

CSUN GATEWAY

Managerial Accounting Study Guide

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1. Introduction to Managerial Accounting

- ✓ **Overview**
- ✓ **the role of managerial accounting and management functions**
- ✓ **major differences between managerial accounting and financial accounting**

Overview

Managerial accounting is rewarding and also challenging. You are exposed to the inner mechanisms of an organization. The business exposure provides managerial accountants with the detail to make sense, from an accounting perspective, the organizations' operations. This enables you to help managers, owners, and employees manage successfully and lead in the right direction.

Keep in mind that the accounting system provides information for both external use (financial accounting) and internal use (managerial accounting). For example, financial accounting deals with reporting information through financial statements that investors need to know in order to decide whether to invest in a company. For this course review segment, our focus is on managerial accounting.

The **internal reporting** function of an accounting system gives managers information needed for daily operations and also for long-range planning. Developing types of information most relevant to specific managerial decisions and interpreting that information is the essence of managerial accounting.

The Role of Managerial Accounting & Management Functions

The workplace has changed and so must the workforce. Today, managerial accounting continually evolves and adapts as the business environment changes. Organizations will continue to change and managerial accountants must be prepared to respond to such changes. Managerial accounting is an integral part of the management team that seeks to create value for the organization by managing resources, activities, and people to achieve the organization's goals. The overview of this module is to understand the role of managerial accounting (MA) and how it adds value to an organization. Managerial accounting systems can be effective tools in providing information that is useful in decision-making at all levels in the organization.

Traditional management systems rely on financial measures that may reveal little about the progress in achieving long-term strategic objectives. More recently, MA has begun to focus on planning and strategic decision-making. Managerial accounting has an important role to play in providing efficient and effective information to contribute to the success of the strategic management process. The fundamental management process is a key means of planning and developing strategies to help organizations attain their goals. The changing role of MA is concerned with the future and meeting organizational goals by working with the management team to influence manager behavior to have a positive impact on decision-making. Today's MA systems must be designed to support the above trends. The challenge for managerial accountants is to add value constantly as part of the management team, while innovating and acquiring the skills and knowledge to be competitive. Therefore, the shift in the role of managerial accountants is from traditionally heavy reliance on financial data to a more creative role in pursuit of competitive MA, thereby providing information that creates value.

Thus, the challenge for managerial accountants is to support the entire management process. In particular, they facilitate the planning and controlling of both operational and strategic activities in order to make the organization as competitive as possible.

Major Differences between Managerial Accounting and Financial Accounting

The focus of managerial accounting is on the needs of managers within the organization, rather than interested parties outside the organization. In your financial accounting course, you learned to prepare the fundamental financial documents (Balance Sheet, Income Statement, Statement of Cash Flows, Notes to Financial Statements). When these are put together in an annual report distributed to stockholders, we have an example of an output from the financial accounting system.

The accounting system of a business is designed to provide the informational needs of various users. These needs differ among users. For example, a creditor (banker) wants to know if the company generates adequate cash flow to make the loan payment, whereas a supervisor would like to know the labor cost or unit cost of a product manufactured. Both the banker (external user) and the supervisor (internal user) draw upon data from an organization's basic accounting system. Therefore, the accounting system accumulates data for use in both financial and managerial accounting. The information is drawn from one accounting information system, and both financial and managerial accounting deal with the economic events of a business. The most important similarity between managerial accounting and financial accounting is that both are used in decision-making.

It is important to note that even though financial accounting reports are aimed primarily at external users and managerial accounting reports are aimed primarily at internal users, managers also make significant use of financial accounting reports, and external users occasionally request financial information that is generally considered appropriate for internal users. For example, creditors (banker) may ask management to provide them with a detailed cash-flow projection (not just a historical financial accounting statement of cash flows).

The principal differences between financial accounting and managerial accounting are summarized below:

	FINANCIAL ACCOUNTING	MANAGERIAL ACCOUNTING
Users	External: Creditors, stockholders, tax authorities	Internal: Managers, executives, employees
Regulations	Regulated: Rules driven by GAAP	No regulations (not in accordance with GAAP), requirements determined by management
Nature of Information	Objective, reliable, consistent	More subjective and judgmental; valid, relevant, accurate
Mandatory	Statements must be prepared	Not mandatory
Scope	Highly aggregate: report on entire organization	Disaggregate: parts or segments reporting
Timeliness	Historical	Current; future oriented

2. Introduction to Cost Terms and Cost Concepts

- ✓ **introduction**
- ✓ **variable costs**
- ✓ **fixed costs**
- ✓ **product costs and period costs**
 - **manufacturing and non-manufacturing costs**

Introduction

Any company, whether it is a manufacturing, retail, or service business, needs to know the cost of its products or services, so it can set the price and calculate profit.

Therefore, the very fundamental concept in managerial accounting is to understand costs and cost behavior. Our objective is to understand the cost structure of a business entity, be it a service business, a non-for-profit organization, or a manufacturing business.

The ability to predict how costs will respond to changes in activity is critical for decision-making, planning, and control. Examples of such activities include number of units produced, direct labor hours, and number of machine hours. For example, for a delivery business, the higher the mileage, the higher the fuel costs. For a fitness club, the larger the number of hours the gym is open, the higher the labor costs, and utility costs. On the other hand, for a yoga instructor, an increase in the number of people attending the yoga classes would cause no increase in costs. The cost of running the yoga class would be constant regardless of the number of people taking the class in one room.

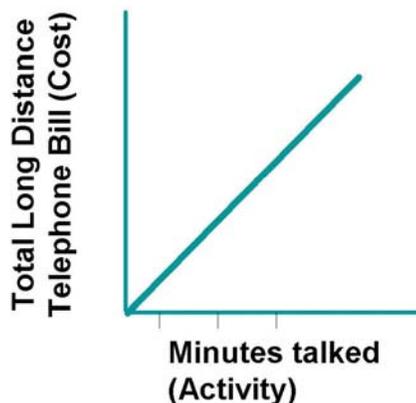
In the above examples, some costs change and others remain the same. This is called cost behavior. Cost behavior is defined relative to some activity, such as the number of units produced, kilometres driven or meals served (also known as a cost “driver”). **Cost behavior** is defined as how cost will react or change as the level of business activity (or driver) changes. An understanding of cost behavior is a valuable insight in developing plans and budgets for future business operations. A key to understanding cost behavior is distinguishing between **variable costs** and **fixed costs**.

Variable Costs

Variable costs are items of cost that vary, in total, directly and proportionately with the level of activity (within the relevant range). (Note: If the student needs review on “relevant range,” he or she should consult a managerial accounting text.) For example, if the level of activity increases 10%, the total amount of variable costs also increases by 10%. A common example of a variable cost item is direct material cost. The more units you produce, the more materials you are going to need. Similarly, the cost of long-distance calls is based on how long you talk on the phone. The following graph shows how your total long distance telephone bill is based on how many minutes you talk.

Total Variable Cost Example

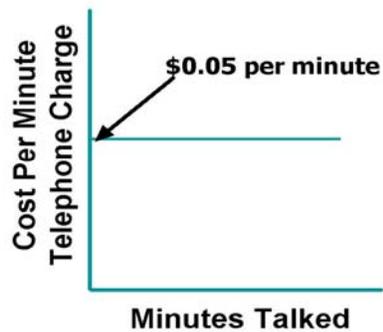
The total long distance telephone bill is based on how many minutes you talk.



Gasoline is another example of a variable cost of running an automobile, since fuel consumption is directly related to (and driven by) miles driven. To avoid confusion, remember that the term variable costs refers to costs whose total varies proportionately with the level of activity (and, ideally, is driven by that activity). Therefore, variable cost per unit of output or activity is constant at all levels of output, as shown in the following example:

Variable Cost Per Unit Example

The cost per long distance minute talked is constant. For example, 5 cents per minute.



Fixed Costs

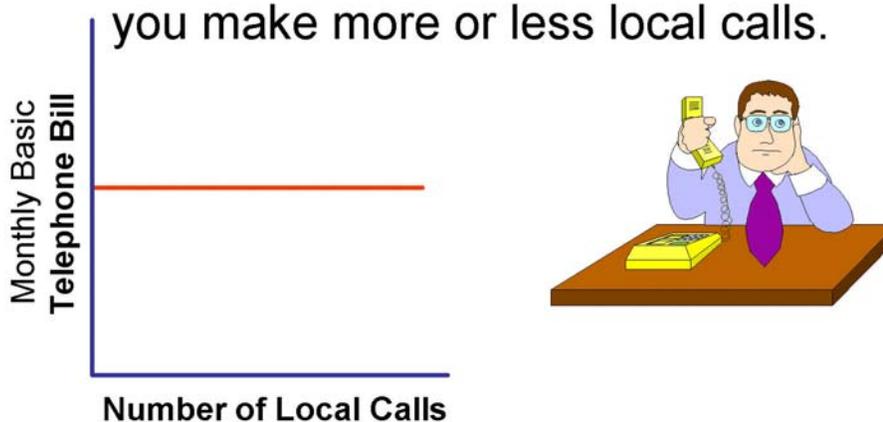
Fixed costs are items of cost that, in total, do not vary at all with the level of activity (within the relevant range). Building rent, property tax, and management salaries are examples. These costs may increase with time, but do not vary because of (and are not driven by) changes in the level of activity within a specified period of time. For example, office rent for an accounting office for next year may be higher than it is this year, but within this year, the rent is unaffected by the changes in number of clients.

Again using the example of telephone calls, your monthly basic telephone bill is probably fixed and does not change when you make more local calls.

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Total Fixed Cost Example

Your monthly basic telephone bill is probably fixed and does not change when you make more or less local calls.



Because the amount of fixed cost is constant in total, the amount of fixed cost per unit of activity decreases as the activity increases and, conversely, increases as the level of activity decreases. For example, the annual insurance cost for a delivery truck is \$1,200; it is a fixed cost since it is independent of the number of parcels delivered or kilometres driven. If the management wants to find the unit cost of insurance, and the number of parcels delivered each month is 1,000 units, then the insurance cost per unit of parcel would be \$1.20. What if the number of parcels increases to 1,200? Then the *unit cost decreases* to \$1.00 but the *total fixed cost does not change*. What if the number of parcels decreases to 800? The unit cost would increase to \$1.50, but the *total fixed cost remains the same*, \$1,200.

The following diagram shows how the fixed cost of telephone service is constant in total but per unit cost decreases as we make more calls:

Fixed Cost Per Unit Example

The fixed cost per local call decreases as more local calls are made.



