certain circumstances (when costs are more than $800,000) after the fact will have planners wishing they had accepted order 2. This is an example of sensitivity analysis.

Sensitivity analysis is the process of selectively varying a plan's or a budget's key estimates for the purpose of identifying over what range a decision option is preferred. In the preceding example, order 1 is preferred if its costs are $800,000 or less. Sensitivity analysis enables planners to identify the estimates that are critical for the decision under consideration. For example, the labor that Oxford Tole Art needs to make each product is an important factor in its planning budget. Small changes in the estimate of this factor, which is the key productive resource, produce large changes in the projected or planned profit. If Oxford Tole Art can develop a process or can redesign the product so that labor time needed to make a buoy would be reduced by 10%, from 0.8 to 0.72 hour per buoy, projected profit would increase 31% from $40,666 to $53,229. This is a signal to April that designing and running the manufacturing process so that the artists can work as efficiently as possible are critical to the success of her business.

Comparing Actual and Planned Results

To understand results, such as production and financial outcomes, organizations use variance analysis to compare planned or budgeted results in the master budget with actual results.

Variance Analysis

Budgets are prepared for specific periods so that managers can compare actual results for the period with the planned results for that period. **Variance analysis** has many forms and can result in complex measures, but, as shown in Exhibit 10-15, its basis is very simple—an actual cost or actual revenue amount is compared with a target cost or target revenue amount to identify the difference, which is called a **variance**. For example, a manager might compute the cost of labor that went into making an aircraft and compare that cost with the planned cost of labor for making that aircraft. A variance represents a departure from what was budgeted or planned. What caused the variance and the size of that variance will trigger an investigation to determine its cause and what should be done to correct that variance.

Budgeted, or planned, costs can come from three sources:

1. *Standards established by industrial engineers*, such as cost of steel that should go into an automobile door based on the door's specifications.
2. *Previous period's performance*, such as the average cost of steel per door that was made in the last budget period.
3. *A performance level achieved by a competitor*—usually called a *benchmark* and based on best-in-class results—such as the cost of steel per comparable door achieved by a competitor who is viewed as the most efficient.

The financial numbers used in variance analysis for flexible resources are the product of a price and a quantity component:

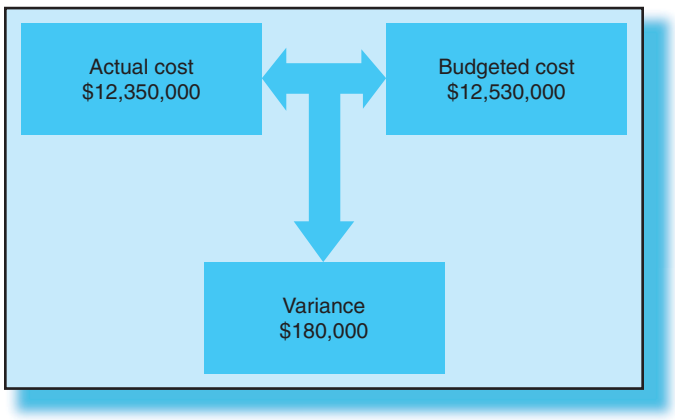
$$\text{Planned, or budgeted, amount} = \text{Standard price per unit} \times \text{Budgeted quantity}$$

while

$$\text{Actual amount} = \text{Actual price per unit} \times \text{Actual quantity}$$

Variance analysis explains the difference between planned costs and actual costs by evaluating differences between standard prices and actual prices and budgeted

Exhibit 10-15
Comparison of Actual Cost to Budgeted Cost to Identify the Variance



quantities and actual quantities. Managers focus separately on prices and quantities because in most organizations one department or division is responsible for the acquisition (thereby determining the actual price) of a resource and a different department uses (thereby determining the quantity of) the resource.

A variance is a signal that is part of a control system for monitoring results, and thus variances provide a signal that operations did not go as planned. Supervisory personnel use variances as overall checks on how well the people who are managing day-to-day operations are doing what they should be doing. When compared to the performance of other organizations engaged in comparable tasks, variances show the effectiveness of the control systems that operations people are using.

Basic Variance Analysis

Variance analysis helps managers understand the source of the differences—the variances—between actual costs and budgeted costs. If managers learn that specific actions they took on some jobs helped lower the actual costs of these jobs, they can pursue further cost savings by repeating those actions on similar jobs in the future. If they can identify the factors causing actual costs to be higher than expected, managers may be able to take the necessary actions to prevent those factors from recurring in the future. If they learn that cost changes are likely to be permanent, they can update their cost information when bidding for future jobs.

We will now study a specific example that illustrates the nature and role of variances.

Canning Cellular Services

Canning Cellular Services (CCS) is a national provider of cellular phone services. Cellular services are highly competitive and, as in any competitive industry, CCS depends on cost control to be profitable. For this reason CCS has undertaken a major study to understand the behavior of its costs and to provide a continuing basis for cost reduction. The two major costs in the cellular business are equipment costs and personnel costs.

As part of its effort to control personnel costs, CCS has documented in euros (€) the costs associated with connecting a new customer and estimated it to be €95.50. Exhibit 10-16 reports the results of the study, which identified three relevant costs: direct materials costs, direct labor costs, and support costs.

The *direct materials costs* relate to the welcoming package provided to each new customer. This package defines the range and nature of the various cellular services offered by CCS.

Exhibit 10-16
Canning Cellular Services: Total Cost per Activated Customer

	Unit	Cost/Unit	Total Cost
Direct material:			
Welcoming package	1.00	€25.00	€25.00
Direct labor:			
Sales staff	0.50	25.00	12.50
Technical staff	0.25	40.00	10.00
Support cost:			
Data processing	0.20	15.00	3.00
System activation	0.15	300.00	45.00
Total cost per activated customer			€95.50

The *direct labor costs* include two components: One is the cost of the salesperson, who describes the various services available and writes up the sales contract. On average, the salesperson spends 0.5 hour with each new customer and is paid €25 per hour. The other component is the cost of the sales staff employees who activate new cellular telephones by calling the control center and providing electronic serial numbers and such customer-related information as names, addresses, and payment details. This requires 0.25 hour of time per phone, and sales staff are paid €40 per hour.

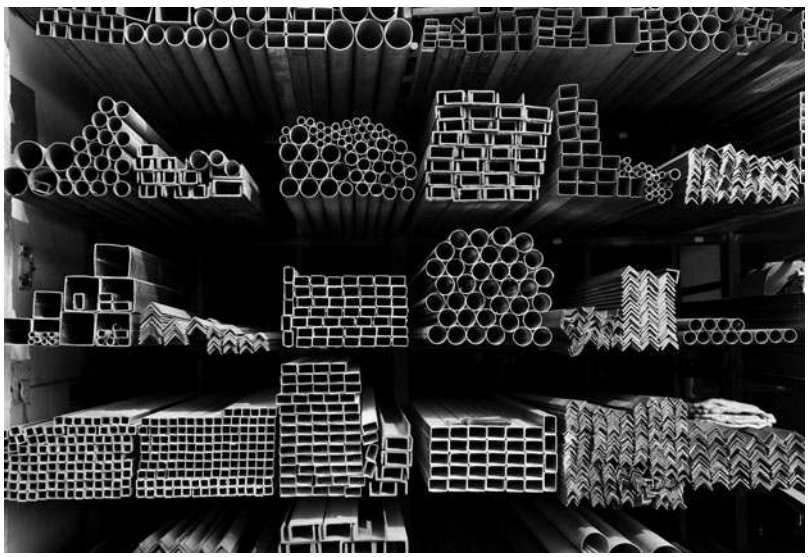
The support costs are comprised of two components. One is the salaries of the data processing staff who enter customer-related information into the CCS customer database. This information is used for billing and advertising purposes. On average, it takes 0.20 hour to enter the information for each customer, and the data processing clerks are paid €15 per hour. The other component is the system activation cost. This includes the cost of the computing and data processing systems that support the process of entering each new customer into the system and activating the customer on the system. On average, the activation process takes 0.15 hour on the computer, and the cost of computer time is estimated at €300 per hour.

Based on these cost estimates and the projected addition of 1 million new customers during fiscal 2011, CCS developed the estimate of costs for the upcoming year (see Exhibit 10-17.)

The document summarizing these costs—variously referred to as budgeted costs, estimated costs, projected costs, target costs, or forecasted costs, but all identify the same costs—is called the **master budget**. Note that the budgeted costs of €95,500,000 depend on the following:

1. The projected volume of activity, which in this example is 1 million customers.
2. The standards for the quantity of each of the budgeted items.
3. The standards for the cost per unit of each of the budgeted items.

If any of these items differs from the forecasted amount, the actual total costs will differ from the master budget total.



The costs of direct materials such as these metal rods, brackets, and extrusions are significant costs of a manufactured product. Purchasing has to carefully consider what quantities to buy in order to get the best price without stockpiling too much inventory.

Shutterstock

Exhibit 10-17
Canning Cellular Services: Master Budget

	Units/Customer Use	Cost/Unit	Total Cost
Direct material:			
Welcoming package	1.00	€25.00	€25,000,000
Direct labor:			
Sales staff	0.50	25.00	12,500,000
Technical staff	0.25	40.00	10,000,000
Support cost:			
Data processing	0.20	15.00	3,000,000
System activation	0.15	300.00	45,000,000
Total customer-related costs			€95,500,000

Exhibit 10-18
Canning Cellular Services: Summary of First-Level Variances

	Master Budget	Actual Costs	Difference
Direct material:			
Welcoming package	€25,000,000	€29,700,000	€4,700,000
Direct labor:			
Sales staff	12,500,000	14,850,000	2,350,000
Technical staff	10,000,000	10,890,000	890,000
Support cost:			
Data processing	3,000,000	3,960,000	960,000
System activation	45,000,000	42,900,000	(2,100,000)
Total customer-related costs	€95,500,000	€102,300,000	€6,800,000

First-Level Variances

Several weeks after year-end 2011, the company comptroller forwarded to the manager of new customer accounts the summary shown in Exhibit 10-18, which displays the **first-level variances** for different cost items. The first-level variance for a cost item is the difference between the actual costs and the budget or planned costs for that cost item. By convention, variances are computed by subtracting budget costs from actual costs. Therefore, variances are "favorable" if the actual costs are less than the estimated master budget costs—that is, if the variance is negative. "Unfavorable" variances arise when actual costs exceed estimated budget costs—that is, when the variance is positive. In this example, the first-level cost variance for sales staff, for example, is €2,350,000 unfavorable.

Sharon Mackenzie, the manager of new customer accounts, was surprised by the report because she had directed her staff to undertake specific initiatives related to employee training and equipment improvement, both intended to reduce costs. Not only had costs not decreased, but they had increased by €6,800,000, which was significant. There was no explanation in this exhibit to help Sharon understand what went wrong. Therefore, Sharon demanded an explanation for why costs had not decreased following the cost-cutting initiatives.

Decomposing the Variances

Following up on Sharon's demand, the financial group prepared Exhibit 10-19 and forwarded it to her. Fred Liang, the CCS comptroller, explained to Sharon that Exhibit 10-19 uses a **flexible budget**, in which the forecast in the master budget is adjusted for the

Exhibit 10-19

Canning Cellular Services: Master Budget, Flexible Budget, and Actual Results Summary

	Master Budget 1,000,000			Flexible Budget 1,100,000			Actual Results 1,100,00		
	U/C	Cost	Total	U/C	Cost	Total	U/C	Cost	Total
Direct material:									
Welcoming package	1.00	€25.00	€25,000,000	1.00	€25.00	€27,500,000	1.00	€27.00	€29,700,000
Direct labor:									
Sales staff	0.50	25.00	12,500,000	0.50	25.00	13,750,000	0.45	30.00	14,850,000
Technical staff	0.25	40.00	10,000,000	0.25	40.00	11,000,000	0.22	45.00	10,890,000
Support cost:									
Data processing	0.20	15.00	3,000,000	0.20	15.00	3,300,000	0.24	15.00	3,960,000
System activation	0.15	300.00	45,000,000	0.15	300.00	49,500,000	0.12	325.00	42,900,000
Total customer-related costs			€95,500,000			€105,050,000			€102,300,000

difference between planned volume and actual volume. Therefore, the flexible budget reflects a cost budget or forecast based on the level of volume that is actually achieved rather than the planned volume—and it is the planned volume that underlies the master budget. Fred referred Sharon to Exhibit 10-19, which provides the details of the flexible budget calculations. A cost difference between a master budget and flexible budget is a **planning variance** because it reflects the difference between planned activity and actual activity. Planning variances arise entirely because the planned volume of activity was not realized. Therefore, based on the result that 1.1 million new customers were added instead of the planned 1 million, the projected, or budgeted, level of costs is now €105,050,000.

Sharon immediately noted three facts when she reviewed Exhibit 10-19:

1. The number of actual customers exceeded the number of customers used to forecast costs.
2. The actual unit cost of four of the five items in the budget exceeded the standard unit cost used to develop the forecast.
3. The per-unit use of both labor items and one of the two support costs was lower, reflecting the results of the process improvements that Sharon had commissioned. The per unit use of the other support item was higher, but only because midway through the year Sharon had developed a more comprehensive form that required more input for new customers.

Sharon asked the finance group to isolate the effects of these various price and use variances.