This table shows the total fixed cost and number of local calls made:

Number of Calls made	Cost Per Call	Total Fixed Cost
1	\$50.00	\$50.00
2	25.00	50.00
10	5.00	50.00
100	0.50	50.00
200	0.10	50.00

Note carefully the definitions of variable and fixed costs in terms of total and on a per-unit basis (repeated below for emphasis).

Fixed costs: Total fixed costs remain unchanged regardless of changes in the level of activity.

Variable costs: The variable cost per unit remains unchanged regardless of changes in the level of activity.

See summary below.

Cost Behavior Patterns

Summary of Variable and Fixed Cost Behavior		
Cost	In Total	Per Unit
Variable	Total variable cost changes as activity level changes.	Variable cost per unit remains the same over wide ranges of activity.
Fixed	Total fixed cost remains the same even when the activity level changes.	Fixed cost per unit goes down as activity level goes up.

Product Costs and Period Costs

Product costs are those costs assigned to goods produced. In the case of manufactured goods, product costs would include direct material, direct labor, and manufacturing overhead. Product costs are considered an asset (inventory) until the finished goods are sold. When the goods are sold, the product costs are expensed (matching principle).

Period costs include administrative, marketing, and selling costs. Period costs are recognized as expenses in the period incurred (e.g., advertising, executive salaries — costs matched to revenue on a “time period” basis).

Manufacturing Costs (Product Costs)

Direct materials: The cost of all materials and parts that are directly and conveniently traced to items produced. For example: wood, parts, motors, and a variety of other items.

Direct labor: The cost of labor that is directly and conveniently traced to items produced is direct labor. For example, for a motorboat company the direct labor includes the labor cost of the workers directly involved in building each motorboat. Please note that this does not generally include the time spent by the supervisor or manager checking or providing directions. It would be very difficult to trace the supervisor’s time directly related to the product.

Manufacturing overhead: Indirect materials, indirect labor, all costs associated with manufacturing the goods other than direct materials and labor are all manufacturing overhead. (Please note: Further discussion of overhead will be provided later on in this segment.) For example, manufacturing overhead would include amortization of tools and building, utilities, costs of screws, glue, varnish, etc.

Non-Manufacturing Costs (Period Costs):

The other costs that are not associated with the production of goods are defined as non-manufacturing costs.

These costs include:

- a. Distribution costs involved in delivering finished products to customers (e.g., freight and salaries of shipping and delivery personnel).
- b. Marketing costs include advertising and promotion expenses.
- c. General and administration costs include management salaries, general accounting, legal, and other costs involved in general administration of the organization.

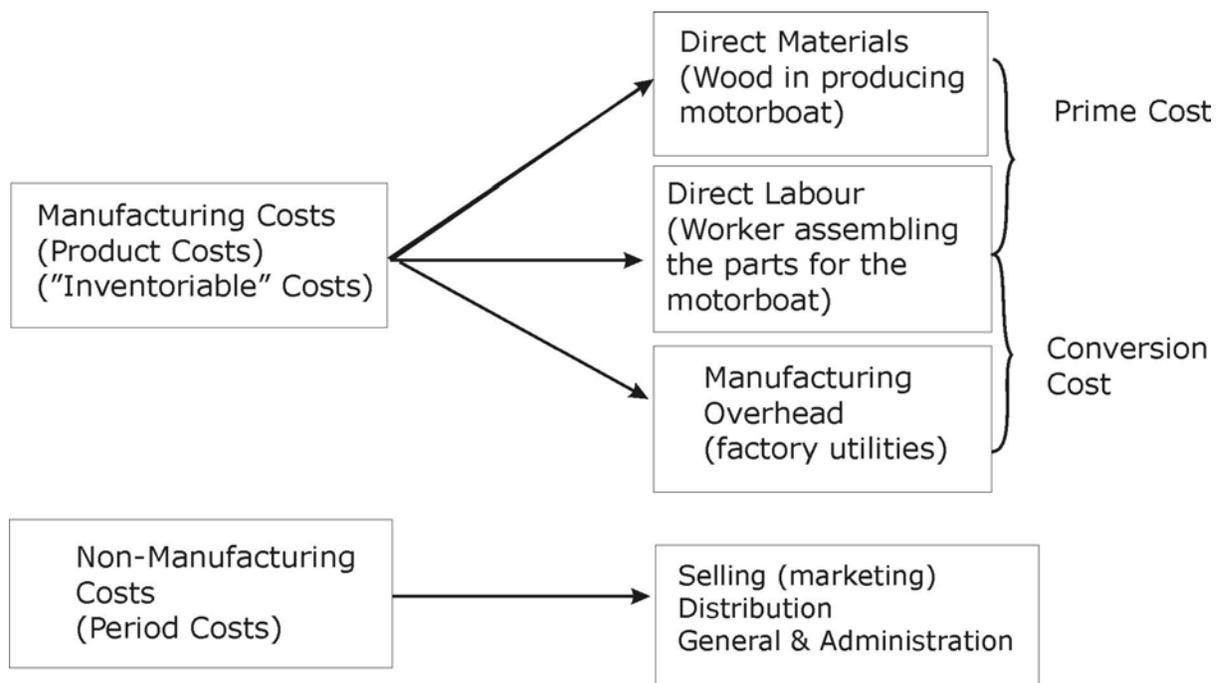
For example, office rent is a period cost, but factory rent is a product cost (manufacturing overhead). The trick in identifying a product cost is to ask, "Is this cost *caused by* production activities.

Some other related cost terms are:

Prime costs: Direct materials used and direct labor

Conversion costs: Direct labor plus manufacturing overhead

Work-in-Process: Cost of goods that are partially completed



In an accounting system, product costs flow from Purchases of Raw Materials to Work-in-Process to Finished Goods (one inventory account to another — Balance Sheet accounts), and then when the goods are sold, the item and its cost is transferred from finished goods (Balance Sheet item) to Cost of Goods Sold (Income Statement item).

Opportunity Costs

Scarcity of resources lead to trade-offs and trade-offs result in opportunity costs. An opportunity cost is the benefit that is sacrificed when an alternative course of action is taken. For example, opportunity cost of going to the college is giving up the job and related pay while you get your degree.

Understanding the cost concepts and classifications help management make sound decisions.

3. Allocation of Manufacturing Overhead Costs

- ✓ **overview**
- ✓ **calculation of overhead rate**
- ✓ **over/under-applied overhead**
- ✓ **Activity-Based Costing using cost pool rates**

Overview

Direct (direct materials and labor) costs are easily traced directly to the cost object, whereas indirect costs are those costs that are not easily identifiable to a particular cost object (ex. Job, product). This is because it is impossible to do so, as in the case of a factory supervisor's salary, or it not feasible to do so because the recordkeeping required for such a direct tracing is impractical and would cost too much. For example, the thread used on stitching labels for packsacks costs only a few pennies and it is not worthwhile to trace it to each packsack. Therefore, problems arise when attempting to trace indirect costs directly caused by a product.

The fact is, product costs should include all direct costs and a fair share of the indirect cost for a particular job/product. For example, the cost of an automobile repair job should include a fair share of all indirect costs [i.e., overhead costs (supervision, tools/ machinery used)] *in addition to* the direct parts (materials) and labor used. Factory overhead (indirect costs) includes all manufacturing costs other than the costs of direct materials and direct labor. Factory overhead is an indirect cost and difficult to trace directly into specific jobs or units.

The question is, how do we assign or allocate indirect costs to a specific job or unit? How do we figure out what the fair share is in terms of what proportions of the indirect costs are caused by each of the various jobs or units? For example, in an automobile repair shop, three hours of labor spent on a tune-up could use up three hours of machine time. Therefore, if we can reasonably determine the causal relationship (the driver), we can use that factor to allocate indirect cost. Allocation simply means assigning indirect costs to individual jobs or units based on some driver.

The process of assigning overhead costs to the jobs or units is commonly called overhead application.

An overhead application rate expresses the relationship of total factory overhead to some other factor that **can** be traced directly to specific units of output. Factory overhead costs are then assigned to jobs **in proportion to this other factor. So now we need to find the factor that would provide a reasonable basis to allocate overhead.** Therefore, overhead costs can be assigned to production in proportion to any measurement that can be traced into specific units. However, a strong relationship exists between the amount of direct labor used in a job and overhead costs likely to be incurred. Jobs that require more direct labor generally require more indirect labor (supervision), more wear and tear on machinery (depreciation), and greater use of electrical power. Thus, overhead application rates often express the relationship between factory overhead costs and the amount of direct labor involved in the production process. This objective may be accomplished by charging factory overhead to jobs in *proportion* to **direct labor costs, direct labor hours, or machine hours.**

Overhead Allocation Rate = Overhead Cost / Allocation Base

Alternative bases include:

- Direct labor hours
- Direct labor cost
- Machine hours
- Direct material cost.

The important point to remember here is that the allocation base used should be strongly associated (correlated) with overhead costs and, ideally, should drive the variable portion of the overhead costs.

Frequently, we need to calculate the product price as soon as the job is completed and immediate cost figures are needed to determine the price to charge to a customer, but the actual overheads (e.g., amortization, property taxes, supervisors' bonus, etc.) are not known until the end of the year. Therefore, it is difficult to determine the actual overhead costs until the end of the accounting period.

One way of allocating overhead or indirect costs is to estimate overhead costs and the level of the allocation base rather than use actual costs. The allocation rate is usually determined at the beginning of the accounting year, because the use of such a predetermined rate results in more meaningful and timely product costs.

The best way of assigning overhead cost to a specific job is to establish, in advance, an overhead rate—called the **predetermined overhead rate**.

Thus, an **overhead application rate** is used to assign a reasonable portion of factory overhead costs to each job.

To determine the overhead application rate in advance (predetermined overhead rate), we first estimate the expected total factory overhead for the year. This estimated amount is called **budgeted overhead**. We then estimate the direct labor costs, direct labor hours or machine hours, whichever is to be used as the basis for applying overhead costs to production.

The predetermined overhead application rate is equal to the budgeted overhead divided by the application base. It is not necessary to wait until the end of the period to know the factory overhead chargeable to goods produced.

Unlike direct costs (direct materials and direct labor), manufacturing overhead is indirectly traced (allocated) to jobs using an overhead allocation rate.

Calculation of Overhead Rate

An overhead allocation rate is calculated by dividing estimated overhead costs by the estimated quantity of the allocation base. For example, suppose Betty Queen Motorboat Company anticipates \$200,000 of manufacturing overhead and 36,364 direct labor hours during the year.

We can calculate the overhead rate	= Estimated overhead Costs/Allocation base (direct labor hours)
	= \$200,000/36,364
	= \$5.50

\$5.50 overhead will be applied to the relevant job for every hour of direct labor work on that job.

Look at our illustration above for direct labor: Betty Queen Motorboat Company used 400 direct labor hours (200 hrs for job #257, 150 hrs for job #258, and 50 hrs for job #259).

With an overhead rate of \$5.50 and 400 hours, \$2,200 of manufacturing overhead will be assigned to the following jobs:

Job #257	200 hrs @ 5.50	= \$1,100
Job #258	150 hrs @ 5.50	= \$825
Job #259	50 hrs @ 5.50	= \$275
Total:	400 hrs @5.50	= \$2,200

Over/Under-Applied Overhead

We should not expect that applied overhead will ever exactly equal actual overhead, since the predetermined overhead application rate was based on estimates.

A debit balance in the Factory Overhead account at the end of a period indicates that overhead applied to jobs was LESS than the actual overhead costs incurred (under-applied overhead). A credit balance in the account shows that overhead applied to jobs EXCEEDED the overhead costs actually incurred (over-applied overhead).

Normally, the amount of over-applied or under-applied overhead is NOT MATERIAL (immaterial) in dollar amount, and it is closed to Cost of Goods Sold. If the over-applied or under-applied overhead is material in dollar amounts, it is apportioned among the Work-in-Process Inventory, the Finished Goods Inventory, and Cost of Goods Sold accounts.

Remember: Overhead is applied to production based on the predetermined overhead rate.

Unless estimates are perfect, at year-end there will be either a debit or a credit balance in the Manufacturing Overhead account (representing over- or under-applied overhead) that is normally closed out to Cost of Goods Sold (assuming it is immaterial in amount). If over- or under-applied overhead is material, it should be allocated between Work-in-Process, Finished Goods, and Cost of Goods Sold.

If actual > applied, a debit balance results; thus the overhead is under-applied.

If actual < applied a credit balance results; thus the overhead is over-applied.

Manufacturing Overhead must be zeroed out at year-end; so it must be closed out either to Cost of Goods Sold or allocated to the various related accounts depending upon its materiality.

Overapplied and Underapplied Manufacturing Overhead

Cost of Goods Sold for the year		Mfg. Overhead for the year	
Unadjusted Balance		Actual overhead costs	Overhead Applied to jobs
	\$30,000	\$650,000	\$680,000
Adjusted Balance		\$30,000	

Dr. R. Yezli

The above diagram shows the actual overhead costs of \$650,000 and the overhead applied to jobs amounted to \$680,000. That means we over-applied the overhead costs by \$30,000. The over-applied overhead cost is credited to Cost of Goods Sold, reducing it.

Now, let's take a different example:

Suppose a company had \$52,000 of actual overhead and applied \$50,000 to jobs using a predetermined overhead rate. In this case, overhead is under-applied by \$2,000, represented by the debit balance in the Manufacturing Overhead account. Under-applied overhead is charged to Cost of Goods Sold [if the amount is immaterial (relatively small)]. The following journal entry is made:

Dr	Cost of Goods Sold	\$2,000.00	
Cr	Manufacturing Overhead		\$2,000.00

Activity-Based Costing: Using Cost Pool Rates

Today, with an increasing level of technology, many industries are moving toward a fully automated system, with computers controlling the entire production process—computer-integrated manufacturing. What is the impact on overhead and labor due to the trend from labor-intensive methods to a more automated process where most of the work is accomplished by machines? The overhead costs are staggering due to the high use of machinery or technology, and direct labor is decreasing as less labor is needed in the production process. Therefore, companies now have higher capital costs than was historically the case. The total overhead cost has increased in some companies to the point that there is no longer any correlation between overhead and direct labor.

In today's global and price-competitive market, we cannot cut costs unless we know what our costs are. Equally, managers need to know the cost of what is being managed. We need to sharpen our pencil and try to find a better way of allocating overhead. Remember, in almost all cost allocation situations, the "true," "correct," "accurate," "exact" allocation is not possible.

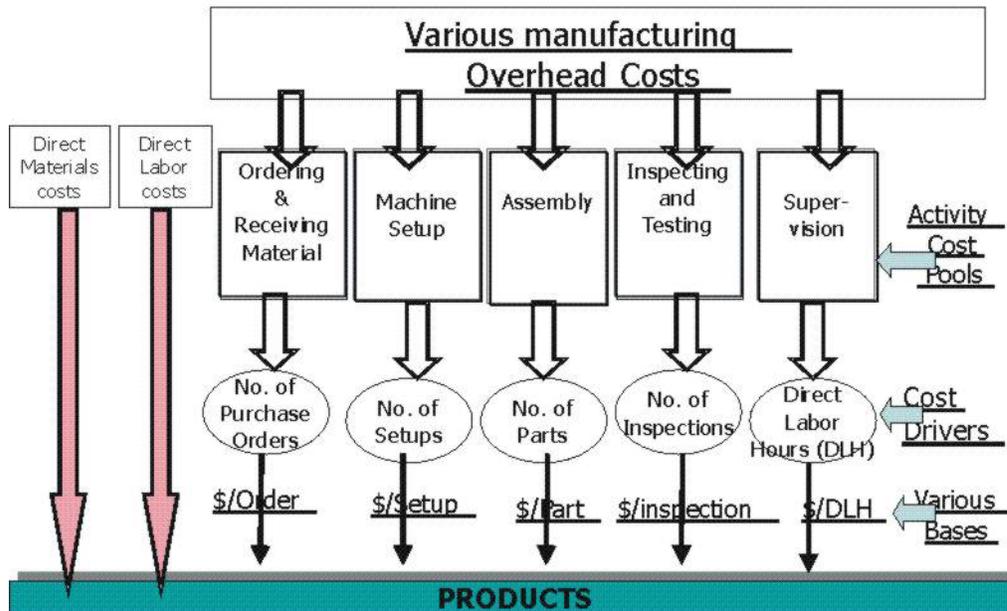
In these highly automated, flexible manufacturing environments, we need to look at a more refined costing system so we can achieve a fair and equitable allocation of costs. There is a need for new approaches to tracing overhead costs. If we can identify the causes of costs by **activities**, we can more accurately assign overhead costs based on the amount of overhead each product truly consumes. This activity-based approach has given accountants and managers a better understanding of what drives overhead costs. This approach/method is called **Activity-Based Costing** or simply **ABC** as it is known in the business world.

With overhead increasing as a percentage of the total costs in many organizations, both in the manufacturing and the service sectors, accountants and managers have begun to question the traditional treatment of overhead costs when calculating unit product costs. With ABC, direct labor and direct materials are treated in the same way as in traditional costing systems (job-order and process costing). The distinguishing feature of ABC is the way in which **overhead costs are treated**.

ABC is a product costing system in which overhead costs are allocated using multiple cost pools and overhead rates (instead of a single cost pool and overhead rate as in the case of a traditional costing system described earlier in this module). I have provided you with a diagram at this stage so that as we walk through the process of ABC, you will have a better idea what your destination is. The most important concept we learn in ABC is how we develop multiple overhead rates.

At this stage, you might not be familiar with some of the terminology used. But don't worry, we will take care of it as we go through the procedure.

Activity-Based Costing System



The above diagram shows Various manufacturing overhead costs for the ABC system.
Caption: Various manufacturing overhead costs

ABC deconstructs overhead costs into different pools and then assigns costs to products and services in a more meaningful manner.

ABC is a product costing approach that assigns costs to products based on the consumption of resources caused by activities. That's how the name **ABC** came about. ABC, a costing system that has recently gained popularity, is based on a simple idea: in an organization, overhead costs (i.e., inspections, machine setup, etc.) are generated by a number of activities needed to successfully perform manufacturing and business process. The ABC costing method recognizes that costs are caused by activities.

Cost Pool: pooling of overhead costs that relate to a specific activity.

Now let's summarize the procedure of the ABC costing system so far:

- Activities are identified and grouped into activity pools.
- Costs are assigned to these activity pools, called activity-cost pools.
- Cost drivers are used to allocate the overhead costs from the activity-cost pools to the specific products or services. Please note that, there should be a high degree of correlation between the cost driver and the consumption of overhead in order to obtain an accurate allocation of the overhead costs.

ABC is a product costing system - a method that first assigns costs to activities and then to goods and services based on how much each good or service uses the activities. How is this costing method different from traditional costing systems? Remember, the distinguishing feature of activity-based product costing is the way in which overhead costs are treated. For ABC and traditional costing systems (i.e., job-order and process costing), there is no difference in how direct labour and direct materials are traced to the product.

ABC is a costing technique that uses a two-stage allocation process:

1. The first stage identifies activities and assigns the overhead costs on the basis of activities that have consumed resources;
2. In the second stage, costs are allocated from each activity-cost pool to each product line in proportion to the amount of products consumed by the product line.

4. Break-Even Analysis

- ✓ **overview**
- ✓ **contribution margin approach**
- ✓ **equation approach**
- ✓ **cost-volume-profit chart**
- ✓ **target net profit analysis**
- ✓ **margin of safety**
- ✓ **operating leverage**

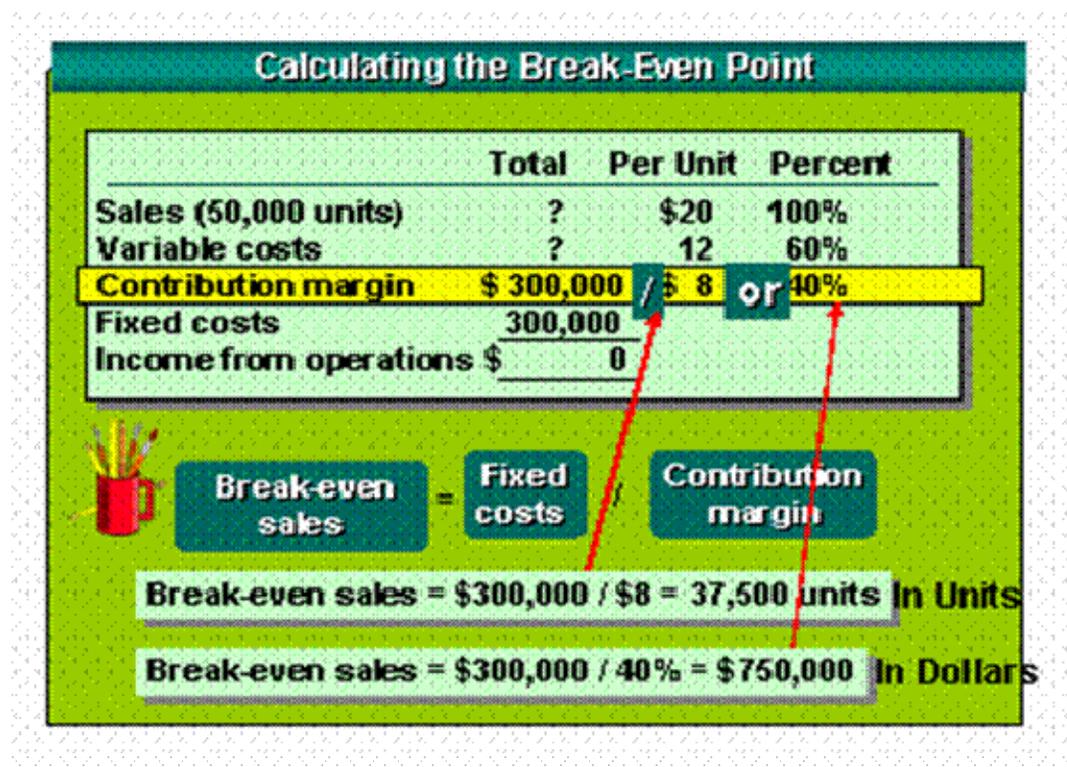
Overview

Let's begin with the basic step, and that is to find out how many or number of units must be sold to break even, that is, where the business neither makes a profit nor sustains a loss. In other words, this is the point where the net income is equal to zero. This is called break even analysis.