Planning and Flexible Budget Variances

In response, the finance group provided Sharon with the additional information shown in Exhibit 10-20. Fred explained that the differences between the flexible budget and the actual results—the **flexible budget variances**—reflect variances from the budget level of costs adjusted for the actual level of activity. He further explained that since the flexible budget identifies the budgeted level of costs for the activity levels achieved, Sharon's focus should be on these variances to determine whether the cost-cutting activities had been successful. Because the total flexible budget variance was –€2,750,000—a favorable variance—overall costs were lower than the

Exhibit 10-20
Canning Cellular Services: Second-Level Variance Summary

	Master Budget	Planning Variance	Flexible Budget	Flexible Budget Variance	Actual Results
Direct material:					
Welcoming package	€25,000,000	€2,500,000	€27,500,000	€2,200,000	€29,700,000
Direct labor:					
Sales staff	12,500,000	1,250,000	13,750,000	1,100,000	14,850,000
Technical staff	10,000,000	1,000,000	11,000,000	(110,000)	10,890,000
Support cost:					
Data processing	3,000,000	300,000	3,300,000	660,000	3,960,000
System activation	45,000,000	4,500,000	49,500,000	(6,600,000)	42,900,000
Total customer-related costs	€95,500,000	€9,550,000	€105,050,000	€(2,750,000)	€102,300,000

budgeted costs for the achieved level of activity. Fred pointed out to Sharon that the planning variance and flexible budget variance are called **second-level variances**, which together add up to the first-level variance.

Sharon was pleased with this information but still concerned. She pointed out to Fred that these flexible budget variances reflect both quantity variances—the difference between the planned and the actual use rates per unit of output—and price variances—the difference between the planned and the actual price per unit of the various cost items. Sharon asked Fred to prepare an exhibit that would highlight the incremental effects of quantity differences and the incremental effects of price variances.

Quantity and Price Variances for Material and Labor

Direct material flexible budget variances and direct labor flexible budget variances can be decomposed further into **efficiency variances**—also called **quantity variances**—and **rate variances**—also called **price variances**. We can refer to these as **third-level variances** because together they explain the flexible budget component of the second-level variance. In Exhibit 10-20, the amount of direct materials used equals the volume of production achieved (1.1 million units produced, that is, customers served) multiplied by the actual use rate, which was 1, giving an actual quantity of direct materials use of 1.1 million. The flexible budget allowance is the volume of production achieved (1.1 million customers) multiplied by the planned or target quantity use rate, which was 1, giving a planned, or budgeted, quantity of direct materials of 1.1 million.

Material Quantity and Price Variances

The material quantity variance can be calculated from the following relationship:

$$\begin{aligned}\text{Quantity variance} &= (AQ - SQ) \times SP \\ &= (1{,}100{,}000 - 1{,}100{,}000) \text{ units} \times €25 \text{ per unit} \\ &= 0\end{aligned}$$

where

AQ = Actual quantity of materials used
SQ = Standard quantity of materials allowed for the production level achieved
SP = Estimated or standard price of materials

The material price variance for direct materials is calculated using the following relationship:

$$\begin{aligned}\text{Price variance} &= (AP - SP) \times AQ \\ &= (€27 - €25) \text{ per unit} \times 1{,}100{,}000 \text{ units} \\ &= €2{,}200{,}000 \text{ (unfavorable)}\end{aligned}$$

where

AP = Actual price of materials
SP = Estimated or standard price of materials
AQ = Actual quantity of materials used

We have now decomposed the total variance for the cost of the welcoming package, which is the direct material in this example, into a material quantity variance and a material price variance. When we add these two third-level variances together (€0 + €2,200,000 unfavorable), we obtain the total flexible budget variance for direct materials (€2,200,000 unfavorable).

The logic of decomposing the variances is easily verified by adding the algebraic formulas for material quantity and price variances. The sum of the decomposed variances is as follows:

$$\begin{aligned}\text{Sum of decomposed vasriances} &= \text{Quantity variance} + \text{Price variance} \\ &= [(AQ - SQ) \times SP] + [(AP - SP) \times AQ] \\ &= (AQ \times SP) - (SQ \times SP) \\ &\quad + (AP \times AQ) - (SP \times AQ) \\ &= (AP \times AQ) - (SQ \times SP) \\ &= \text{Actual cost} - \text{Budgeted cost} \\ &= \text{Flexible budget variance}\end{aligned}$$

What does this variance and its decomposition tell Sharon, who is the manager ultimately responsible for these costs? They tell her that the quantity used was consistent with the number of customers, no more and no less. They also tell her that the cost of €27 per unit exceeded the standard, or budgeted, cost of €25 per unit. Perhaps this cost increment reflected changes in the welcoming package or perhaps additional costs billed by the supplier. Given the magnitude of the variance—€2, or 8% of the target cost—Sharon would follow up to determine its cause. However, it is important to point out that as a good manager, Sharon might already be well aware of the variance and its cause and that the value of the variance analysis is to confirm its amount.

Material Quantity and Price Variances: A General Approach

Many people find that a diagram makes calculating variances easier. To prepare such a diagram, we define one more variable, PQ, the actual quantity of raw materials purchased. This additional variable allows one to handle situations where the amount of raw materials purchased differs from the amount of raw materials used. Here are the terms that you will see in Exhibit 10-21:

Total Cost: The actual cost of the acquired raw materials = purchased quantity (PQ) × actual price (AP).

Price Adjusted Cost: The cost of acquired materials using the standard price = purchased quantity (PQ) × standard price (SP).

Price Adjusted Quantity: The cost of materials used using the standard price = quantity used (AQ) × standard price (SP).

Flexible Budget Cost: The cost of the standard quantity of materials = standard quantity (SQ) × standard price (SP).

Exhibit 10-21
Direct Materials Flexible Budget Variance Analysis

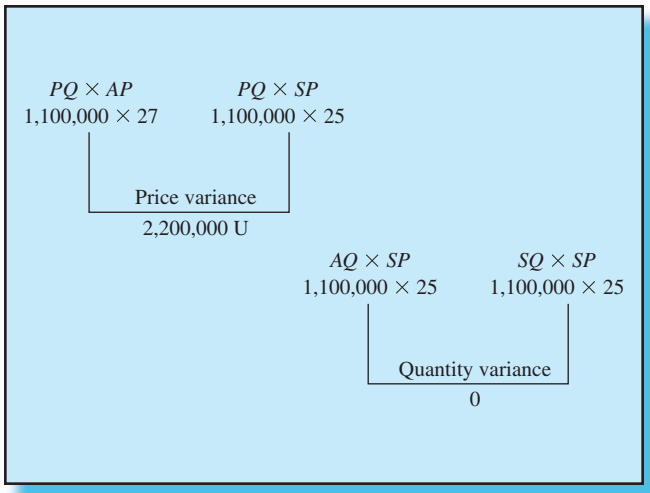
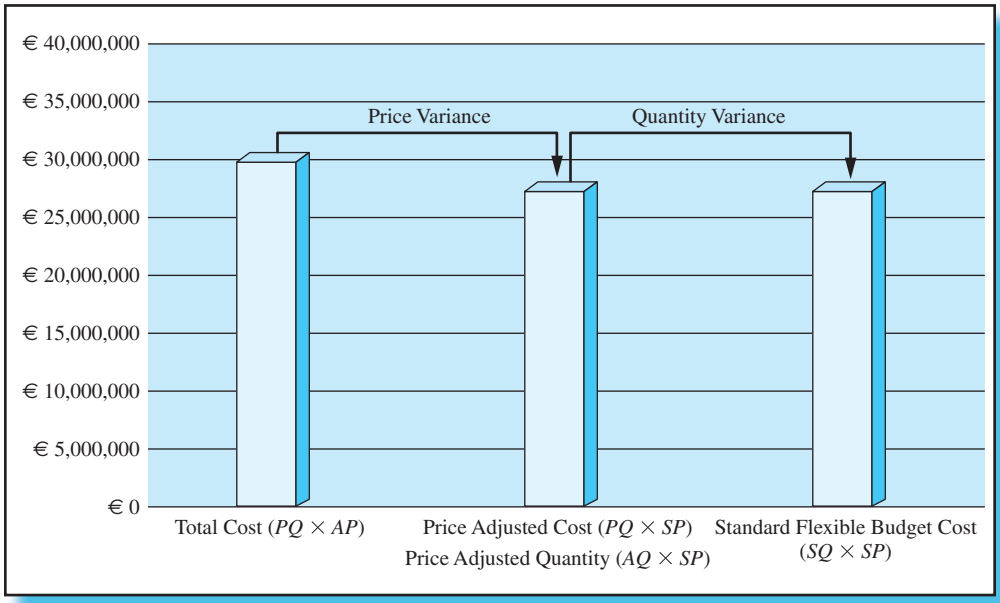


Exhibit 10-22
A Graphical Approach to Direct Materials Flexible Budget Variance Analysis



Where the quantity acquired is the quantity used, as is the case in the CSS example, the price-adjusted cost and the price-adjusted quantity are equal.

Exhibit 10-21 diagrams the flexible budget variances for direct materials costs, and Exhibit 10-22 illustrates a graphical approach representing these variances when the price-adjusted cost and the price-adjusted quantity are equal.

Efficiency and Wage Rate Variances for Direct Labor Costs

The labor cost variances are determined in a way similar to that described for material quantity and price variances. The formulas are as follows:

$$\text{Labor efficiency variance} = (AH - SH) \times SR$$
$$\text{Labor rate variance} = (AR - SR) \times AH$$

where

AH = Actual number of direct labor hours
AR = Actual wage rate
SH = Number of direct labor hours allowed given the level of output achieved
SR = Standard wage rate

Note that while it is common to use the terms *price* and *quantity* for the material variances, it is common to use the terms *rate* and *efficiency* for the comparable labor variances.

The total cost variance for labor is computed as follows:

$$\begin{aligned}\text{Efficiency variance} + \text{Rate variance} &= (AH - SH) \times SR + (AR - SR) \times AH \\ &= (AH \times SR) - (SH \times SR) \\ &\quad + (AR \times AH) - (SR \times AH) \\ &= (AR \times AH) - (SR \times SH) \\ &= \text{Actual cost} - \text{Budgeted cost} \\ &= \text{Flexible budget variance}\end{aligned}$$

To compute the efficiency and rate variance for the sales staff, the total hours of sales staff used is 495,000 (0.45 × 1,100,000 hours), and the total budgeted level of hours, given the achieved level of production, is 550,000 (0.5 × 1,100,000 hours).

Therefore, the efficiency variance for sales staff labor cost is as follows:

$$\begin{aligned}\text{Efficiency variance} &= (AH - SH) \times SR \\ &= (495{,}000 - 550{,}000) \times €25 \\ &= -€1{,}375{,}000 \text{ (favorable)}\end{aligned}$$

The efficiency efforts commissioned by Sharon evidently paid off in terms of fewer hours used of sales staff time than planned for the achieved level of income, resulting in cost savings of €1,375,000.

The price or rate variance for sales staff labor is as follows:

$$\begin{aligned}\text{Rate variance} &= (AR - SR) \times AH \\ &= (€30 - €25) \text{ per hour} \times 495{,}000 \text{ hours} \\ &= €2{,}475{,}000 \text{ (unfavorable)}\end{aligned}$$

In other words, for the number of hours worked, the sales staff was paid €2,475,000 more than was planned when the master budget was developed. This increase might reflect a corporate-wide wage adjustment that is beyond Sharon's control, or perhaps it reflects the hiring of more skilled and qualified sales staff who were responsible for the favorable efficiency variance. These facts would be established by an investigation, which would be triggered by a variance this size.

Exhibit 10-23 shows another way to visualize direct labor variances. As required, the sum of the rate variance and the efficiency variance equals the total flexible budget variance for sales staff costs. Total flexible budget variance for sales staff cost = −€1,375,000 + €2,475,000 = €1,100,000 (unfavorable).

Efficiency and Wage Rate Variances for Direct Labor Costs: A General Approach

Following are the terms we need to diagram the flexible budget variances for direct labor costs:

Total Cost: The actual cost of direct labor = actual labor hours (AH) × actual labor rate (AR).

Price Adjusted Quantity: The cost of direct labor quantity using the standard price = actual labor hours (AH) × standard labor rate (SR).