The cost-volume-profit analysis is sometimes referred to as break-even analysis. The break-even point is the point where total sales revenue equals total costs (variable and fixed) or the point where the total contribution margin equals total fixed costs. In other words, how many units do we need to sell so that our contribution margin equals total fixed costs?

The following diagram provides the basic approaches to calculating the break-even point:

Contribution Margin Approach



Break-even point (in units) = Fixed costs / Unit contribution margin

$$\$300,000 / \$8$$

$$\text{Break-even point} = 37,500 \text{ units}$$

Break-even point in sales dollars = Fixed costs / Contribution margin ratio

$$\$300,000 / 40\%$$

$$\text{Break-even point} = \$750,000$$

The above approach to calculating the break-even point is called the contribution margin approach.

From the above calculation, the break-even point in units is 37,500. If the sales fall below this number, the company will be in the red (loss). Or, if the total revenue is below \$750,000, the company is operating at a loss.

Equation Approach

An alternate approach to compute the break-even point is based on the profit equation we introduced at the beginning of this topic. That is:

$$\text{Total revenue} - \text{Total costs} = \text{Profit}$$

OR

$$\text{Total revenue} = \text{Unit sales price} \times \text{Sales volume in units}$$

$$\text{Total costs} = \text{Variable costs} + \text{Fixed costs}$$

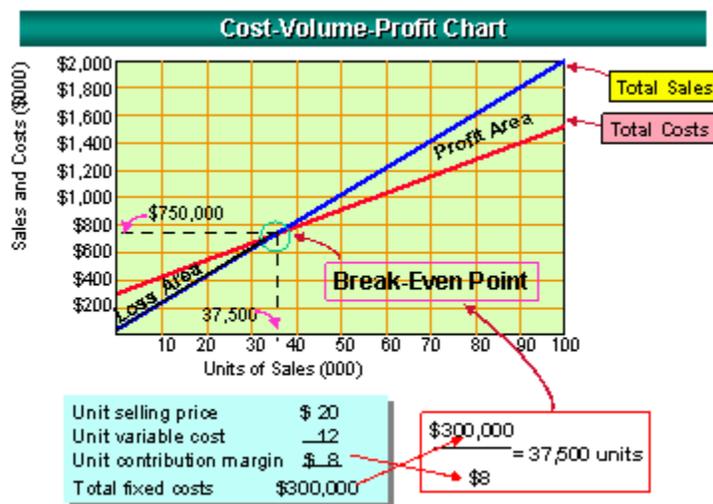
$$\text{Variable costs} = \text{Unit variable cost} \times \text{sales volume in units}$$

$$\text{Fixed costs} = \text{Total fixed costs}$$

$$\text{TOTAL REVENUE} - \text{VARIABLE COSTS} - \text{FIXED COSTS} = 0$$

The break-even point is the point where the total revenue line and the total costs intersect. If you draw a vertical line from this point to the x-axis you can find the break-even point in units. If you draw a horizontal line from this point across to the y-axis, you can find the break-even point in dollars, as shown below:

Cost-Volume-Profit Chart



Why a “break-even” point? Don't we want to make a profit?

Yes, but establishing the break-even point enables us to determine the level of product and sales necessary to cover our total costs. Any sales level below the break-even point represents a loss and any sales level above the break-even point generates profit.

Interpretation of the cost-volume-profit chart: The area between the fixed cost line and the total cost represents the total variable cost in dollars for all levels of output. The area between the total revenue line and the total cost line to the left of the break-even point represents the loss. If you sell fewer units than the break-even point, you lose money. The area between these two lines to the right of the break-even point represents a profit. If you sell more units than the break-even point you make a profit, as shown in the following diagram.

The break-even chart (shown above) and the profit graph (shown below) are most fruitfully employed as a means of presenting analysis information in graphical form. These graphs provide cost-volume-profit relationships for decision makers. The cost-volume-profit analysis helps managers predict the outcomes of their decisions. For a given level of expected sales volume, it helps managers plan costs and predict operating income or loss.

Target Net Profit Analysis

Targeted income is the amount of income the company would like to earn.

As part of the planning process, management sets the target for profit, and the cost-volume-profit analysis is used to determine the sales volume needed to achieve the planned target.

Well, there are two ways you can help the management get the answer: (1). using the contribution margin approach, i.e., using the cost-volume-profit equation, or (2). using profit volume graph to find out the targeted units.

The method for computing the desired or target sales volume in units and the desired or target net income is the same as was used in our earlier break-even computations. However, the targets are expressed in the equations.

The targeted income can be computed using the equations below.

$$\text{Units of sales to realize targeted income} = \frac{\text{Fixed Costs} + \text{targeted income}}{\text{Contribution margin per unit}}$$

For example, what sales in units and dollars are needed to obtain a targeted income of \$20,000? (Company's fixed costs = \$40,000; variable cost per unit = \$6 and sales per unit = \$10)

$$\begin{aligned} \text{Units of sales to realize targeted income} &= \frac{\text{Fixed Costs} + \text{targeted income}}{\text{Contribution margin per unit}} \\ &= \frac{(\$40,000 + \$20,000)}{(\$10 - \$6)} \\ &= 15,000 \text{ units} \end{aligned}$$

$$\begin{aligned} \text{Dollars of sales to realize targeted income} &= \frac{\text{Fixed Costs} + \text{targeted income}}{\text{Contribution margin ratio}} \\ &= \frac{(\$40,000 + \$20,000)}{((\$10 - \$6) / \$10)} \\ &= \frac{(\$60,000)}{((\$4) / \$10)} \\ &= \$150,000 \end{aligned}$$

Margin of Safety

The margin of safety is the excess of budgeted sales over the break-even sales. It provides a safety range; in a sense it provides the amount by which sales can drop before losses are incurred. In other words, the margin of safety serves as a measure of risk by showing how much sales the company can lose before it incurs an operating loss. Using a formula, we can say: Total sales (or budgeted sales) – break-even sales = margin of safety.

Margin of Safety			
Sales – Sales at break-even point			
Sales			
	Dollars	Units	
A Sales	\$1,000,000	50,000	
Break-even sales	750,000	37,500	
B Excess	\$ 250,000	12,500	
Margin of safety (B/A)	25%		

Margin of safety indicates the decrease in sales that may occur before an operating loss results.

Margin of safety expressed in units.

For example, Ranger Company's total sales amounted to:

In dollars

$$\begin{aligned}\text{Margin of safety} &= \$1,000,000 - \text{break-even sales} \\ &= \$1,000,000 - (37,500 \text{ break-even units} \times \$20) \\ &= \$1,000,000 - \$750,000 \\ &= \$250,000\end{aligned}$$

In units

$$\begin{aligned}\text{or } (\$250,000/\$20) &= 12,500 \text{ units} \\ \text{or } (50,000 \text{ units (sales units)} - 37,500 \text{ units (break-even units)}) &= 12,500 \text{ units}\end{aligned}$$

In percentage

$$\text{Margin of safety in } \$ (\$250,000)/\text{sales } (1,000,000) = 25\%$$

Margin of safety provides management with a comfort zone before the company hits break-even or floats in red.

I have an important question to ask you now. Think about the contribution margin and how that amount contributes to cover the fixed costs. The question is, do you think that companies with high fixed costs would be better off than companies with low fixed costs?

Here is an important concept to consider when doing the analysis. This concept is called cost structure. **Cost structure** refers to the relative proportion of fixed and variable costs existing in an organization. An automated manufacturing plant would have a high proportion of fixed costs, whereas a direct labor-intensive plant would have a high proportion of variable costs.

Any organization has some choice as to its cost structure. But before we choose the cost structure we need to know the implication of the choices. A company's cost structure has a significant effect on the way in which profits fluctuate in response to changes in sales volume. So yes, it does have an impact on profit.

Say two companies have similar sales dollars and variable costs, but their fixed costs are different. Which company would show the higher profit?

Operating Leverage

The measure of the extent to which fixed costs (compared to variable costs) are being used in an organization is called operating leverage. Operating leverage measures the sensitivity of profits to changes in sales.

How does it work? First, we need to calculate an operating leverage factor and then apply that factor to see the changes in sales and profits. Let's use an example: Jones Inc. is capital intensive—a high use of fixed costs—and Wilson Inc. is labour intensive—low fixed costs.

Operating Leverage			
Contribution margin	Operating leverage is a measure of the relative mix of variable costs and fixed costs.		
	Operating income		
	Jones Inc.	Wilson Inc.	
Sales	\$400,000	\$400,000	
Variable costs	300,000	300,000	
A Contribution margin	\$100,000	\$100,000	
Fixed costs	80,000	50,000	
B Income from operations	\$20,000	\$50,000	
Operating leverage (A/B)	5	2	
Operating leverage = Contribution margin Net income	Capital intensive?	Labor intensive?	

The formula to calculate the *operating leverage factor*:

$$\text{Operating Leverage factor} = \frac{\text{Contribution Margin}}{\text{Income from operation}}$$

$$\text{Jones Inc.} \quad \frac{(\$100,000)}{(\$20,000)} = 5$$

$$\text{Wilson Inc.} \quad \frac{(\$100,000)}{(\$50,000)} = 2$$

To illustrate the importance of operating leverage, let's measure how a percentage change in sales will affect profits. If sales are increased by 10%, what will be the percentage increase in net income?

Answer:

Once we calculate the operating leverage factor as shown above, we can apply the factor and find the percentage change in profit. Jones Inc., which is capital intensive and has a high operating leverage, would increase profit by 50%. For Wilson Inc., which is labour intensive and has a low operating leverage compared to Jones, profit would increase by 20% only.

5. The Master Budget

- ✓ **overview and schedule integration**
- ✓ **example and description of each component schedule**

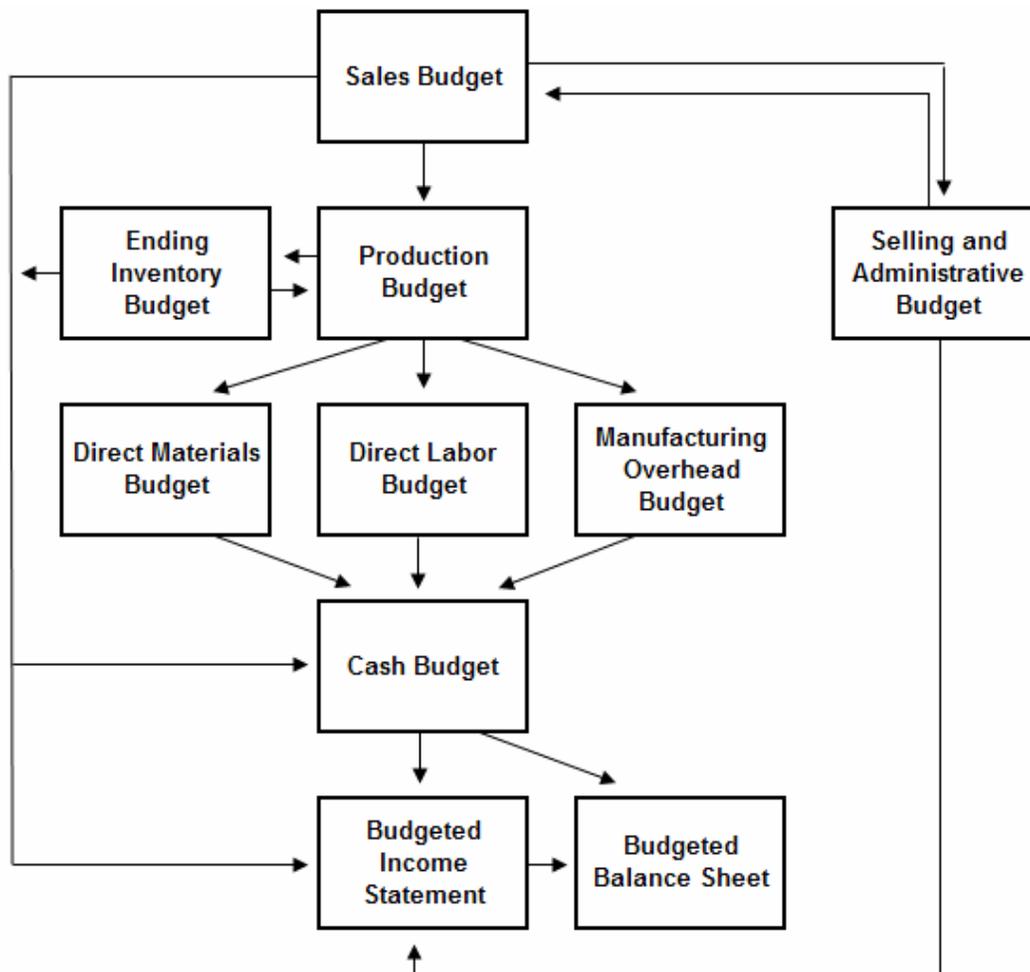
Overview

The Master Budget is a forward-looking financial document and roadmap – usually prepared annually for the upcoming year. It consists of several financial schedules intertwined with one-another – ultimately producing projected financial statements. This enables the enterprise to align its detailed operations with its overall goals.

This document will summarize the detailed schedules, and how they produce the input for the projected financial statements, in much the same manner as presented in *Introduction to Managerial Accounting* (Brewer, et. al.), and the student should refer to chapter 7 of that textbook or their own managerial accounting text should more detailed information be desired. Many of the schedules in this document use numbers and assumptions similar to the example in the body of chapter 7 of that book to permit the student to bridge to that more detailed example with ease should the need arise. This document is designed as an overview only.

The interrelationship of the various budget schedules and financial statements is shown below. The student should refer back to this interrelationship while studying each individual schedule to ensure understanding of how that particular schedule fits into the overall budgeting process.

Generally speaking, the budget starts with the sales budget, because so many things (production levels, inventory needs, other variable costs, etc.) depend on the level of activity. Spend a moment and follow the arrows in the schedule below and think about why they are ordered in that manner. Return when done with this entire section and do it again.



Sales Budget

The beginning point for budgeting, the sales budget, is merely a summary of expected sales for the year. It is one of the simplest schedules in the master budget. Connected to it and immediately following it is the cash collections budget. Assumptions are made (usually based on historical experience) regarding when sales revenues will be collected, and then those collections are placed into the appropriate time period as expected cash receipts. This enables the summarization of cash collections by time period – a critical need for projecting cash inflows.

In the example below, sales in units are multiplied by the number of units sold to arrive at sales in dollars. Then, based on assumptions regarding collections timing, those sales dollars are channeled into the time period when they will be collected. Note that 70% of sales are to be collected in the period of sale and 30% in the period following, and verify a couple of collections amounts. (Example: of the \$400,000 sales shown in Q1, \$280,000 [70%] is collected in Q1, \$120,000 [30%] in Q2.) Note that beginning accounts receivable is collected in Q1. The uncollected portion of Q4 sales becomes accounts receivable on the budgeted ending balance sheet to be collected in Q1 of the next year. The income statement and several other detailed budget schedules depend on the sales budget (refer to the diagram on the preceding page).

	<u>Q1</u>	<u>Q2</u>	<u>Q3</u>	<u>Q4</u>	<u>Total</u>
<u>Sales</u>					
Budgeted sales in units	5,000	15,000	20,000	10,000	50,000
Selling price per unit	80	80	80	80	80
Total sales in dollars	\$ 400,000	\$ 1,200,000	\$ 1,600,000	\$ 800,000	\$ 4,000,000

Percentage of sales collected in period of sale 70%

Percentage of sales collected in period following sale 30%

<u>Collections</u>					
Beginning accts receivable	\$ 180,000				\$ 180,000
Sales, Quarter 1	280,000	\$ 120,000			400,000
Sales, Quarter 2		840,000	\$ 360,000		1,200,000
Sales, Quarter 3			1,120,000	\$ 480,000	1,600,000
Sales, Quarter 4				560,000	560,000
Total	\$ 460,000	\$ 960,000	\$ 1,480,000	\$ 1,040,000	\$ 3,940,000

Production Budget

The starting point for the production budget is budgeted sales. The trick with this schedule (and also with the raw materials budget) is to properly work with inventories. The objective is to produce the necessary amount to support the quarter's sales, *plus* an inventory "buffer" carryover for the subsequent quarter, *less* what is already in finished goods inventory at the start of the quarter.

In the example below, note that budgeted sales for each quarter is identical to the sales budget on the previous page. In each quarter, *in addition to that quarter's budgeted sales*, an ending inventory buffer is added. This buffer is so that there are sufficient finished goods available to begin the following quarter and also to accommodate budget inaccuracies should actual sales be larger than budgeted sales. The buffer in this example is 20%. Therefore, the amount added to Q1 required production is 3,000 units (20% of Q2's 15,000 budgeted unit sales), summing to a total required of 8,000 units.

Since, at the beginning of Q1, there were already 1,000 units on hand (beginning inventory carried forward from the previous year's Q4 at 20% of Q1's 5,000 unit sales) we do not need to make them again, we already have them!! So the required production of 8,000 is reduced by the amount already on hand to arrive at the total we need to make in Q1 of 7,000 units. Prove a couple of additional quarters for practice.

The only other trick to this schedule is that not all rows total across; the ending inventory (second line) for the year is the same as the ending inventory for Q4, the beginning inventory for the year is the same as the beginning inventory for Q1.

	<u>Q1</u>	<u>Q2</u>	<u>Q3</u>	<u>Q4</u>	<u>Total</u>
Budgeted sales in units	5,000	15,000	20,000	10,000	50,000
Add ending invty "buffer"	3,000	4,000	2,000	1,500	1,500
Total FG required	8,000	19,000	22,000	11,500	51,500
Less beginning invty	1,000	3,000	4,000	2,000	1,000
Need to produce	7,000	16,000	18,000	9,500	50,500

Direct Materials Budget

Once budgeted production is known it becomes possible to budget for direct materials needed to support that production. Like the sales and collections budget, this schedule consists of two parts: direct materials needs and required payments for those direct materials.

The first section dealing with direct materials consists mainly of a schedule identical to the production budget. This is because we are again dealing with inventory (raw materials instead of finished goods, this time). Therefore, many calculations on this schedule are the same as those in the production budget (using different “buffer” percentages). In our example we use 10% as the buffer percentage. Ignore the first two and last two lines of the direct materials schedule and focus on the middle five lines. You will see that it operates exactly as described for the production budget on the previous page. Refer to that page for further explanation of this portion of the direct materials needs schedule if necessary (substituting 10% instead of the 20% used on that schedule).

Once the above is understood, it becomes fairly straightforward to understand the first two lines – where we take the required production (from the production schedule) and multiply it by the number of raw materials units needed for each (in our example, 10 units of raw materials are needed for each unit of production) deriving the quantity of raw materials required for that production quantity. The final two lines of this section then multiply the raw materials needed in units by their unit price arriving at the cash needs for raw materials purchases.

The bottom section applies those cash needs to the schedule of cash disbursements in exactly the same way described for cash collections in the sales and collections budget (except this schedule assumes 50% will be paid in the same quarter and 50% in the following quarter instead of the 70%/30% split assumed on the sample for cash collections).

	<u>Q1</u>	<u>Q2</u>	<u>Q3</u>	<u>Q4</u>	<u>Total</u>
<u>Direct Materials</u>					
Budgeted production	7,000	16,000	18,000	9,500	50,500
Required RM per unit	10	10	10	10	10
Budgeted sales in units	70,000	160,000	180,000	95,000	505,000
Add ending invty "buffer"	16,000	18,000	9,500	7,500	7,500
Total FG required	86,000	178,000	189,500	102,500	512,500
Less beginning invty	7,000	16,000	18,000	9,500	7,000
Need to purchase	79,000	162,000	171,500	93,000	505,500
Price of RM per unit	\$ 0.30	\$ 0.30	\$ 0.30	\$ 0.30	\$ 0.30
RM purchase cost	\$ 23,700	\$ 48,600	\$ 51,450	\$ 27,900	\$ 151,650

<u>Cash Disbursements</u>					
Beginning accts payable	\$ 12,900				\$ 12,900
Purchases, Quarter 1	11,850	\$ 11,850			23,700
Purchases, Quarter 2		24,300	\$ 24,300		48,600
Purchases, Quarter 3			25,725	\$ 25,725	51,450
Purchases, Quarter 4				13,950	13,950
Total	\$ 24,750	\$ 36,150	\$ 50,025	\$ 39,675	\$ 150,600

Direct Labor Budget

Once required production is known, it becomes possible to budget for the direct labor needed to support that production. This is one of the simpler schedules, using required production from the production schedule and multiplying it by the direct labor hours per unit of production, and then multiplying those hours by the cost per labor hour to derive the total dollar cost of direct labor.