Exhibit 10-23
Visualizing the Direct Labor Cost Variances

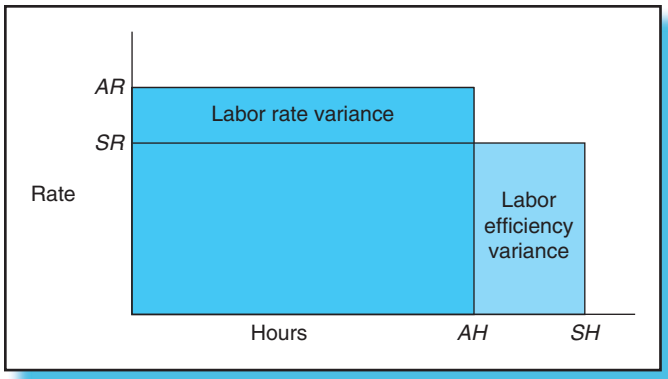


Exhibit 10-24
Direct Labor Flexible Budget Variance Analysis

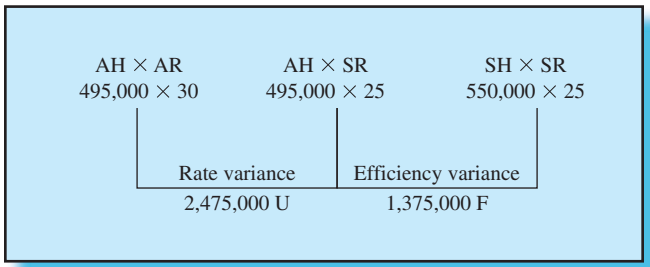
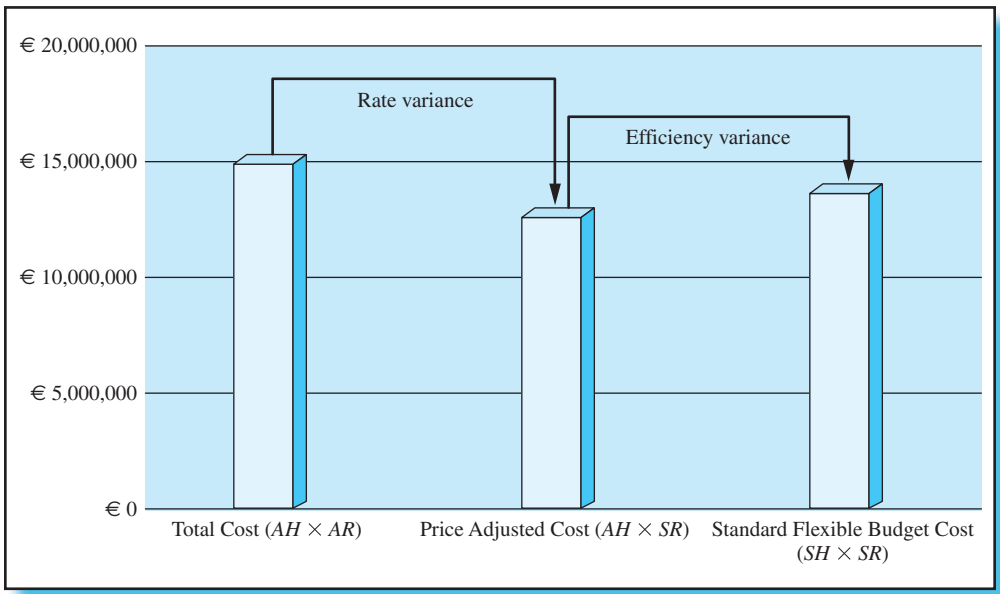


Exhibit 10-25
A Graphical Approach to Direct Labor Flexible Budget Variance Analysis



Flexible Budget Cost: The cost of the standard quantity of labor = standard labor hours (SH) × standard labor rate (SR).

Exhibit 10-24 diagrams the flexible budget variances for direct labor costs, and Exhibit 10-25 shows a graphical approach to representing these variances.

Detailed Analysis of Support Activity Cost Variances

What about support costs? Support costs can reflect variable, or fixed, costs. The quantity of fixed costs may not change from period to period, but the spending on them may fluctuate. Engineers can travel, take courses, vacation, quit, and be replaced with someone else. Thus, it is possible and desirable to monitor spending variances on capacity-related resources, even when one cannot monitor efficiency variances that will show up as changes in used and unused capacity.

What about variable support costs? Such support costs reflect behind-the-scenes operations that are proportional to the volume of activity but are not directly a part of the product or service provided to the customer. For example, an indirect support cost in a factory would be the wages paid to employees who move work in process around the factory floor as the product is being made.

At CCS, these support costs reflect (1) the time and cost of the equipment and personnel who input customer data each time a new customer is added to the CCS customer file, and (2) the time and cost of equipment and personnel each time a new customer is activated on the computers that control access to the cellular system.

An investigation by Sharon revealed that the cost of the data processing staff had two components: a wage rate and a system access charge incurred when the data processor was accessing the system. These cost components are summarized in Exhibit 10-26.

The actual hourly clerical wage is €10, and for each hour the clerk works, the database is, on average, accessed for 0.1 hour. The system access fee is €50. This yields a total cost of €15 per data processing clerk hour. When an aggregate rate per hour is constructed in this way, the rate variance will reflect both the amount and the cost of the components used to compute the rate. With this understanding of how the rate was computed for a flexible support item, cost analysis can be used to investigate the variance associated with a support cost item.

In view of the size of the variance associated with system activation costs, Sharon directed Fred to analyze its source. Exhibit 10-27 summarizes the calculation used to develop the €300 hourly charge for the hourly activation rate, which has two components. One component reflects the wage paid to the sales staff, which is €40 per hour. The other component is the system access fee, which is charged at the rate of €520 per hour of access. On average, the sales staff accesses the activation system for half an hour for each hour worked, yielding the blended rate of €300 per hour, which was used in developing the budget.

Exhibit 10-26
Canning Cellular Services: Clerical Budgeted Cost per Hour

	Units	Rate	Total
Clerical wage	1	€10.00	€10.00
Computer access time	0.1	50.00	5.00
Total cost per hour			€15.00

Exhibit 10-27
Canning Cellular Services: Technical Staff Budgeted Hourly Cost Calculation

	Units	Rate	Total
Technical staff	1	€40.00	€40.00
Computer access time	0.5	520.00	€260.00
Total cost per hour			€300.00

Exhibit 10-28
Canning Cellular Services: Actual Calculation of Technical Staff Cost per Hour

	Units	Rate	Total
Technical staff	1	€55.00	€55.00
Computer access time	0.45	600.00	€270.00
Total cost per hour			€325.00

Exhibit 10-29
Canning Cellular Services: Analysis of System Activation Flexible Budget Variance

Due to labor use	$[(1{,}100{,}000 \times 0.12 \times 1) - (1{,}100{,}000 \times 0.15 \times 1)] \times €40 = €1{,}320{,}000$ F
Due to labor rate	$1{,}100{,}000 \times 0.12 \times 1 \times (€55 - €40) = €1{,}980{,}000$ U
Due to additional computer use	$[(1{,}100{,}000 \times 0.12 \times 0.45) - (1{,}100{,}000 \times 0.15 \times 0.5)] \times €520 = €12{,}012{,}000$ F
Due to additional access rate	$1{,}100{,}000 \times 0.12 \times 0.45 \times (€600 - €520) = €4{,}752{,}000$ U

Investigation yielded the information in Exhibit 10-28 to explain the actual access fee. Note that the actual rate differs from the budget rate for three reasons: (1) The wage paid to the sales staff was €15 higher than the budgeted rate, (2) the computer access time per hour worked by sales staff was lower than budgeted, and (3) the rate for computer access time was higher than budgeted.

These three elements, combined with the data in Exhibit 10-19, allow Fred to develop the information in Exhibit 10-29, which explains the total flexible budget variance for system activation support costs.

Sales Variances

We have studied how managers factor cost variances into different components in order to signal to management where costs deviated from the plan or target amounts. What about revenues? To illustrate a common approach to variance analysis for sales, consider Danny's Bagel Barn.

Danny sells three types of bagels: regular, superior, and deluxe, which are priced at $0.40, $0.55, and $0.70, respectively. Exhibit 10-30 displays the sales budget that Danny prepared for July.

During July, Danny experienced intense sales competition from Maggie's Bagel Factory on his regular and superior bagel lines. Danny cut his prices for those two lines.

Exhibit 10-30
Danny's Bagel Barn: Planned Sales for July

	Products						
	Regular		Superior		Deluxe		
	Data	% Total	Data	% Total	Data	% Total	Total
Unit Price	$0.40		$0.55		$0.70		
Unit Sales	10,000	50.00%	6,000	30.00%	4,000	20.00%	$20,000
Total	$4,000		$3,300		$2,800		$10,100

Exhibit 10-31
Danny's Bagel Barn: Actual Sales for July

	Products						
	Regular		Superior		Deluxe		
	Data	% Total	Data	% Total	Data	% Total	Total
Unit price	$0.35		$0.50		$0.80		
Unit sales	9,000	42.86%	7,000	33.33%	5,000	23.81%	21,000
Total	$3,150		$3,500		$4,000		$10,650

Even with the price cut, Danny sold fewer regular bagels than planned. However, the price cut on the superior bagels resulted in higher than planned sales. Exhibit 10-31 summarizes the July results.

Danny notes that revenues were $550 higher than planned ($10,650 − $10,100) and would like to know how the price changes and volume changes each contributed to this difference between planned and actual results.

Managers undertake the reconciliation between actual and planned sales revenue in two steps. The first step isolates the effect of sales volume differences, and the second step isolates the effect of sales price differences.

Sales Volume Effects

In a firm with multiple products, volume-related revenue differences can arise in two ways:

1. ***Because the mix (the percentage of the total of each product's sales) was different than planned.*** This is called the **sales mix variance**, and *for each product,* the sales mix variance is computed as follows:

   Actual total sales units of all products × (Actual sales mix percentage of this product − Planned sales mix percentage of this product) × Planned revenue per unit of this product

   Here is the sales mix variance for each of the products:

   Regular: 21,000 × (0.4286 − 0.5000) × $0.40 = –$600 (unfavorable). (Note that now we are dealing with revenues, so a negative variance is unfavorable.) This means that because sales of the regular bagel made up less than the planned percentage of total sales, revenues of $600 were lost on this product.

   Superior: 21,000 × (0.3333 − 0.3000) × $0.55 = $385 (favorable). This means that because sales of the superior bagel made up more than the planned percentage of total sales, revenues of $385 were gained on this product.

   Deluxe: 21,000 × (0.2381 − 0.2000) × $0.70 = $560 (favorable). This means that because sales of the deluxe bagel made up more than the planned percentage of total sales, revenues of $560 were gained on this product.

2. ***Because the volume of sales was different than planned.*** This is called the **sales quantity variance** and *for each product*, the sales quantity variance is computed as follows:

   (Actual total sales units of all products − Planned total sales units of all products) × Planned sales mix percentage of this product × Planned revenue per unit of this product

Here is the sales quantity variance for each of the products:

Regular: (21,000 − 20,000) × 0.5000 × $0.40 = $200 (favorable). This means that because of the overall increase in sales, if the regular bagel's sales mix percentage had remained as planned, then an increase in sales revenues of $200 would have been realized on this product.

Superior: (21,000 − 20,000) × 0.3000 × $0.55 = $165 (favorable). This means that because of the overall increase in sales, if the regular bagel's sales mix percentage had remained as planned, then an increase in sales revenues of $200 would have been realized on this product.

Deluxe: (21,000 − 20,000) × 0.2000 × $0.70 = $140 (favorable). This means that because of the overall increase in sales, if the regular bagel's sales mix percentage had remained as planned, then an increase in sales revenues of $140 would have been realized on this product.

Sales Price Effects

The sales volume and sales mix variances explain the difference between planned and actual revenues because of volume-related effects. What remains to consider is the effect on revenues of differences between actual and planned selling prices. This is the **sales price variance**.

For each product, the sales price variance is computed as follows:

Actual number of units sold × (Actual price per unit − Planned price per unit)

Here are the sales price variance calculations:

Regular: 9,000 × (0.35 − 0.40) = −$450 (unfavorable). This means that because Danny was unable to sell the regular bagels at the planned price of $0.40 per unit, $450 of revenues were lost on the 9,000 units of sales.

Superior: 7,000 × (0.50 − 0.55) = −$350 (unfavorable). This means that because Danny was unable to sell the superior bagels at the planned price of $0.55 per unit, $350 of revenues were lost on the 7,000 units of sales.

Deluxe: 5,000 × (0.80 − 0.70) = $500 (favorable). This means that because Danny was able to sell the deluxe bagels at a price that exceeded the planned price of $0.70 per unit, $500 of revenues were gained on the 5,000 units of sales.

Exhibit 10-32 summarizes the sales variances for Danny's July operations. Note that, as required, the total of the variances equals the difference between the actual and planned revenues ($10,650 − $10,100).

Exhibit 10-32
Danny's Bagel Barn: Sales Variance Summary

	Products			
	Regular	Superior	Deluxe	Total
Price variance	$(450)	$(350)	$500	$(300)
Sales mix variance	(600)	385	560	345
Sales quantity variance	200	165	140	505
Total	$(850)	$200	$1,200	$550

The Role of Budgeting in Service and Not-for-Profit Organizations

We have focused on the role of budgeting in manufacturing organizations up to this point. Budgeting serves a slightly different but equally relevant role in natural resource companies, service organizations, and not-for-profit (NFP) organizations such as charitable organizations and government agencies. As in manufacturing organizations, budgeting helps nonmanufacturing organizations perform their planning function by coordinating and formalizing responsibilities and relationships and communicating the expected plans. Exhibit 10-33 summarizes the focus of the budgeting process in manufacturing, natural resource, service, and NFP organizations.

In the natural resources sector, the focus is on balancing demand with the availability of natural resources, such as minerals, fish, or wood. Because the natural resource supply often constrains sales, success requires managing the resource base effectively to match resource supply with potential demand.

In the service sector, the focus is on balancing demand and the organization's ability to provide services, which is determined by the level and mix of skills in the organization. Although the service sector often uses machines to deliver products to customers, most operations remain labor paced—that is, they operate at a pace dictated by their human operators. Therefore, people rather than machines usually represent the capacity constraint in the service sector. Planning in the service sector must consider the time needed to put skilled new people in place as sales increase. Planning is critical in high-skill organizations, such as in a consulting business, because people capacity is expensive and services cannot be inventoried when demand falls below capacity.

In NFP organizations, the focus of budgeting has been to balance revenues raised by taxes or donations with spending demands. In government agencies, planned cash outflows, or spending plans, are called **appropriations**. Appropriations set limits on a government agency's spending. Governments worldwide are facing increased pressures to eliminate deficits without raising tax revenues. Therefore, many governments are looking for ways to eliminate unnecessary expenditures and to make necessary expenditures more efficient rather than just ensuring that government agencies do not spend more than they have been authorized to spend. As part of the planning process, these agencies must establish priorities for their expenditures and improve the productivity with which they deliver services to constituents.

Periodic and Continuous Budgeting

The basic budgeting process described in this chapter involves many organizational design decisions, such as the length of the budget process, the basic budget spending assumptions, and the degree of top management control.

Exhibit 10-33
Focus of Budgeting in Different Organizations

Organization Type	Main Focus of Budgeting Process
Manufacturing	Sales and manufacturing activities
Natural resource	Sales, resource availability, and acquisition
Service	Sales activities and staffing requirements
NFP	Raising revenues and controlling expenditures

The budget process described for Oxford Tole Art is performed on an annual budget cycle or, generally, a **periodic budget** cycle. Gael, the owner, prepares budgets periodically for each planning period. Although planners may update or revise the budgets at anytime during the budget period, periodic budgeting is typically performed once per budget period.

In a **continuous budget** cycle, as one budget period—usually a month or a quarter—passes, planners drop the current budget period from the master budget and add a future budget period in its place. Therefore, if Oxford Tole Art used continuous budgeting with a one-year cycle, April would drop one month from the beginning of the budget period and add a month to the end of the budget period as each month passes, at the same time making any changes in the estimates of the original months 2 through 12 that appear appropriate given new information that arrived during period 1. For example, at the end of February 2011, April would drop February 2011 from the budget and add February 2012.

The length of the budget period used in continuous budgeting reflects the competitive forces, skill requirements, and technology changes that the organization faces. The budget period must be long enough for the organization to anticipate important environmental changes and adapt to them and yet short enough to ensure that estimates for the end of the period will be reasonable and realistic. Advocates of periodic budgeting argue that continuous budgeting takes too much time and effort and that periodic budgeting provides virtually the same benefits at a lower cost. Advocates of continuous budgeting argue that it keeps the organization planning and assessing and thinking strategically year-round rather than just once a year at budget time.

Controlling Discretionary Expenditures

Organizations use three general approaches to budget discretionary expenditures for items such as spending on research and development:

1. Incremental budgeting.
2. Zero-based budgeting.
3. Project funding.

Each has benefits relative to the others.

Incremental Budgeting

Incremental budgeting bases a period's expenditure level for a discretionary item on the amount spent for that item during the previous period. If the total budget for discretionary items increases by 10%, each discretionary item is allowed to increase 10%. This basic model has variations. For example, if the total spending on all discretionary items is allowed to increase by 10%, all discretionary spending may experience an across-the-board increase of 5%, and the remaining 5% increase in total spending may be allocated to discretionary items based on merit, such as a high level of performance on an existing project that can be expanded, or based on need, such as a promising new project.

Some people have criticized incremental budgeting because it does not require justification of the organization's goals for discretionary expenditures. Incremental budgeting includes no provision to reduce or eliminate expenditures as the organization changes, nor does it have a mechanism to provide disproportionate support to discretionary items that will yield substantial benefits.

Zero-Based Budgeting

Zero-based budgeting (ZBB) requires that proponents of discretionary expenditures continuously justify every expenditure. (*Note:* ZZB is inappropriate for budgeting costs that vary in proportion to production, such as the amount of wood used in a furniture factory, since by their nature they are inevitable once the manufacturing decision is made.) For each planning period, in ZBB, the starting point for each budget line item is zero.

ZBB arose, in part, to combat indiscriminate incremental budgets, which are based on a percentage adjustment of the previous period's budget. Because incremental budgeting requires very little thought, it often results in misallocation of resources. Proponents also proposed ZBB to control projects that, once activated, take on a life of their own and resist going out of existence, such as a government department that is created for one purpose and is not disbanded when that purpose has been achieved or is no longer required.

Under ZBB, planners allocate the organization's scarce resources to the spending proposals they think will best achieve the organization's goals. While this seems logical, the zero-based approach to planning discretionary expenditures is controversial. This approach to project budgeting has been used primarily to assess government expenditures. In profit-seeking organizations, ZBB has been applied only to discretionary expenditures, such as research and development, advertising, and employee training.

Traditionally, ZBB ideas do not apply to engineered costs—that is, short-term costs that have an identifiable relationship with some activity level. Engineered costs are controlled by measuring and using reports of the amounts of resources consumed by operating activities and by the cost variances described earlier. However, even for engineered costs, ZBB could be effective when combined with the reengineering approach. For example, reengineering a product or process involves developing a vision of how a product should perform or how a process should work independently of current conditions. It is possible to use ZBB as a tool to provide baseline costs to new products or processes.

Project funding requires detailed scrutiny of data in order to determine how much discretionary spending should occur in a very specific time period.
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Project Funding

Critics of ZBB complain that it is expensive because it requires so much employee time to prepare. These critics have proposed an intermediate solution between the two extremes of ZBB and incremental budgeting to mitigate the disadvantages of each. The intermediate solution is called **project funding** and is a proposal for discretionary expenditures with a specific time horizon or sunset provision. Projects with indefinite lives, which are sometimes called *programs*, should be continuously reviewed to ensure that they are living up to their intended purposes.

Advocates of discretionary expenditures state their requests as project proposals that include project duration and cost for each period during a project's life. Planners approve no discretionary spending for projects that have indeterminate lengths or indeterminate spending amounts. If the planners approve the project, they agree to provide the level of support requested in the plan. Requests to extend or modify the project must be approved separately. The advantage of providing sunset provisions is that they strike a balance between the high cost resulting from the need for close scrutiny and continuous justification provided by ZBB and the much lower cost of incremental budgeting.

Managing the Budgeting Process

Who should manage and oversee the budgeting process? Many organizations use a budget team, headed by the organization's budget director, sometimes the controller or the chief financial officer, to coordinate the budgeting process. The budget team usually reports to a budget committee, which generally includes the chief executive officer, the chief operating officer, and the senior executive vice president. The composition of the budget committee reflects the role of the budget as the planning document that reflects and relates to the organization's strategy and objectives. The danger of using a budget committee is that it may signal to other employees that budgeting is relevant only to senior management. Senior management must take steps to ensure that the organization members affected by the budget do not perceive the budget and the budgeting process to be beyond their control or responsibility.

Criticisms of the Traditional Budgeting Model and the "Beyond Budgeting" Approach

In this chapter we have discussed the traditional model of budgeting. The traditional approach was developed in the 1920s for cost control purposes. As organizations grew and became more complex, senior management relied increasingly on the budgeting process to control the complexity of multiple divisions, diverse product lines, and new technologies and to motivate managers to achieve specific goals. Today's budgeting process in large organizations is often a yearlong process involving thousands of people and enormous quantities of time and resources.

According to critics the traditional budgeting process has gone unchecked for too long. The traditional model was useful when market conditions were stable, competition and the need for continual innovation were not as intense as they are today, and customers were not as demanding. Critics claim that the traditional budgeting process is an outmoded ritual that hamstrings organizations and managers and prevents them from being able to respond to a constantly changing environment. It reflects a top-down approach to organizing that is inconsistent with the need to be flexible and adapt to changing organizational circumstances. Further, it focuses on controls (such as meeting the target budget) rather than on helping the organization

achieve its strategic objectives. Resource allocations are also driven by politics rather than strategy—that is, political power in the organization drives resource allocations rather than the strategic needs that drive traditional budgeting.

As an alternative, leading critics such as Jeremy Hope and Robin Fraser[1] have proposed a "beyond budgeting" approach. The beyond budgeting approach differs in two fundamental ways from traditional budgeting. First, traditional budgets are based on fixed annual plans that tie managers to predetermined actions. In the beyond budgeting approach, targets are developed based on stretch goals tied to peers, competitors, and key global benchmarks. These targets are reviewed and modified if necessary and managers are more motivated to achieve these goals since the goals represent measures that link directly to the competition rather than an internal artificial goal. Second, the beyond budgeting model provides a more decentralized way of managing. Rather than relying on traditional hierarchical and centralized management, managers are much more accountable to their teams and work groups since the targets directly pertain to what they are doing. This provides everyone with a more direct sense of responsibility and is more motivating. While the arguments for the beyond budgeting approach are sound, it has been difficult for many organizations to switch to this approach because it requires a fundamental shift not only in thinking but also in the way entire organizations operate.

Epilogue to the California Budget Crisis

On September 24, 2010, Governor Arnold Schwarzenegger and state lawmakers agreed to a compromise to close the $19.1 billion deficit and give California a budget. The agreement ended the state's record three-month impasse that began on July 1, 2010. The deal was reached after a grueling five-hour negotiating session among the Governor and Democratic and Republican heads of the Senate and the State Assembly. A relieved

Budgeting is often not a game for the feint of heart. The process can be extremely contentious as evidenced by these lawmakers.

Getty Images, Inc.—Getty News

[1] J. Hope and R. Fraser, *Beyond Budgeting: How Managers Can Break Free from the Annual Performance Trap* (Boston: Harvard Business School Press, 2003).

Darrell Steinberg, the Senate president pro tem, emerged from the meeting simply saying, "We have a comprehensive agreement. The new budget deal neither raises taxes as desired by Democrats nor does it gut the state's welfare system as desired by Republicans. Pundits have already predicted even more fireworks for the next budget cycle. As we can all see from this example, the technical side of the budgeting process is quite easily managed compared to the effects of politics and human behavior.

Summary

This chapter discussed how organizations use budgets to plan what they are going to do during a budget period—which is usually one year—to allocate resources to various projects, and to monitor progress toward achieving financial objectives.

We saw that there are two types of budgets: Operating budgets describe the various activities (for example, hiring people, acquiring machinery and raw materials, producing, and distributing) that the organization plans to undertake during the budget period, whereas financial budgets describe the expected financial consequences (in particular, cash flows and expected profits) of those planned activities.

Budgeting, the process of preparing budgets, allows the organization to evaluate whether prospective plans are feasible and have the potential to achieve the organization's objectives. When done properly, budgeting coordinates activities toward achieving the organization's objectives and provides a means of involving organization members in the budgeting process and through this involvement increasing employee commitment to achieving the budget objectives.

The Oxford Tole Art example provided an extended illustration of the budgeting process and showed how organizations commit to and budget for variable costs (such as raw materials and paint) and short- and long-term fixed costs (such as painters and production facilities).

The chapter discussed what-if analysis, a modeling tool that explores the effects on scheduled activities and financial results as key assumptions (such as employee productivity, materials costs, or product prices) are changed. We saw that what-if analysis allows decision makers to determine how sensitive plans are to the underlying assumptions, which, in turn, may suggest either contingency planning or additional investment to make estimates more accurate.

The chapter described variance analysis, which involves comparing actual results to planned results and, when the variance (the difference between the planned and actual results) is deemed significant, undertaking an investigation to determine its cause. In this sense, a variance is like a warning signal—it signals that someone was not as expected but not what or why—that requires investigation.

The chapter discussed some different approaches to the traditional budgeting model illustrated by Oxford Tole Art. Whereas periodic budgeting involves developing a budget for each budget period, continuous budgeting involves rolling the budget forward each month. So, for example, as January of this year is completed, a budget for January of next year is added to the budget. In this way the budget period is continuously maintained.

A common approach to budgeting, often found in governments, is incremental budgeting. In this approach, this year's budget is based on an incremental adjustment of last year's budget. For example, each budget unit is told to increase sales by 10% or to cut costs by 5%. Most students of budgeting consider this approach to be practical but ineffectual since it does not recognize the specific and differential opportunities facing different units in the organization. For example, one division may face a mature and declining market for its products and find it difficult to maintain let alone increase its sales, whereas another product division may be competing in an expanding market where sales increases come relatively easily. Asking both divisions to increase sales by 10% does not reflect the differential opportunities facing the two divisions.

Managers monitor and evaluate discretionary expenditures (such as advertising, research and development, and employee training) differently than expenditures that are tied to and driven by acquisition, production, and distribution activities where activity measures and outcomes are readily measured. Because it is very difficult to measure the outcome of discretionary expenditures (for example, how do we measure the effect on profits of advertising), managers usually control these expenditures through spending budgets that are often tied to sales (for example, research and development will be 5% of

sales). As we saw, this type of control does not evaluate whether the money is being well spent, and managers continue to search for ways to measure the benefits of discretionary expenditures.

Finally, the chapter considered some alternatives to, and complaints about, traditional budgeting. The concern is that organizations often prepare budgets slavishly and then tie performance to achieving budgeted performance. Some people believe that this approach inhibits both organization flexibility and innovation (better to achieve the budget than be innovative by redirecting funds to another project). In summary, most organizations continue to use some form of budgeting to plan, allocate resources, and coordinate organization activities. The well-known limitations associated with the traditional budgeting model continue to be addressed by modifications, such as those described in this chapter.