In our example below, the first line is the budgeted production from the production schedule. We assume 1.2 direct labor hours per unit so in Q1 the total direct labor hours needed is 8,400 (7,000 units x 1.2 hours per unit). Then the 8,400 required hours in Q1 is multiplied by the direct labor rate of \$5.00 per direct labor hour to obtain the total direct labor cost for Q1 of \$42,000. All four quarters are done the same way and the totals column sums them for the year.

	<u>Q1</u>	<u>Q2</u>	<u>Q3</u>	<u>Q4</u>	<u>Total</u>
Budgeted production	7,000	16,000	18,000	9,500	50,500
Direct labor hours per unit	1.2	1.2	1.2	1.2	1.2
Required direct labor hours	8,400	19,200	21,600	11,400	60,600
Direct labor per hour rate	\$ 5.00	\$ 5.00	\$ 5.00	\$ 5.00	\$ 5.00
Total cost of direct labor	\$ 42,000	\$ 96,000	\$ 108,000	\$ 57,000	\$ 303,000

Manufacturing Overhead Budget

This schedule includes variable and fixed manufacturing overhead and we assume in our example that the cost driver for variable overhead is direct labor hours (found in the direct labor budget).

The variable overhead application rate is multiplied by budgeted direct labor hours to obtain the total budgeted variable overhead. Fixed overhead is added and the sum of the two is total manufacturing overhead. (Note that another driver for overhead could be used as appropriate, such as machine hours.)

Since overhead includes the non-cash expense depreciation, *and* since one of our objectives is to obtain the cash outlay for overhead, we need to subtract that non-cash expense (depreciation) included in the total budgeted overhead expense to obtain the budgeted overhead cash outlay. In our example, total overhead *expense* is \$212,100 but the cash requirement is \$182,100 because depreciation is not a cash outlay.

Finally, a separate schedule is made at the bottom deriving the *total* overhead application rate (predetermined overhead application rate) by dividing total overhead (including depreciation) by the budgeted direct labor hours (from the direct labor budget – direct labor is the denominator level of activity in this example).

	<u>Q1</u>	<u>Q2</u>	<u>Q3</u>	<u>Q4</u>	<u>Total</u>
Budgeted direct labor hours	8,400	19,200	21,600	11,400	60,600
Variable overhead rate	\$ 1.50	\$ 1.50	\$ 1.50	\$ 1.50	\$ 1.50
Total variable overhead	12,600	28,800	32,400	17,100	90,900
Fixed overhead	30,300	30,300	30,300	30,300	121,200
Total overhead	42,900	59,100	62,700	47,400	212,100
Less depreciation	7,500	7,500	7,500	7,500	30,000
Overhead cash requirement	\$ 35,400	\$ 51,600	\$ 55,200	\$ 39,900	\$ 182,100

Total overhead cash requirement	\$ 182,100
Divide by total direct labor hours	60,600
Predetermined overhead rate	<u>\$ 3.00</u>

Ending Finished Goods Inventory Budget

The ending finished goods inventory is derived using information from earlier schedules, adding the per unit cost of the three elements comprising total production costs used to produce it: direct materials, direct labor, and overhead. The per unit cost of each of the three elements (obtained from the schedule for each) is summed to derive the total cost per unit of finished goods. Then that total unit cost is multiplied by the number of units projected to be in ending finished goods inventory (as shown in Q4 of the production schedule) to obtain the total dollar value of ending finished goods.

In our example, the direct materials budget shows a \$.30 cost per unit of direct material and that 10 direct material units are required for each unit of finished goods. Multiplying the direct material unit cost by the number of units in each unit of finished goods yields the total direct materials cost contained in each unit of finished goods. This process is repeated for direct labor and overhead using numbers obtained from each of those schedules, respectively. The finished goods per unit cost of \$12.60 is the sum of the per unit cost of the three production elements used to produce it. The total finished goods per unit cost of \$12.60 is multiplied by the 1,500 units in finished goods inventory to obtain the total dollar value of finished goods of \$18,900. This value will be used for the end-of-year balance sheet.

<u>Production Cost Element</u>	<u>Quantity</u>	<u>Cost</u>	<u>Total</u>
Direct materials	10 RM units	\$.30 per unit	\$ 3.00
Direct labor	1.2 hours	\$ 5.00 per hour	6.00
Overhead	1.2 hours	\$ 3.00 per hour	3.60
Per unit cost of ending inventory			\$ 12.60
Multiply by units in ending finished goods			1,500
Total cost of ending inventory			<u>\$ 18,900</u>

Selling and Administrative Budget

The selling and administrative budget has the same calculational structure as the overhead budget. It includes both variable and fixed expenses, the variable expenses are calculated based on a predetermined rate per item *sold*, then fixed expenses are added to derive the total expense, and the non-cash expense (depreciation) is removed from the total expense to arrive at a cash expenditure amount for the cash flow budget. The only calculational difference between this budget and the overhead budget is that variable sales costs are based on the number of units sold instead of units produced (used for overhead), and the fixed expenses are more detailed (in our example). Please refer to the overhead budget for detailed discussion of the calculations if necessary.

	<u>Q1</u>	<u>Q2</u>	<u>Q3</u>	<u>Q4</u>	<u>Total</u>
Budgeted sales	5,000	15,000	20,000	10,000	50,000
Variable expenses per unit	\$ 1.00	\$ 1.00	\$ 1.00	\$ 1.00	\$ 1.00
Total variable expense	5,000	15,000	20,000	10,000	50,000
Fixed expenses					
Advertising	9,500				9,500
Salaries and wages	35,000				35,000
Insurance			6,000		6,000
Property taxes		4,500		4,500	9,000
Depreciation	4,000	4,000	4,000	4,000	16,000
Total selling and adm. Exp.	53,500	23,500	30,000	18,500	125,500
Less depreciation	7,500	7,500	7,500	7,500	30,000
Cash requirement	<u>\$ 46,000</u>	<u>\$ 16,000</u>	<u>\$ 22,500</u>	<u>\$ 11,000</u>	<u>\$ 95,500</u>

Cash Budget

The cash budget begins with the cash balance per the balance sheet from the beginning of the budget period, adds cash receipts from the cash collections schedule, subtracts cash disbursements from the cash disbursements schedule, and arrives at a projected ending cash balance for each quarter, and for the year. Usually a company will have a minimum desired cash balance it wants on hand for unexpected occurrences and to accommodate budget inaccuracies.

If the projected cash balance, after adding and subtracting the expected receipts and disbursements, does not meet the minimum cash required to be on hand, then borrowings are made to boost the cash balance back up to that required minimum. If the projected cash balance, after adding and subtracting the expected receipts and disbursements, *exceeds* the minimum cash required to be on hand, then that excess is used to pay off borrowings (if any exist), applying those payments first to interest, then principle.

The basic cash budget structure, and the source of each amount, is shown below. As with prior schedules, a fully completed cash budget would include a column for each quarter and also a column for the year's totals.

<u>Line #</u>		<u>Line #</u>	
	<u>Cash Receipts</u>		
1	Beginning cash	1	from beginning balance sheet
2	Add customer collections	2	from collections section of sales budget
3	Total cash available	3	sum of the two lines above
	<u>Less Cash Disbursements</u>		
4	Direct materials	4	from disbursement section of direct materials budget
5	Direct labor	5	from direct labor budget
6	Manufacturing overhead	6	from the disbursements line of overhead budget
7	Selling and administrative	7	from cash disbursements line of selling and administrative budget
8	Other purchases	8	as determined or provided by other sources (example: equipment)
9	Cash dividends paid	9	as determined or provided by other sources
10	Total disbursements	10	sum of lines 4 through 9
11	Cash balance before financing	11	line 3 minus line 10
	<u>Financing Section</u>		
12	Add new borrowing	12	amount needed to bring insufficient cash up to minimum balance
13	Subtract principle repayments	13	amount available (after interest payments) above minimum balance
14	Subtract interest repayments	14	calculated based on the outstanding balance for the quarter
15	Ending cash	15	line 11 plus line 12, minus lines 13 and 14 <i>(also is beginning balance for next quarter)</i>

Budgeted Income Statement and Balance Sheet

The budgeted income statement and balance sheet get their numbers primarily from the supporting budgets on the previous pages. Their basic structure is like any other income statement or balance sheet except that they are projected, not historic. As with the cash budget on the previous page, the basic structure and source of the amounts are indicated below. Many companies will make a budgeted income statement and balance sheet as of the end of each quarter. For example purposes however that is unnecessary, as the procedure for each quarter would be the same as that for the year in total.

<u>Line #</u>		<u>Line #</u>	
<u>Income Statement</u>			
1	Sales	1	from sales budget
2	Cost of goods sold	2	total units per sales budget times unit cost per ending inventory budget
3	Gross margin	3	line 1 minus line 2
4	Less selling and admin expenses	4	from the total expense line of selling and administrative budget
5	Net operating income	5	line 3 minus line 4
6	Less interest expense	6	from the total interest in cash budget financing section
7	Net income	7	line 5 minus line 7
<u>Balance Sheet</u>			
Current assets			
1	Cash	1	from the ending balance on cash flow budget
2	Accounts receivable	2	uncollected portion of Q4 sales (30%) from sales and collections budget
3	Raw materials inventory	3	from direct materials budget (ending units times price per raw material unit)
4	Finished goods inventory	4	from finished goods budget
5	Total current assets	5	sum of lines 1 through 4
6	Buildings and equipment	6	beginning balance sheet amount plus purchases per cash budget
7	Accumulated depreciation	7	beginning balance plus deprec. totals from overhead and sales budgets
8	Net buildings and equip.	8	line 6 minus line 7
9	Total assets	9	line 5 plus line 8
Current liabilities			
10	Accounts payable	10	unpaid portion of Q4 purchases (50%) from direct materials purchases budget
Stockholders' equity			
11	Common stock	11	beginning balance sheet amount plus any issuances of common stock during year
12	Retained earnings	12	beginning balance plus net income minus dividends paid per cash budget
13	Total stockholders' equity	13	sum of lines 11 and 12
14	Total liab. & stockhldrs' eq.	14	line 10 plus line 13

6. Expenses and Capital Budgeting

- ✓ **capital versus revenue expenditures differentiated**
- ✓ **capital budgeting and NPV analysis**

Capital Expenditures versus Revenue Expenditures (expenses)

The distinction between expenditures that should be capitalized and those that should be expensed immediately is straightforward. Ask yourself, “Does this expenditure benefit multiple years, or only the present year?” If it benefits multiple years, then is it material in amount? If the answer to both questions is “yes,” the expenditure should be capitalized onto the balance sheet and [usually] depreciated, amortized, or depleted over the years it benefits using a reasonable method (e.g., straight-line, accelerated, or units of production). If the answer to *either* question is “no,” the expenditure should be expensed and reflected as such in the present period’s income statement (deducted in full to arrive at net income for the current period).