Key Terms

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Assignment Materials

Questions

10-1 What is a budget? **(LO 1)**

10-2 What is the difference between flexible and capacity-related resources? **(LO 1)**

10-3 A student develops a spending plan for a school semester. Is this budgeting? Why? **(LO 1)**

10-4 How does a family's budget differ from a budget developed for an organization? **(LO 1)**

10-5 What is a production plan? Give an example of one in a courier company. **(LO 2, 3)**

10-6 What is the difference between an operating and a financial budget? **(LO 3)**

10-7 Would a labor hiring and training plan be more important in a university that is hiring faculty members, or a municipal government office that hires casual workers to do unskilled work? Why? **(LO 2, 3)**

10-8 What is the relationship between a demand forecast and a sales plan? **(LO 4)**

10-9 What is a demand forecast? Why is it relevant in budgeting? **(LO 4)**

10-10 Is employee training an example of a discretionary expenditure? Why? **(LO 4)**

10-11 What does a capital spending plan do? **(LO 4)**

10-12 What is an example of a capacity-related expenditure? **(LO 4)**

10-13 Are food costs in a university residence cafeteria a variable cost or a capacity-related fixed cost? Briefly explain. **(LO 4)**

10-14 Are materials always a flexible resource? Why? **(LO 4)**

10-15 What is a line of credit? How is it useful to a small organization? **(LO 4)**

10-16 What are three broad uses for budget information? **(LO 4)**

10-17 What are the similarities and differences between what-if and sensitivity analyses? **(LO 5)**

10-18 What is a variance? How is a dashboard warning light that indicates low oil pressure like a variance? **(LO 6)**

10-19 How does analysis of reasons for variances between actual and estimated costs help managers? **(LO 6)**

10-20 What is a flexible budget? **(LO 6)**

10-21 How are first, second, and third levels of variance analysis related? **(LO 6)**

10-22 Why is it useful to decompose a flexible budget variance into a rate (price) variance and an efficiency (quantity) variance? **(LO 6)**

10-23 "If more experienced workers work on the job than were planned when developing the labor standards, the labor efficiency variance is likely to be favorable, but the labor rate variance is likely to be unfavorable." Do you agree with this statement? Explain. **(LO 6)**

10-24 What effect will the purchase and use of cheaper, lower quality materials likely have on price and quantity (efficiency) components of both materials and labor variances? **(LO 6)**

10-25 What two steps are taken to reconcile the difference between actual and planned sales revenue? **(LO 6)**

10-26 What is an appropriation? Give an example of one in a university. **(LO 7)**

10-27 What is a periodic budget? **(LO 4)**

10-28 You are planning your expenditures for the upcoming school semester. You assume that this year's expenditures will equal last year's plus 2%. What approach to budgeting are you using? **(LO 4)**

10-29 You are willing to donate to worthy organizations. However, you believe strongly that each request for a donation should be evaluated on the basis of its own merits. You would not feel bad in any year if you donated nothing. What approach to budgeting are you using? **(LO 4)**

10-30 What are some criticisms of the traditional budgeting model? **(LO 1, 4, 8)**

10-31 What are two fundamental ways in which the beyond budgeting approach differs from traditional budgeting? **(LO 1, 4, 8)**

Exercises

LO 2, 3 **10-32** ***Budgeting information*** Consider a company that sells prescription drugs. It has salespeople who visit doctors and hospitals to encourage physicians to prescribe its drugs. The company sells to drugstores. Salespeople are evaluated based on the sales in their territories. For each, income is a salary plus a bonus if actual sales exceed planned sales. To plan operations, this company needs to develop estimates of total sales. Where should it get this information?

LO 1, 4, 8 **10-33** ***Budgeting and planning*** Some people say that budgets are great for planning but not for control. What do you think they mean? Do you agree with this sentiment? Explain.

LO 1, 4, 7 **10-34** ***Budgeting: types of resources in a university*** For a university, identify a cost that you think is controllable in the short term and explain why. Identify a cost that you think is controllable in the intermediate term and explain why. Identify a cost that you think is controllable in the long term and explain why. What does this cost structure imply about the university's flexibility in responding to changing student demands and enrollment?

LO 1, 2, 3, 4 **10-35** ***Financial budgets*** Many managers consider the pro forma financial statements to be the most important product of the master budgeting process. Why do you think they believe this?

LO 1, 2, 4, 7 **10-36** ***Consulting company: types of resources*** Budgeting allows an organization to identify broad resource requirements so that it can develop plans to put needed resources in place. Use an example to illustrate why this might be valuable in a consulting company that provides advice to clients.

LO 1, 2, 3, 4 **10-37** ***Canning company: budgeting process*** Budgeting allows an organization to identify potential problems so that plans can be developed to avoid these problems or to deal with them systematically. Give an example of how budgeting might serve this role in a company that buys vegetables and cans them.

LO 3, 4 **10-38** ***Financial budgets: cash flows*** Monthly cash budgets of inflows and outflows are an important part of the budgeting process in most organizations. In the course of preparing a cash budget, the organization must estimate its cash inflows from credit sales. Suppose that in response to

projected cash shortfalls, the organization decides to speed its collections of credit sales. What effect can this have on the organization?

LO 1, 3, 4 **10-39** ***Machine shop: comparing financial and operational results*** Budgeting allows an organization to compare its projected operating and financial results with those of competitors as a general test of the efficiency of the organization's operating processes. Explain how this might be valuable for a machine shop that does custom machining work for its customers.

LO 2, 3 **10-40** ***Merchandising firm purchases budget*** Boynton Company sells a variety of recycling bins. The company estimates that it will sell 40,000 units of bin BLX in April. The company expects to have 6,000 units of BLX in inventory on April 1 and would like 5,000 units of BLX in inventory on April 30. How many units of BLX will Boynton budget to purchase in April?

LO 2, 3 **10-41** ***Manufacturing firm production and purchases budget*** Glynn Company is preparing a budget to determine the amount of part G12 to produce for the first quarter of the year, and the amount of resin to purchase for part G12. The company desires to have 25% of the next month's estimated sales of G12 in inventory at the end of each month. Glynn has a very reliable supplier of resin and therefore desires an ending inventory of only 10% of resin needs for the next month's production. Each unit of G12 requires half a pound of resin. Projected sales of G12 for January, February, and March are 50,000 units, 60,000 units, and 54,000 units, respectively.

Required

(a) How many units of part G12 will Glynn budget to produce in January and February?
(b) How many pounds of resin will Glynn budget to purchase in January and February?

LO 5 **10-42** ***What-if analysis*** Jeren Company is considering replacing its existing cutting machine with a new machine that will help reduce its defect rate. Relevant information for the two machines includes the following:

Cost Item	Existing Machine	New Machine
Monthly fixed costs	$32,000	$40,000
Variable cost per unit	$44	$40
Sales price per unit	$55	$55

Required

(a) Determine the sales level, in number of units, at which the costs are the same for both machines.
(b) Determine the sales level in dollars at which the use of the new machine results in a 10% profit on sales (profit/sales) ratio.

LO 2, 3, 5 **10-43** ***Sensitivity analysis*** Sensitivity analysis is an important component of any budgeting exercise. Which estimates do you think will be most crucial in developing a master budget? Why?

LO 5, 7 **10-44** ***Sensitivity analysis: cost cutting*** A university faced with a deficit reacts by cutting resource allocations to all faculties and departments by 8%. Do you think this is a good approach to budgeting? Why or why not?

LO 6 **10-45** ***Variance analysis, material and labor*** The following information is available for Mandalay Company:

ACTUAL	
Materials:	12,000 pounds purchased at $2.50 per pound; used 10,500 pounds
Direct labor:	1,800 hours at $12 per hour
Units produced:	500
STANDARD	
Materials:	20 pounds per unit at a price of $2.20 per pound
Direct labor:	4 hours per unit at a wage rate of $10 per hour

Required

(a) Determine the material price variance based on the quantity of materials purchased.
(b) Determine the material quantity variance.
(c) Determine the direct labor rate variance.
(d) Determine the direct labor efficiency variance.

LO 6 **10-46** ***Variance analysis, materials and labor*** Pharout Company uses a standard cost system. Job 822 is for the manufacturing of 500 units of the product P521. The company's standards for one unit of product P521 are as follows:

	QUANTITY	PRICE
Direct material	5 ounces	$2 per ounce
Direct labor	2 hours	$10 per hour

The job required 2,800 ounces of raw material costing $5,880. An unfavorable labor rate variance of $250 and a favorable labor efficiency variance of $100 also were determined for this job.

Required

(a) Determine the direct material price variance for job 822 based on the actual quantity of materials used.
(b) Determine the direct material quantity variance for job 822 based on the actual quantity of materials used.
(c) Determine the actual quantity of direct labor hours used on job 822.
(d) Determine the actual labor costs incurred for job 822.

LO 6 **10-47** ***Variance analysis, material and labor*** Each unit of job Y703 has standard requirements of 5 pounds of raw material at a price of $100 per pound and 0.5 hour of direct labor at $12 per hour. To produce 9,000 units of this product, job Y703 actually required 40,000 pounds of the raw material costing $97 per pound. The job used a total of 5,000 direct labor hours costing a total of $60,000.

Required

(a) Determine the material price variance for job Y703.
(b) Determine the material quantity variance for job Y703.

(c) Assume that the materials used on this job were purchased from a new supplier. Would you recommend continuing with this new supplier? Why or why not?
(d) Determine the direct labor rate variance for job Y703.
(e) Determine the direct labor efficiency variance for job Y703.

LO 6 **10-48** ***Standard costs versus actual costs for materials*** Assembly of product P13 requires one unit of component X, two units of component Y, and three units of component Z. Job J372 produced 220 units of P13. The following information pertains to material variances for this job, analyzed by component:

	Component		
	X	Y	Z
Price variance	160 U	120 F	192 U
Quantity variance	168 U	100 U	84 F

The actual material prices were $0.30 more, $0.20 less, and $0.50 more per unit for components X, Y, and Z, respectively, than their standard material prices per unit.

Required

(a) Determine the number of materials units consumed of each type of component.
(b) Determine the standard materials price per unit of each type of component.

LO 4 **10-49** ***Master and flexible budgets*** An organization plans to make a product in batches of 25,000 units. Planned production is 1,000,000 units, and actual production is 1,125,000 units. What are the planned (master budget) number of batches and the flexible budget number of batches?

Problems

LO 2, 3 **10-50** ***Operating budgets: production plan*** Borders Manufacturing is developing a sales and production plan as part of its master budgeting process. Following are the projected monthly sales, which occur uniformly during each month, for the upcoming year:

Borders Manufacturing
Projected Monthly Sales

Month	Unit Sales
January	8,742
February	9,415
March	7,120
April	8,181
May	7,942
June	9,681
July	2,511
August	2,768
September	2,768
October	2,283
November	1,542
December	1,980
January	8,725

Production for each month equals one-half of the current month's sales plus one-half of the next month's projected sales. Develop the production plan for Borders Manufacturing for the upcoming year.

LO 2, 3, 4 **10-51** ***Operating budgets: labor hiring and production plan*** Mira Vista Planters provides reforestation services to large paper products companies. It must hire one planter for every 10,000 trees that it has contracted to plant each month. New employees are hired in the month needed, on the first day of the month. An employee must receive one week of evaluation and training before being profitably employed and therefore works three out of four weeks in the month hired. New employees are paid full wages for all four weeks. For every five prospective employees who enter training, three are deemed suitable for employment. When cutbacks occur, employees are laid off on the first day of the month. Every employee laid off receives severance pay equal to one week's salary, which is on average $400, regardless of how long the layoff will last. Laid-off employees inevitably drift away, and new hires must be trained. The organization will have two trained employees on January 1 and wants to have at least one trained employee at the end of each month.

The company has been offered the following contracts for the upcoming year. Each monthly contract is offered on an accept or reject basis; that is, if a monthly contract is accepted, it must be completed in full. Partial completion is not acceptable. The revenue per tree planted is $0.20.

Mira Vista Planters
Monthly Tree Planting Contracts

Month	Trees
January	8,692
February	5,765
March	8,134
April	34,400
May	558,729
June	832,251
July	1,286,700
August	895,449
September	733,094
October	203,525
November	29,410
December	9,827

Required

Prepare a labor plan for the upcoming year, indicating the following for each month:

(a) Whether you feel the company should accept or reject the proposed planting contract.
(b) How many people will be hired for training. (Recall that an employee is not available for planting during the week of training and that only three of the five employees accepted for training can be hired.)
(c) How many people will be laid off.

Operating budgets: labor hiring plan Strathfield Motel is planning its operations for the upcoming tourist season. The motel has 60 units. The following table presents the average number of daily rentals expected for each of the 12 weeks of the tourist season.

The motel hires housekeeping staff on a weekly basis. Each person can clean 15 rooms per day. Employees must be hired for the entire week at a wage of $400 per employee per week. Because of the motel's location in a midsize city, trained people are always available to work on short notice.

The motel does not own its linen and towels but rents them from a rental agency in a nearby city. The rental contract must be signed for a 4-week period and for a fixed amount of linen and towels. Therefore, the motel must sign three contracts for the 12-week tourist season. The contract provides the linen required for each room for $3 per night.

Strathfield Motel Average Number of Daily Rentals

Week	Average Units Rented	Week	Average Units Rented
1	46	7	55
2	48	8	55
3	54	9	50
4	60	10	45
5	60	11	37
6	60	12	30

Required

Prepare a weekly budget for the hotel showing the following:

(a) The number of housekeeping staff to employ
(b) The number of linen and towel units to contract.

LO 2, 3, 7 **10-53** ***Financial budgets: expense budget*** During the school year, the Homebush School band arranges concert dates in many communities. Because only part of the school's travel expenses are covered by the concert admission fees, the band raises money to help defray its operating expenses through events in the local community such as car washes.

To estimate its expenses for the upcoming year, the band's manager has estimated the number of concert dates for each of the school months, September through May. For each concert, the manager estimates hotel costs of $900, food costs of $480, bus rental costs of $600, and other costs of $200.

The following table presents the number of planned concerts during the upcoming year:

Homebush School Band Scheduled Concerts

Month	Scheduled Concerts	Month	Scheduled Concerts
September	3	February	4
October	4	March	2
November	5	April	5
December	8	May	7
January	3		

Prepare a monthly schedule estimating the band's travel expenses.

LO 2, 3, 7 **10-54** ***Financial budgets: cash inflows*** Worthington Company makes cash (20% of total sales), credit card (50% of total sales), and account (30% of total sales) sales. Credit card sales are collected in the month following the sale, net a 3% credit card fee. This means that if the sale is $100, the credit card

company's fee is $3, and Worthington receives $97. Account sales are collected as follows: 40% in the first month following the sale, 50% in the second month following the sale, 8% in the third month following the sale, and 2% never collected.

The following table identifies the projected sales for the next year:

Worthington Company Projected Sales

Month	Sales	Month	Sales
January	$12,369,348	July	$21,747,839
February	15,936,293	August	14,908,534
March	13,294,309	September	11,984,398
April	19,373,689	October	18,894,535
May	20,957,566	November	21,983,545
June	18,874,717	December	20,408,367

Prepare a statement showing the cash expected each month from the collections from these sales.

LO 2, 3 **10-55** ***Operating budgets: materials purchasing plan*** Masefield Dairy is preparing a third-quarter budget (July, August, and September) for its ice cream products. It produces five brands of ice cream, and each uses a different mix of ingredients. Its suppliers deliver ingredients just in time, provided that they are given two months' notice. The following table indicates the units of weight or volume of each type of ingredient required per unit of each product:

Masefield Dairy Required Ingredients

	Product				
Ingredients	A	B	C	D	E
Ingredient 1	1	2	1	1	1
Ingredient 2	2	0	3	1	4
Ingredient 3	0	1	2	4	0
Ingredient 4	1	3	0	2	2
Ingredient 5	0	2	1	0	2
Ingredient 6	3	1	3	0	1

The following table summarizes the estimated unit sales for each product in each of the months in the third quarter:

Masefield Dairy Estimated Unit Sales

Product	July	August	September
A	194,675	162,033	129,857
B	104,856	98,375	76,495
C	209,855	194,575	170,654
D	97,576	75,766	55,966
E	47,867	39,575	20,958

Prepare a monthly purchases budget for the ice cream ingredients.

LO 2, 3, 7 **10-56** ***Financial budgets: wages and expense budgets*** Nathaniel's Motor Shop does major repair work on automobile engines. The major cost in the shop is the wages of the mechanics. The shop employs nine mechanics who are paid $750 each for working a 40-hour week. The workweek consists of five days of

eight hours each. Employees actually work seven hours each day because they are given one hour of breaks each day. They are highly skilled and valued by their employer, so these mechanics are paid whether or not there is work available for them to do. They are also paid $30 for every overtime hour or partial overtime hour they work.

The machine shop industry estimates that for every mechanic hour actually worked in a shop like this, the employee consumes about $25 of variable support items, such as lubricants, tool parts, and electricity.

The motor shop estimates that the following work will be available each week during the next 10 weeks:

Nathaniel's Motor Shop Estimated Work

Week	Hours of Work	Week	Hours of Work
1	255	6	280
2	330	7	260
3	300	8	300
4	285	9	340
5	325	10	355

Develop a weekly budget of mechanic wages and variable support costs.

LO 2, 3 **10-57** ***Financial budgets: cash outflows*** Country Club Road Nurseries grows and sells garden plants. The nursery is active between January and October each year. During January, the potting tables and equipment are prepared. The potting and seeding are done in February. In March and April, the plants are cultivated, watered, and fertilized. May and June are the peak selling months. July, August, and September are the peak months for visiting customers in their homes to provide them with advice and help solve their problems. During October, the equipment and buildings are secured for the winter months, and in November and December, full-time employees take their paid holidays, and the business is closed.

The nursery employs 15 full-time staff and, depending on the season, up to 20 part-time staff. The full-time staff members are paid an average salary of $2,700 per month and work 160 hours per month.

The part-time staff members are paid $10 per hour. Because the nursery relies on local students for part-time work, there is no shortage of trained people willing to work the hours that are available. The ratio of full-time employee hours worked to part-time employee hours worked is as follows: January, 5:1; February, 5:1; March, 3:1; April, 3:1, May, 1:1; June, 1:1; July, 1:1; August, 1:1; September, 2:1; and October, 4:1. Because part-time students are used mainly for moving and selling activities, their work creates very little incremental support costs.

Fixed costs, other than wages, associated with this operation are about $55,000 per month. The cost drivers in this operation are the activities that the full-time employees undertake. These cost drivers are proportional to the hours worked by the full-time employees. The variable costs depend on the season and reflect the common employee activities during that season. Average variable costs per employee hour worked are as follows: January, $15; February, $15; March, $15; April, $15; May, $5; June, $5; July, $20; August, $20; September, $20; and October, $10. These variable costs include both support items such as power and water and direct items such as soil and pots. Assume that all expenses are paid in the month they are incurred.

On the basis of the information provided, determine the cash outflows for the upcoming year.

LO 2, 3 **10-58** ***Budgeted cash flows and income statement*** In September, TEE Company, a merchandising firm that sells one product, assembled the following information and estimates to prepare a budget for October. Expected sales are 40,000 units at a price of $32 per unit. The cost of merchandise purchases is expected to be $20 per unit. Selling and administrative expenses are estimated at $350,000, of which $20,000 is depreciation. The October 1 cash balance is expected to be $40,000.

TEE estimates that 70% of each month's sales are collected in the month of sale and the remaining 30% is collected in the month after sale. Expected sales for September are $1,000,000. The company pays for 20% of its merchandise purchases during the month of purchase, and pays the remaining 80% during the month following purchase. Merchandise purchases for September are estimated to be $880,000 and the purchase cost per unit is $20. All other out-of-pocket expenses are paid for in cash.

Required:

(a) TEE plans to purchase 38,000 units of merchandise in October. Prepare a cash budget or statement of estimated cash flows for October for the company.
(b) Prepare a budgeted income statement (for external reporting purposes) for the month ended October 31 for TEE Company.

LO 2, 3 **10-59** ***Master budget*** Adams Company, a merchandising firm that sells one product, estimates it will sell 12,000 units of its product at $60 per unit in December. In November, the company prepared other information to prepare a budget for December, as shown here:

Merchandise inventory, December 1	2,000 units
Desired merchandise inventory for December 31	3,000 units
Cost per unit of merchandise purchases	$40
Selling and administrative expenses	$200,000
Cash balance, December 1	$30,000
November sales	$600,000

- The company estimates that 60% of each month's sales are collected in the month of sale and that the remaining 40% is collected in the month after sale.
- The $200,000 of selling and administrative expenses includes $40,000 of depreciation.
- The company pays for half of merchandise purchases during the month of purchase and pays the remainder during the month following purchase. Estimated merchandise purchases for November are $340,000.
- All other out-of-pocket expenses are paid for in cash.

Required

(a) How many units of merchandise will Adams budget to purchase in December? What is the dollar amount of Adams' budgeted merchandise purchases for December?
(b) Prepare a budgeted income statement for the month ended December for Adams Company.
(c) Prepare a statement of estimated cash flows for the month ended December for Adams Company.

LO 2, 3, 7 **10-60** ***Operating budgets: labor hiring plan*** Shadyside Insurance Company manages a medical insurance program for its clients. Employees of client firms submit claims for reimbursement of medical expenses. Shadyside processes these claims, checks them to ensure that they are covered by the claimant's policy, notes whether the claimant has reached any limit on coverage, computes any deductible, and issues a check for the claimant's refund.

Three types of clerks work in the claims processing department: supervisors, senior clerks, and junior clerks. The supervisors are paid $42,000 per year, the senior clerks are paid $37,000 per year, and the junior clerks are paid $32,000 per year. For every 150,000 claims processed per year, Shadyside plans to use one supervisor, six junior clerks, and two senior clerks.

Last year, the company processed 2 million medical claims and employed 14 supervisors, 30 senior clerks, and 83 junior clerks.

Required

(a) Compute the excess costs or cost savings relating to the claims processing staff.
(b) How would you interpret these results? What additional information would you ask for if you were making a determination of the clerical group's processing efficiencies?

LO 3, 4, 5 **10-61** ***Budgeted profit, what-if analysis*** The Monteiro Manufacturing Corporation manufactures and sells folding umbrellas. The corporation's condensed income statement for the year ended December 31, 2011, follows:

Sales (200,000 units)		$1,000,000
Cost of goods sold		600,000
Gross margin		400,000
Selling expenses	$150,000	
Administrative expenses	100,000	250,000
Net profit (before income taxes)		$150,000

Monteiro's budget committee has estimated the following changes for 2012:

30% increase in number of units sold
20% increase in material cost per unit
15% increase in direct labor cost per unit
10% increase in variable indirect cost per unit
5% increase in indirect fixed costs
8% increase in selling expenses, arising solely from increased volume
6% increase in administrative expenses, reflecting anticipated higher wage and supply price levels

Any changes in administrative expenses caused solely by increased sales volume are considered immaterial.

Because inventory quantities remain fairly constant, the budget committee considered that for budget purposes any change in inventory valuation can be ignored. The composition of the cost of a unit of finished product during 2011 for materials, direct labor, and manufacturing support, respectively, was in the ratio of 3:2:1. In 2011, $40,000 of manufacturing support was for fixed costs. No changes in production methods or credit policies were contemplated for 2012.

Required

(a) Compute the unit sales price at which the Monteiro Manufacturing Corporation must sell its umbrellas in 2012 in order to earn a budgeted profit of $200,000.
(b) Unhappy about the prospect of an increase in selling price, Monteiro's sales manager wants to know how many units must be sold at the old price to earn the $200,000 budgeted profit. Compute the number of units that must be sold at the old price to earn $200,000.
(c) Believing that the estimated increase in sales is overly optimistic, one of the company's directors wants to know what annual profit is likely if the selling price determined in part a is adopted but the increase in sales volume is only 10%. Compute the budgeted profit in this case.

LO 5 **10-62** ***Breakeven analysis, what-if analysis*** The Herschel Candy Company produces a single product: a chocolate almond bar that sells for $0.40 per bar. The variable costs for each bar (sugar, chocolate, almonds, wrapper, and labor) total $0.25. The total monthly fixed costs are $60,000. Last month, bar sales reached 1 million. However, the president of Herschel Candy Company was not satisfied with its performance and is considering the following options to increase the company's profitability:

1. Increase advertising.
2. Increase the quality of the bar's ingredients and simultaneously increase the selling price.
3. Increase the selling price with no change in ingredients.

Required

(a) The sales manager is confident that an intensive advertising campaign will double sales volume. If the company president's goal is to increase this month's profits by 50% over last month's, what is the maximum amount that can be spent on advertising that doubles sales volume?
(b) Assume that the company increases the quality of its ingredients, thus increasing variable costs to $0.30 per bar. By how much must the selling price per unit be increased to maintain the same breakeven point in units?
(c) Assume next that the company has decided to increase its selling price to $0.50 per bar with no change in advertising or ingredients. Compute the sales volume in units that would be needed at the new price for the company to earn the same profit as it earned last month.

LO 5 **10-63** ***Breakeven point, what-if analysis*** Premier Products, Inc., is considering replacing its existing machine with a new and faster machine that will produce a more reliable product and will turn around customer orders in a shorter period. This change is expected to increase the sales price and fixed costs but not the variable costs:

Cost Item	Old Machine	New Machine
Monthly fixed costs	$120,000	$250,000
Variable cost per unit	14	14
Sales price per unit	18	20

Required

(a) Determine the breakeven point in units for the two machines.
(b) Determine the sales level in units at which the use of the new machine will achieve a 10% target profit-to-sales ratio.
(c) Determine the sales level in units at which profits will be the same for either the old or the new machine.

(d) Which machine represents a lower risk of incurring a loss? Explain why.
(e) Determine the sales level in units at which the profit-to-sales ratio will be equal with either machine.

LO 5 **10-64** ***What-if-analysis*** Tenneco, Inc., produces three models of tennis rackets: standard, deluxe, and pro. Following are the sales and cost information for 2011:

Item	Standard	Deluxe	Pro
Sales (in units)	100,000	50,000	50,000
Sales price per unit	$30	$40	$50
Variable manufacturing cost per unit	$17	$20	$25

Fixed manufacturing support costs are $800,000, and fixed selling and administrative costs are $400,000. In addition, the company pays its sales representatives a commission equal to 10% of the price of each racket sold.

Required

(a) If the sales price of deluxe rackets decreases 10%, its sales are expected to increase 30%, but sales of standard rackets are expected to decrease 5%, as some potential buyers of standard rackets will upgrade to deluxe rackets. What will be the impact of this decision on Tenneco's profits?
(b) Suppose that Tenneco decides to increase its advertising by $50,000 instead of cutting the price of deluxe rackets. This is expected to increase sales of all three models by 2% each. Is this decision advisable?
(c) The incentive created by sales commissions has led Tenneco's sales force to push the higher priced rackets more than the lower priced ones. Is this in the best interests of the company?