Rule #1 in accounting is the Revenue Recognition Principle which (oversimplified) basically says we should record revenue when we earn it, when we know how much we have earned, and when we have a reasonable expectation that we will get paid.

Rule #2 (inseparable from Rule #1), is the Matching Principle. This rule says that, for whatever revenue was recognized under Rule #1, you must match against it the appropriate costs to facilitate understanding the correct profit or loss from the activity that gave rise to that revenue.

Both rules disregard the timing of when cash is received or disbursed, and this creates the need for accruals and deferrals in order to properly recognize them (covered in your financial accounting course).

With the above as a backdrop, assessing expenditures to determine whether to capitalize them (code them to a balance sheet account) or expense them (code them to the income statement) depends upon the matching principle.

1. If the expenditure benefits solely the current period, then it should be expensed immediately – this matches that expenditure against the present revenue and it becomes a deduction in arriving at net income on the current year’s income statement. These are frequently referred to in academia as “revenue expenditures” but in the real world they’re just known as “expenses.”
2. If the expenditure benefits multiple periods, then it should be placed on the balance sheet (essentially a deferred expense) and then [usually] allocated (expensed) to the income statements for the periods it benefits. This matches costs against the revenues they serve to earn, in the years they serve to earn it. These are commonly referred to as “capital expenditures” and the common short-form expression is just to say “capitalized.”

Examples abound. Expenses include wages, utilities, supplies, and just about any other thing you can think of spending money on that is consumed in the current period for the production of income. (Note that any of the foregoing examples, if they were product costs, would instead be attached to the inventory product and expensed when the inventory is sold.) Capitalized expenditures – those benefiting multiple periods – are exemplified by machinery, buildings, vehicles, and other “capital” assets. (Note that their depreciation, if it were production property and equipment, would be handled as product costs and attached to the inventory produced during the depreciation period.)

One final note: Despite all of the above, many times expenditures benefiting multiple periods are expensed because they are immaterial. For instance, a new trash can should be expected to last many years. But a company will not capitalize such a minor item since there is no real benefit to doing so. No value would flow to a financial statement user by depreciating a \$5 trash can over five years at \$1 per year, for instance. Furthermore, the cost in terms of employee time to make the calculations and journal entries would exceed the usefulness of the information.

Determining the Desirability of a Capital Expenditure & Net Present Value (NPV) Analysis

Capital expenditures are frequently very large in amount and, since they last several years, impact the profitability and viability of the company for long periods of time. Therefore, it is important to evaluate significant capital expenditures carefully. The most economically sound manner is Net Present Value (NPV) analysis.

Briefly stated, NPV analysis categorizes cash inflows and outflows into the years during which they are expected to occur, applies an assumed interest rate to them and discounts them to their present value equivalent amount, then summarizes those present values equivalents of all of those cash flows – determining whether the result is positive (good) or negative (not good). If a capital expenditure (using NPV analysis) yields a positive overall result, this means that the positive present values exceed the negative present values and, therefore, that value will be created should the enterprise undertake the expenditure/project. If a capital expenditure, on the other hand, yields a negative NPV, this says the present value of the associated costs exceed the present value of the revenues – so undertaking it would actually *destroy* enterprise value, reducing it.

To perform NPV analysis, all cash flows (in and out) associated with a contemplated expenditure must be identified. To illustrate, an example follows in which a clothing chain is determining whether to purchase and operate a new store location. Opening the new location would bring new capital costs, revenues, and expenses to the existing company. The potential new store is being considered for a five year period after which it will be closed due to expected competition from new trends rendering it unprofitable.

Assumptions for the Five-Year Store Operation

Cash inflows and outflows for the contemplated store include the following:

✓ Initial cost of point-of-sale equipment, racks, and shelving	\$ 50,000
✓ Working capital requirements (cash, store inventory, etc.)	\$ 75,000
✓ Renovation of shelving and racks in three years	\$ 8,000
✓ Salvage value of point of sale equipment, racks and shelving in five years	\$ 20,000
✓ Annual revenues and expenses:	
Sales revenues	\$180,000
Cost of goods sold	\$ 95,000
Other expenses (wages, utilities, advertising, etc.)	\$ 45,000

Note that some of the items above are one-time cash flows, others recur annually. This means that, when finding the present values of these items, we must refer to the present value of a single sum for the one-time items, and refer to the present value of an annuity for the recurring items. (If this doesn't make sense to you, you need to refer to your financial or managerial accounting text and review present value concepts.) Note also that the working capital requirement of \$75,000 (to buy inventory and put cash into the cash registers) will be released at the end of the five years when the store is closed (and inventory and cash for the cash registers are no longer needed – freeing these resources for use elsewhere).

It is helpful, also, to summarize the recurring revenues and expense above into one recurring “annual net cash inflow.”

Sales revenues	\$180,000
Less: Cost of goods sold	95,000
Other expenses	<u>45,000</u>
Annual net cash inflow	<u>\$ 40,000</u>

For this example, we will assume an interest rate for present value purposes of 12%. The factors shown below are from the present value of \$1 and present value of an annuity tables as presented in Appendix 12B of *Introduction to Managerial Accounting* (Brewer, et. al.) but identical factors should be available in your financial or managerial accounting text, as well as from other sources. You can also use a financial calculator to find the present values if you know how, but the results will differ slightly from those shown below due to rounding in the table factors used in this example (the calculator is more precise).

Net Present Value Analysis - Potential New Store Location

	<u>Year</u>	<u>Cash Flow</u>	<u>12% Factor</u>	<u>Present Value</u>
Purchase point of sale equipment, racks, and shelving	Now	\$ (50,000)	1.000	\$ (50,000)
Working capital requirements	Now	(75,000)	1.000	(75,000)
Renovation of shelving and racks	3	(8,000)	0.712	(5,696)
Annual net cash inflow	1 - 5	40,000	3.605	144,200
Salvage value of sale equipment, racks, and shelving	5	20,000	0.567	11,340
Release of working capital when store closes	5	75,000	0.567	42,525
				\$ 67,369

Detailed description of the net present value analysis above follows:

Each of the cash inflows and outflows identified as part of the project under consideration (in this case, the new store) is listed in the Cash Flow column. The time(s) at which the cash flows occur and their amounts are also listed. The appropriate factors are then determined from the present value tables and listed. Note that the factor for “now” is always 1.000, the factor for present value of a single sum is always less than 1.000, and the factor for present value of an annuity (the recurring amount) is always greater than 1.000.

Multiplying the nominal cash flow amount in the “Cash Flow” column by the “12% Factor” from the tables yields the present value of that nominal amount (the equivalent value now at the given interest rate – in this case, 12%). That present value is the dollar value that has equal worth to us today compared to receiving the larger nominal amount in the future. (Example: \$20,000 received in five years is worth the same as to us as \$11,340 today at a 12% discount rate. This is because we could invest \$11,340 today and earn 12% compounded annually, and it would grow to \$20,000 in five years.)

By converting each cash flow to its equivalent value to us *today* we can then add all of the inflows and subtract all of the outflows at today’s values and derive the overall value of the expenditure/project *today*. In our example, that value is positive, meaning the present value of the inflows exceeds the present value of the outflows by \$67,369. Assuming all of our assumptions are correct (nominal cash flow amounts, timing of those cash flows, 12% cost of funds interest factor), this analysis is telling us that opening the store and operating it for five years creates value for the enterprise in the amount of \$67,369 (it has a “net present value of \$67,369). Pursuing the project would therefore increase the value of the firm.

Note that, had our analysis yielded a negative net present value amount, that would be telling us that opening and operating the store and operating it for five years would not be a profitable endeavor overall, and would therefore reduce the value of the firm.

Not every project/expenditure is subjected to NPV analysis because it is time consuming and costly to do the analyses. Usually, companies use a less-expensive and easier “screening device” such as the payback method to reduce their large number of potential undertakings to a limited number of “best candidates.” Then, with those high-potential expenditures/projects that survive the initial screening process, it becomes worthwhile to undergo the extra effort and cost to determine their NPV and make a decision regarding the best alternatives.

7. Purposes of Cost Classifications

- ✓ **selecting appropriate cost type for a need**
- ✓ **inventory valuation and operating income**

Different Costs for Different Purposes

Section 2 of this study guide described the various cost terms and what they mean. For instance, a product cost is any cost caused by a product, and therefore ends up as a part of that product's cost. There are three product costs, direct materials, direct labor, and overhead. Some are fixed, and some are variable. It follows that the same cost can go by several names. For instance, direct materials is a product cost, a direct cost, and a variable cost at the same time. Straight-line factory depreciation is a product cost, an indirect cost, and a fixed cost at the same time. Other costs include incremental (or differential) costs, sunk costs, opportunity costs, prime costs, conversion costs, and more. The remainder of this section assumes student knowledge of what various cost terms mean. If the terms' meanings are unclear, the student should refer back to Section 2 of this study guide, or their managerial accounting text.

All of these names for costs exist for a reason. As managerial accountants, one of our primary goals is to understand the financial details of our business. To do that, it is necessary to separate the overall financial results of that business into various components to understand what led to those results. This requires separating revenues and costs by organizational unit, by classification type, and/or various other categorizations. Because of the numerous cost types (most mentioned, above), classifying them can be difficult and requires considerable accounting expertise *in addition to a thorough understanding of the enterprise*. This section highlights some of the main purposes of various cost terms.

Purpose of Product Costs

Product costs enable us to understand the cost of our product and, hence, value (cost) our inventory correctly. Inventory is frequently one of the larger assets on a company's balance sheet, and so the ability to properly cost that asset is critical to accurate profitability and net worth. For GAAP purposes, full absorption costing is used – a methodology that includes all product costs in the inventory valuation, including fixed factory overhead. For internal purposes, variable costing is frequently used – this method includes all product costs *except fixed factory overhead* in inventory. Therefore, variable costing valuations will always be less than full-absorption valuations since it doesn't include fixed factory overhead cost component.