LO 5 **10-65** ***Breakeven point, what-if analysis*** The following information pertains to Torasic Company's budgeted income statement for the month of June 2011:

Sales (1,200 units at $250)	$300,000
Variable cost	150,000
Contribution margin	$150,000
Fixed cost	200,000
Net loss	($50,000)

Required

(a) Determine the company's breakeven point in both units and dollars.
(b) The sales manager believes that a $22,500 increase in the monthly advertising expenses will result in a considerable increase in sales. How much of an increase in sales must result from increased advertising in order to break even on the monthly expenditure?
(c) The sales manager believes that an advertising expenditure increase of $22,500 coupled with a 10% reduction in the selling price will double the sales quantity. Determine the net income (or loss) if these proposed changes are adopted.

LO 5 **10-66** ***Breakeven point, what-if analysis*** Air Peanut Company manufactures and sells roasted peanut packets to commercial airlines. Following are the price and cost data per 100 packets of peanuts:

Estimated annual sales volume = 11,535,700 packets	
Selling price	$35.00
Variable costs:	
Raw materials	$16.00
Direct labor	7.00
Manufacturing support	4.00
Selling expenses	1.60
Total variable costs per 100 packets	$28.60
Annual fixed costs:	
Manufacturing support	$192,000
Selling and administrative	276,000
Total fixed costs	$468,000

Required

(a) Determine Air Peanut's breakeven point in units.
(b) How many packets does Air Peanut have to sell to earn $156,000?
(c) Air Peanut expects its direct labor costs to increase by 5% next year. How many units will it have to sell next year to break even if the selling price remains unchanged?
(d) If Air Peanut's direct labor costs increase by 5%, what selling price per 100 packets must it charge to maintain the same contribution margin-to-sales ratio?

LO 6 **10-67** ***Planning and flexible budget variances*** Tang Company's production performance report for April includes the information shown below. Prepare a flexible budget for the items shown and compute the flexible budget cost variances and planning cost variances for each item. Indicate whether the variances are favorable or unfavorable for each item.

	Actual	Master Budget
Volume	80,000	90,000
Manufacturing costs:		
Direct materials	$550,000	$630,000
Direct labor	225,000	247,500
Fixed manufacturing support	400,000	420,000
Total	$1,175,000	$1,297,500

LO 6 **10-68** ***Variance analysis*** The Sudbury, South Carolina, plant of Saldanha Sports Company has the following standards for its soccer ball production:

Standards:	
Material (leather) per soccer ball	0.25 yard
Material price per yard	$16
Direct labor hours per soccer ball	0.20 hour
Wage rate per direct labor hour	$10 per hour
Variable support cost rate	$15 per direct labor hour
Actual results for October:	
Used 13,000 yards of raw material, purchased for $205,150	
Paid for 8,240 direct labor hours at $9.50 per hour	
Incurred $131,840 of variable support costs	
Manufactured 40,000 soccer balls	

Required

Determine the following variances for October:

(a) Total direct material cost variance
(b) Total direct labor cost variance
(c) Total variable support cost variance
(d) Direct material price variance
(e) Direct material quantity variance
(f) Direct labor rate variance
(g) Direct labor efficiency variance
(h) Variable support rate variance
(i) Variable support efficiency variance.

LO 6 **10-69** ***Variance analysis*** The North Point plant of Englehart Electronics Company has the following standards for component C93:

Standards:	
Material	2 units of material B
Material price	$10 per unit of B
Direct labor	1 hour
Wage rate	$10 per direct labor hour
Variable support cost rate	$25 per direct labor hour
Actual results for May:	
Used 4,200 units of B, purchased at $9.75 per unit of B	
Paid for 2,000 direct labor hours at $11 per hour	
Incurred $48,000 of variable support costs	
Manufactured 2,000 units of component C93	

Required

Determine the following variances for May:

(a) Total direct material cost variance
(b) Total direct labor cost variance
(c) Total variable support cost variance
(d) Direct material price variance
(e) Direct material quantity variance
(f) Direct labor rate variance
(g) Direct labor efficiency variance
(h) Variable support rate variance
(i) Variable support efficiency variance.

LO 6 **10-70** ***Standard versus actual costs*** For each of the following two jobs manufacturing two different products, determine the missing amounts for items (a) through (h):

Item	Job 321	Job 322
Units produced	200	(e)
Standards per unit:		
Material quantity	5 pounds	(f)
Material price	$2 per pound	$3 per pound
Labor hours	2 hours	3 hours
Labor rate	$15 per hour	$12 per hour

(*continued*)

Item	Job 321	Job 322
Actual consumption:		
Material quantity	(a)	1,000 pounds
Material cost	$2,000	(g)
Labor hours	(b)	(h)
Labor cost	(c)	$5,800
Variance:		
Material quantity	(d)	$100 F
Material price	$50 U	$500 F
Labor efficiency	$100 F	$60 U
Labor rate	$60 U	$200 F

LO 4, 6 **10-71** ***Variance analysis, material and labor*** Trieste Toy Company manufactures only one product, Robot Ranger. The company uses a standard cost system and has established the following standards per unit of Robot Ranger:

	Standard Quantity	Standard Price	Standard Cost
Direct materials	3.0 pounds	$12 per pound	$36.00 per unit
Direct labor	1.2 hours	15 per hour	18.00 per unit

During November, the company recorded the following activity:

- The company produced 6,000 units.
- A total of 21,000 pounds of material were used, purchased at a cost of $241,500.
- The company employs 40 persons to work on the production of Robot Ranger. These employees worked an average of 160 hours at an average rate of $16 per hour.

The company's management wishes to determine the efficiency of the activities related to the production of Robot Ranger.

Required

(a) For direct materials used in the production of Robot Ranger, compute the direct material price variance and the direct material quantity variance.
(b) The direct materials were purchased from a new supplier who is eager to enter into a long-term purchase contract. Would you recommend that Trieste sign the contract? Explain.
(c) For direct labor employed in the production of Robot Ranger, compute the direct labor rate variance and the direct labor efficiency variance.
(d) In the past, the 40 persons employed in the production of Robot Ranger consisted of 16 experienced workers and 24 inexperienced assistants. During November, the company experimented with 20 experienced workers and 20 inexperienced assistants. Would you recommend that Trieste continue the new labor mix? Explain.

LO 6, 7 **10-72** ***Variance analysis, hospital (adapted from CMA, June 1989)*** Mountain View Hospital has adopted a standard cost accounting system for evaluation and control of nursing labor. Diagnosis-related groups (DRGs), instituted by the U.S. government for health insurance reimbursement, are used as the output measure in the standard cost system. A DRG is a patient classification scheme that perceives hospitals to be multiproduct firms where inpatient treatment procedures are related to the numbers and types of patient ailments treated. Mountain View Hospital has developed

standard nursing times for the treatment of each DRG classification, and nursing labor hours are assumed to vary with the number of DRGs treated within a time period.

The nursing unit on the fourth floor treats patients with four DRG classifications. The unit is staffed with registered nurses (RNs), licensed practical nurses (LPNs), and aides. Following are the standard nursing hours and salary rates:

Fourth-Floor Nursing Unit Standard Hours

DRG Classification	RN	LPN	Aide
1	6	4	5
2	26	16	10
3	10	5	4
4	12	7	10

Standard Hourly Rates	
RN	$12
LPN	8
Aide	6

Following are the results of operations for the fourth-floor nursing unit for the month of May:

	Actual Number of Patients
DRG 1	250
DRG 2	90
DRG 3	240
DRG 4	140
	720

	RN	LPN	Aide
Actual hours	8,150	4,300	4,400
Actual salary	$100,245	$35,260	$25,300
Actual hourly rate	$12.30	$8.20	$5.75

The accountant for Mountain View Hospital calculated the following standard times for the fourth floor nursing unit for May:

		Standard Hours/DRG			Total Standard Hours		
DRG Classification	No. of Patients	RN	LPN	Aide	RN	LPN	Aide
1	250	6	4	5	1,500	1,000	1,250
2	90	26	16	10	2,340	1,440	900
3	240	10	5	4	2,400	1,200	960
4	140	12	7	10	1,680	980	1,400
					7,920	4,620	4,510

The hospital calculates labor variances for each reporting period by labor classification (RN, LPN, aide). The variances are used by nursing supervisors and hospital administration to evaluate the performance of nursing labor.

Required

Calculate the total nursing labor variance for the fourth-floor nursing unit of Mountain View Hospital for May, indicating how much of this variance is attributed to the following for each class of hospital worker:

(a) Labor efficiency
(b) Rate differences.

LO 6 **10-73** ***Variance analysis*** Asahi USA, Inc., based in Denver, Colorado, is a subsidiary of a Japanese company manufacturing specialty tools. Asahi USA employs a standard cost system. Following are the standards per unit of one of its products, tool KJ79. This tool requires a special chrome steel as a direct material.

	Standard Quantity	Standard Price	Standard Cost
Direct materials	8 pounds	$18 per pound	$144
Direct labor	2.5 hours	$8 per hour	20
			$164

During November, Asahi USA started and completed job KJX86 to manufacture 1,900 units of tool KJ79. It purchased and used 14,250 pounds of the special chrome steel for tool KJ79 at a total cost of $270,750. The total direct labor charged to job KJX86 was $37,800. Job KJX86 required 5,000 direct labor hours.

Required

(a) For job KJX86, compute the following and indicate whether the variances are favorable or unfavorable:
(1) Direct material price variance
(2) Direct material quantity variance
(3) Direct labor rate variance
(4) Direct labor efficiency variance.
(b) Provide a plausible explanation for the variances.

LO 6 **10-74** ***Sales variance analysis*** Bakery Extraordinaire sells several types of muffins and scones and also sells carrot bread loaves. Planned prices and sales quantities for February are shown here:

Planned Sales for February

	Muffins	Scones	Carrot Bread	Totals
Unit price	$1.35	$1.75	$2.75	
Unit sales	1,600	3,400	1,000	6,000
Total	$2,160	$5,950	$2,750	$10,860

The actual results for February are shown here:

Actual Sales for February

	Muffins	Scones	Carrot Bread	Totals
Unit price	$1.55	$1.60	$3.25	
Unit sales	1,400	4,500	1,300	7,200
Total	$2,170	$7,200	$4,225	$13,595

The owner would like to know how the price changes and volume changes each contributed to the $2,735 difference between planned and actual sales revenues.

Required

(a) Compute the sales mix variance for each product line and explain the meaning of each variance you computed.
(b) Compute the sales quantity variance for each product line and explain the meaning of each variance you computed.
(c) Compute the sales price variance for each product line and explain the meaning of each variance you computed.

LO 4, 6 **10-75** ***Variances and motivation*** Discuss the possible effect on human behavior of a preoccupation with variances in financial control.

Cases

LO 3, 4, 5 **10-76** ***Budget preparation, breakeven point, what-if analysis with multiple products (adapted from CPA, May 1993)*** The following budget information for the year ending December 31, 2011, pertains to Rust Manufacturing Company's operations:

	Product		
Budget Item	Ace	Bell	Total Costs
Budgeted sales in units	200,000	100,000	
Selling price per unit	$40	$20	
Direct materials cost per unit	$8	$3	
Direct labor hours per unit	2	1	
Depreciation			$200,000
Rent			$130,000
Other manufacturing support costs			$500,000
Selling costs			$180,000
General and administrative costs			$40,000

The following information is also provided:

1. Rust has no beginning inventory. Production is planned so that it will equal the number of units sold.
2. The cost of direct labor is $5 per hour.
3. Depreciation and rent are fixed costs within the relevant range of production. Additional costs would be incurred for extra machinery and factory space if production is increased beyond current available capacity.
4. Rust allocates depreciation proportional to machinery use and rent proportional to factory space. Budgeted usage is as follows:

	Ace	Bell
Machinery	70%	30%
Factory space	60%	40%

5. Other manufacturing support costs include variable costs equal to 10% of direct labor cost and also include various fixed costs. None of the miscellaneous fixed manufacturing support costs depend on the level of activity, although support costs attributable to a specific product are avoidable if that product's production ceases. The fixed-cost portion of other manufacturing support costs is allocated between Ace and Bell on the basis of a percentage of budgeted direct labor cost.

6. Rust's selling and general and administrative costs are committed in the intermediate term.
7. Rust allocates selling costs on the basis of number of units sold at Ace and Bell.
8. Rust allocates general and administrative costs on the basis of sales revenue.

Required

(a) Prepare a schedule, using separate columns for Ace and Bell, showing budgeted sales, variable costs, contribution margin, fixed costs, and pretax operating profit for the year ending December 31, 2011.
(b) Calculate the contribution margin per unit and the pretax operating profit per unit for Ace and for Bell.
(c) Calculate the effect on pretax operating profit resulting from a 10% decrease in sales and production of each product.
(d) What may be a problem with the above analysis?

LO 2, 3, 4 **10-77** ***Commitment and consumption of labor hours*** Steelmax, Inc., sells office furniture in the Chicago metropolitan area. To better serve its business customers, Steelmax recently introduced a new same-day service. Any order placed before 2:00 P.M. is delivered the same day.

Steelmax hires five workers on an eight-hour daily shift to deliver the office furniture. Each delivery takes 30 minutes on average. If the number of customer orders exceeds the available capacity on some days, workers are asked to work overtime to ensure that all customer orders are delivered the same day. Regular wages are $12 per hour. Overtime wages include a 50% premium in addition to the regular wages.

Steelmax's management has noticed considerable fluctuation in the number of customer orders from day to day during the past three months, as shown here:

Day of the Week	Average Number of Orders
Monday	65
Tuesday	70
Wednesday	80
Thursday	85
Friday	95

Steelmax has decided to pursue a more variable hiring policy. It will reduce the number of delivery workers to four on Mondays and Tuesdays and increase the number to six on Fridays.

Required

(a) Determine the total and unit delivery cost per day under the old hiring policy when the number of daily customer orders is 70, 80, or 90.
(b) For each day of the week, determine the expected total delivery cost per day and the expected delivery cost per customer order based on both the old and the new hiring policy. What is the expected savings per week with the new variable hiring policy?

LO 2, 3, 4, 5 **10-78** ***Budgeting: comprehensive problem*** Judd's Reproductions makes reproductions of antique tables and chairs and sells them through three sales outlets. The product line consists of two styles of chairs, two styles of tables, and three styles of cabinets. Although customers often ask Judd Molinari, the owner/manager of Judd's Reproductions, to make other products, he does not intend to expand the product line.

The planning group at Judd's Reproductions prepares a master budget for each fiscal year, which corresponds to the calendar year. It is December 2011, and the planners are completing the master budget for 2012.

Unit prices are $200, $900, and $1,800 for the chairs, tables, and cabinets, respectively. Customers pay (1) by cash and receive a 5% discount, (2) by credit card (the credit card company takes 3% of the revenue as its fee and remits the balance in the month following the month of sale), or (3) on account (only exporters buy on account). The distribution of cash, credit card, and exporter sales is 25%, 35%, and 40%, respectively. Of the credit sales to exporters, Judd's Reproductions collects 30% in the month following the sale, 50% in the second month following the sale, and 17% in the third month following the sale, with 3% going uncollected. Judd's Reproductions recognizes the expense of cash discounts, credit card fees, and bad debts in the month of the sale.

Judd's employs 40 people who work in the following areas: 15 in administration, sales, and shipping; 2 in manufacturing supervision (director and a scheduler); 9 in manufacturing fabrication and assembly (carpenters); and 14 in manufacturing, finishing, and other areas (helpers, cleaners, and maintenance crew).

The carpenter hours required to make the parts for and assemble a chair, table, or cabinet are 0.4, 2.5, and 6, respectively. Production personnel have organized the work so that each carpenter hour worked requires 1.5 helper hours. Therefore, production planners maintain a ratio on average of 1.5 helpers for every carpenter. The company pays carpenters and helpers $24 and $14 per hour, respectively (including all benefits).

Judd's Reproductions guarantees all employees pay for at least 172 hours per month regardless of the hours of work available. When the employees are not doing their regular jobs, they undertake maintenance, training, community service, and customer relations activities. Judd's pays each employee weekly for that week's work. If an employee works 172 hours or less during the month, Judd's still pays the employee for 172 hours at his or her normal hourly rate. The company pays 150% of the normal hourly rate for every hour over 172 that the employee works during the month. Planners add new carpenters if the projected total monthly overtime is more than 5% of the total regular carpenter hours available. Judd's has a policy of no employee layoffs. Any required hiring is done on the first day of each month.

For a factory, Judd's Reproductions rents a converted warehouse that costs $600,000 per year. The company pays rent quarterly beginning January 1 of each year. Judd's pays other fixed manufacturing costs, which include manufacturing supervision salaries and amount to $480,000 annually, paid in equal monthly amounts.

The capital investment policy is to purchase, each January and July, $5,000 of machinery and equipment per carpenter employed during that month. Judd's recognizes depreciation at the rate of 10% of the year-end balance of the machinery and equipment account. Statistical studies of cost behavior have determined that supplies, variable support, and maintenance costs vary with the number of carpenter hours worked and are $5, $20, and $15 per hour, respectively.

The units of wood required for chairs, tables, and cabinets are 1, 8, and 15, respectively. Each unit of wood costs $30. The inventory policy is to make products in the month they will be sold. Two suppliers deliver raw materials and supplies as required. The company pays for all materials, supplies, variable support, and maintenance items on receipt.

Annual administration salaries, fixed selling costs, and planned advertising expenditures are $300,000, $360,000, and $600,000, respectively. Judd's Reproductions makes these expenditures in equal monthly amounts. Packaging and shipping costs for chairs, tables, and cabinets are $15, $65, and $135, respectively. Variable selling costs are 6% of each product's list price. Judd's Reproductions pays packaging, shipping, and variable selling costs as incurred.

Using its line of credit, Judd's Reproductions maintains a minimum cash balance of $50,000. All line-of-credit transactions occur on the first day of each month. The bank charges interest on the line-of-credit account balance at the rate of 10% per year. Judd's pays interest on the first day of each month on the line-of-credit balance outstanding at the end of the previous month. On the first of each month, the bank pays interest at the rate of 3% per year on funds exceeding $50,000 in the company's cash account at the end of the previous month.

Realized sales for October and November and expected sales for December 2011 appear in the following table:

Judd's Reproductions Unit Sales 2011

Item	October	November	December
Chairs	900	975	950
Tables	175	188	201
Cabinets	90	102	95

Sales staff estimates the unit demand for 2012 as follows: chairs, 1,000, plus a random number uniformly distributed between 0 and 50, plus 15% of the previous month's sales of chairs; tables, 200, plus a random number uniformly distributed between 0 and 20, plus 15% of the previous month's sales of tables; and cabinets, 100, plus a random number uniformly distributed between 0 and 10, plus 15% of the previous month's sales of cabinets. This estimation process resulted in the demand forecasts and the sales plan found in the following table:

Judd's Reproductions
Projected Unit Sales 2012

Month	Chairs	Tables	Cabinets
January	1,020	200	109
February	1,191	237	120
March	1,179	243	119
April	1,195	250	126
May	1,200	252	122
June	1,204	255	125
July	1,194	242	123
August	1,199	253	121
September	1,222	243	127
October	1,219	248	126
November	1,207	244	126
December	1,192	255	119

Planners project the Judd's Reproductions balance sheet at January 1, 2012, to be as follows:

Judd's Reproductions Balance Sheet January 1, 2012

Cash	$50,000	Bank loan	$0
Accounts receivable	575,008		
Machinery (net book value)	360,000	Shareholder's equity	985,008
Total	$985,008	Total	$985,008

Required

(Round quantities up in the problem.)

(a) Prepare a sales forecast, staffing plan, production plan, estimated cash flow statement, pro forma income statement for the year ended December 31, 2012, and pro forma balance sheet at December 31, 2012.

(b) The level of bad debts concerns the Judd's Reproductions controller. If Judd's insists on cash payments from exporters who would be given the cash discount, the sales staff expects that total sales to exporters in 2012 will fall by 5% (sales in 2011 will not be affected). Based on the effect of this change on profitability, is it desirable? (Round sales forecasts to the nearest unit.)

(c) Ignore the changes described in part b and return to the data in the original example. The sales staff is considering increasing the advertising budget from $600,000 to $900,000 and cutting prices by 5% beginning on January 1, 2012. This should increase sales by 30% in 2012. Based on the effect of this change on profitability, is it desirable? (Round sales forecasts to the nearest unit.)

(d) Is there a criterion other than profitability that may be used to evaluate the desirability of the changes proposed in parts b and c? If yes, what is that criterion, and why is it important? If no, why is profitability the sole relevant criterion?

LO 6 **10-79** ***Variance and cost analysis, original activity-based costing hierarchy*** Peterborough Food produces a wide range of breakfast cereal foods. Its granola products are two of its most important product lines.

Because of the complexity of the granola production process, the manufacturing area in the plant that makes these two product lines is separated from the rest of the plant and is treated as a separate cost center. Exhibit 10-34 presents the activity and cost data for this cost center for the most recent quarter. The plan data in Exhibit 10-34 reflect the master budget targets for the quarter.

The factory accountant estimates that, with the increased production in line 1, the labor-related product-sustaining costs and the other product-sustaining costs for line 1 should increase by $20,000 and $100,000, respectively. The factory accountant also indicates that the decreased production in line 2 would require several quarters to be reflected in lower product-sustaining costs.

The factory accountant indicated that the labor-related business-sustaining costs and the other business-sustaining costs should increase by $0 and $140,000, respectively, given the net increase in production.

Required

Prepare a second-level and third-level variance analysis of costs for the granola line cost center. In your analysis, group costs into unit-related, batch-related, product-sustaining, and business-sustaining costs.

LO 4, 7 **10-80** ***Budgeting: motivational issues*** Nate Young is the dean of a business school. The university is under strong financial pressures, and the university president has asked all the deans to cut costs. Nate is wondering how he should respond to this request.

The university receives its operating funds from three sources: (1) tuition (60%), (2) government grants (25%), and (3) gifts and endowment income (15%). The money flows into the university's general operating fund. A management committee consisting of the university president, the three vice presidents, and the nine deans allocates funds to the individual schools. The university's charter requires that it operate with a balanced budget.

The initial allocation of funds reflects (1) fixed costs that cannot be avoided, primarily the employment costs of tenured faculty, and (2) fixed costs relating to support items, such as staff, building maintenance, and other operations costs. The balance of funds is allocated to discretionary activities, such as scholarships, program changes or additions, and sports.

The various deans compare their respective funding levels. The basis of comparison is to divide total university expenditures by the number of full-time students to get an average cost per student. Then the average cost per student is multiplied by the number of full-time students to get the target funding for each school. On average, the actual funding for the business school has been about 70% of the target funding, which is the second lowest in the university. (The lowest is the arts school.)

Because of the rapid growth of fixed faculty and administrative costs, the amount of funds allocated to discretionary activities has been declining from a historic level of about 10%. This year, the projected revenues will not even cover the projected fixed costs. In response to this development, the president has called on all deans to "do your best to reduce the level of expenditures."

The president's request has been met with skepticism by many deans, who are notorious for digging in their heels, ignoring requests for spending cuts, and then being bailed out by funds

Exhibit 10-34

Peterborough Food: Granola Line Products

	Line 1 Plan	Line 1 Actual	Line 2 Plan	Line 2 Actual	Total Line 1 Plan	Total Line 1 Actual	Total Line 2 Plan	Total Line 2 Actual	Total Plan	Total Actual
Number of boxes	945,000	1,200,000	1,175,000	945,000						
Number of batches	189	200	235	210						
Units per batch	5,000	6,000	5,000	4,500						
Unit-related costs:										
Materials										
Grams per box	500	515	350	375						
Cost per gram	$0.0030	$0.0027	$0.0050	$0.0055	$1,417,500	$1,668,600	$2,056,250	$1,949,062	$3,473,750	$3,617,662
Packaging										
Units per box	1.0000	1.0600	1.0000	1.0405						
Cost per unit	$0.0450	$0.0420	$0.0380	$0.0410	$42,525	$53,424	$44,650	$40,314	$87,175	$93,738
Labor										
Hours per box	0.013	0.011	0.009	0.010						
Cost per hour	$18.00	$18.25	$18.00	$18.25	$221,130	$240,900	$190,350	$172,463	$411,480	$413,363
Batch-related costs:										
Materials										
Per batch	$1,200	$1,325	$1,525	$1,495	$226,800	$265,000	$358,375	$313,950	$585,175	$578,950
Labor										
Hours per batch	12	11	16	18						
Cost per hour	$18.00	$18.25	$18.00	$18.25	$40,824	$40,150	$67,680	$68,985	$108,504	$109,135
Product-sustaining costs										
Labor					$256,000	$287,000	$305,000	$323,000	$561,000	$610,000
Other					$2,054,000	$2,123,000	$1,927,000	$2,005,000	$3,981,000	$4,128,000
Business-sustaining costs										
Labor									$145,000	$152,000
Other									$4,560,000	$4,740,000
Total all costs					$4,258,779	$4,678,074	$4,949,305	$4,872,774	$13,913,084	$14,442,849

released from other activities or raised to meet the budget shortfall. Many deans believe that the departments that sacrificed and reduced their budgets would only create funds that would be used by the university to support other schools that had made little or no effort to reduce their budgets. Then these schools would be asked to make even more cuts to make up for the lack of cuts in schools that made little progress in cost reduction. On the other hand, the deans also believe that if there were no reaction to the president's initial request for cost reductions, arbitrary cutbacks would be imposed on the individual schools.

In response to this situation, Nate is wondering what to do. He knows that by increasing class sizes slightly, using some part-time instructors, and eliminating some optional courses that seldom attract many students, he can trim about $800,000 from his operating budget of $11,000,000. However, making these changes would create hardships for both the students and faculty in the business school, and given the historic relationship of the school's average funding to its target funding, Nate is wondering whether the business school should be asked to make additional sacrifices.

Nate knows that he has several alternatives:

- Do nothing, arguing that the business school is already cost effective relative to others and that it is time for others to reduce their cost structures.
- Make the cuts that he has identified but stretch them out over a number of years and stop making them if other schools are not doing their share in cutting costs.
- Make the cuts unilaterally and advise the administration that the business school budget can be reduced by about $800,000.

Required

Explain what you would do if you were Nate and why. Your explanations should include your analysis of the motivation of all schools to cut costs in an environment that traditionally has taken advantage of those who cooperate.