Because full absorption costing includes fixed factory overhead in inventory cost and variable costing does not, *the value placed on the same inventory is larger using absorption costing than it is under variable costing*. A sample per-unit inventory valuation is below. The unit cost under each methodology is as follows:

Direct labor	\$10
Direct materials	8
Variable overhead	<u>7</u>
<i>Total unit cost under variable costing</i>	<i>15</i>
Allocated fixed factory overhead	<u>5</u>
<i>Total unit cost under absorption costing</i>	<i><u>\$20</u></i>

Using full absorption versus variable costing can also cause differing operating income results. This occurs when inventory levels change. A simple example using the above inventory unit costs illustrates this. Below are two income statements. On the left is an absorption costing income statement, on the right a contribution format income statement using variable costing. The difference in inventory valuation between the two is fixed factory overhead included in the ending inventory value. This, in turn, causes the difference in net income between the two statements.

In our example, we will assume no beginning inventory and an ending inventory of 1,000 units. Because of the difference in unit costs under variable versus absorption costing, the value of the 1,000 units in ending inventory between absorption and variable costing will differ by \$5,000 (1,000 units X \$5 allocated fixed factory overhead per unit). Because ending inventory is a balance sheet item, the value on the balance sheet between the two methods will differ by the same \$5,000. The ending inventory difference also *causes a \$5,000 difference in operating income between the two methods*.

<u>ABSORPTION COSTING</u>		<u>VARIABLE COSTING</u>	
Sales	\$ 150,000	Sales	\$ 150,000
COGS		COGS	
Beg Invty	\$ -	Beg Invty	\$ -
COG Mfg (a)	<u>100,000</u>	COG Mfg (c)	<u>75,000</u>
Gds avail	100,000	Gds avail	75,000
Less E.I. (b)	<u>20,000</u>	Less E.I. (d)	<u>15,000</u>
COGS	<u>80,000</u>	COGS	60,000
Gross profit	70,000	Less variable SG&A	<u>10,000</u>
SG&A (\$10k var, \$10k fixed)	<u>20,000</u>	Contribution margin	80,000
Operating income	<u>\$ 50,000</u>	Less fixed expenses	
		Fixed fact OH (e)	25,000
		Fixed SG&A	<u>10,000</u>
		Operating income	<u>\$ 45,000</u>
(a) - \$20 unit cost X 5000 units		(c) - \$15 unit cost X 5000 units	
(b) - \$20 unit cost X 1000 units		(d) - \$15 unit cost X 1000 units	
		(e) - \$5 unit cost X 5000 units produced	

The profit between the two statements above differs by \$5,000 (\$50,000 versus \$45,000). This difference is caused by the difference in valuation of inventory between them. Look at the ending inventory in each statement. In absorption costing the 1,000 units are costed at \$20 each and so the ending inventory is \$20,000. In variable costing, the 1,000 units are costed at \$15 each and so the ending inventory is \$15,000. The difference is the \$5 per unit allocated fixed overhead cost (multiplied by 1,000 units in ending inventory). Under absorption costing this \$5,000 is included in ending inventory on the balance sheet; under variable costing it is just expensed. Expensing the \$5,000 versus including it in inventory on the balance sheet creates the net income difference between the two methods. (Note that if inventory levels decrease during the period instead of increasing, the net income effect would be reversed between the two methods.)

To understand the total cost of a product, it makes sense that *all* product costs *including fixed factory overhead* should be included. Otherwise, mistakes could be made in thinking a product is more profitable than it is, because all costs caused by that product are not being considered. (Again, absorption costing is required by GAAP and most accounting regulators in the modern world.)

Conversely, to enable Cost-Volume-Profit analysis (“what if” calculations), all fixed and variable costs must be separated so a contribution format income statement can be produced. Doing this requires that the fixed manufacturing overhead included in inventory valuations under full-absorption costing be taken out and shown below the contribution margin in total with other fixed costs.

It is critical to be aware of the inventory valuation issues and their impact on operating income as one undertakes either of these methods.

Purpose of Cost Behavior

Understanding cost behavior is necessary to understanding changes in profitability at varying activity levels. Because variable costs are driven by activity, they will increase and decrease proportionate to that activity level. This permits prediction of total variable costs at any level of activity (within the relevant range) because variable cost will always represent the same percentage to total sales. For instance, if at \$100k sales variable costs are \$50,000, then at \$150,000 sales variable costs will be \$75,000 (50% of sales in each instance). At the other end of the cost behavior spectrum, fixed costs remain constant in total (within the relevant range). This means that, at any given level of activity within the relevant range, total fixed costs will not change. For instance, if at \$100k sales fixed costs are \$25k, then at \$150k sales fixed costs will still be \$25k. While variable costs remain constant as a percentage of sales, fixed costs remain constant in total.

There are hybrids in between variable and fixed cost – “step variable” or “step fixed,” and “mixed” costs. Their behavior is a blend of the fixed and variable costs’ behavior. To properly predict costs, mixed costs must be separated into their variable and fixed components, and the width of the steps in step variable costs must be known.

Understanding cost behavior permits prediction of total costs at a given activity level (within the relevant range). This, in turn, permits understanding profitability at different levels of activity. At any level of sales within the relevant range, cost levels can be predicted. That means profitability can be predicted, and “what-if?” analyses can be performed. For example: What if we lower the sales price and volume increases as a result? If you know how your costs will behave with this change, you can predict the profit and decide whether making the change will increase, or decrease, profitability.

The sample contribution format income statements below illustrate how cost behavior can be utilized to predict profitability. Using the same data discussed above, sales increase and variable costs increase in the same proportion (50% increase in each). This creates a \$25,000 increase in the contribution margin (which is still 50% of sales, as it was before the increase). But fixed costs do not change. This means that the entire increase in the contribution margin also increases operating income (operating income is \$25,000 higher, same as the contribution margin).

	<u>Original</u>		<u>50% Increase</u>	
Sales	\$ 100,000	100%	\$ 150,000	100%
Variable costs	<u>50,000</u>	50%	<u>75,000</u>	50%
Contribution margin	50,000	50%	75,000	50%
Fixed costs	<u>25,000</u>	25%	<u>25,000</u>	17%
Operating income	<u>\$ 25,000</u>	25%	<u>\$ 50,000</u>	33%

Note that, after the change, the proportion of fixed costs to sales decreased from 25% to 17% and operating income increased from 25% to 33%. This is because the fixed costs did not change when sales increased, so they are less in proportion to the new sales total than they were to the old sales total. Note, also, that operating income doubled. We see from these sample statements that being able to properly classify costs as variable and fixed enables us to do “what if” analyses (in this case, “what if sales increase 50%?”). It is important to remember that these analyses are only valid within the relevant range. Outside the relevant range, variable costs may not remain a constant percentage of sales, and fixed costs may change in total, rendering this methodology inaccurate.

There are numerous variants of the above example. What if we reduce variable costs and increase fixed costs? What if we leave variable costs the same but increase advertising (a fixed cost)? What if we modify the prices? Understanding cost behavior, and constructing the contribution format income statement enables us to answer these questions.

Purpose of Incremental Costs (Differential Costs)

Incremental costs are costs that change based on a decision. They are also known as differential costs because they are the costs that will be different if you follow Plan A versus Plan B. Non-differential costs can be ignored when making decisions, because they do not change dependent upon the choice of action, and so don't matter when making that particular decision.

For example, let's say you are thinking about leasing or buying a copier. Under the lease, you would pay lease payments of \$50 per month, but if you buy the copier you will make loan payments of \$75 per month. Whether you lease or buy the copier, you must buy the paper (\$20/mo) and toner (\$10/mo). The lease and loan payments are differential because they differ between the alternatives. The paper and toner are not differential because they will be the same under either alternative.

LEASE OR BUY COPIER

	<u>Lease</u>	<u>Buy</u>	<u>Difference</u>	
Payments	\$ 50	\$ 75	\$ (25)	← differential cost
Toner	10	10	-	← non-differential costs
Paper	20	20	-	←
Total cost	\$ 80	\$ 105	\$ (25)	

When making the decision, the non-differential costs can be ignored because they will be the same either way. The accountant can focus only on the incremental differences between decisions and still arrive at the right decision. Most decisions have many differential and non-differential costs. Including both can get confusing and cumbersome. Eliminating the non-differential costs and focusing only on the things that change based on the decision being considered can make that decision easier just because the analysis is more succinct and easier to understand.

Opportunity costs are differential costs and should be included in decision making analyses. Sunk costs are never differential and should not be included in decision-making analyses.

For more utilization of differential costs and their use, refer to the next section, Decision Making.

8. Decision-Making

- ✓ **relevant revenues and costs**
- ✓ **make or buy**
- ✓ **drop or retain a segment**

Relevant Revenues and Costs

In decision-making, it is important to focus on things that will change depending on the decision. Those things that will change based on the decision are relevant to that decision. Please refer to the immediately preceding section for an introduction to this concept. If a cost is incremental, that means it will differ based on the decision at-hand. The same can be said for revenues. This section expands on the incremental cost concept, extending it to revenues and costs to illustrate how differential profitability can be determined.

Two examples to illustrate this concept are shown below: a make or buy decision and a drop or retain a segment decision. These are more complex than the simple “lease or buy a copier” example in the preceding section because there are more elements to the decisions and also because there is differential revenue as well as differential costs.

Make or Buy

This is a common decision – determining whether it is more advantageous to purchase an item (such as a part used in making a product) outside the company or to make it internally. Here is an example set of costs for making a part internally:

	<u>Per Unit</u>
Direct labor	\$ 5
Direct materials	3
Variable overhead	2
Production supervisor’s salary*	2
Production equipment depreciation	3
Allocated overhead from headquarters	<u>1</u>
 Total unit costs	 <u>\$ 16</u>

*Production supervisor supervises several products, not just this one.

Suppose an outside supplier offered to sell an identical part to the company for \$12. At first glance, it would be tempting to say “yes” because the outside supplier’s price of \$12 is \$4 less than the \$16 cost to produce the part internally. That would be the wrong answer, however, because not all of the above costs to produce the part are relevant to this decision.

Evaluate the list of unit costs and observe that the last three – production supervisor’s salary, production equipment depreciation, and the allocated overhead from headquarters – are not likely to go away if the decision is made to buy the part instead of making it. Only the costs that will be eliminated if we buy the part instead of making it should be compared to the outside supplier’s price. Those are the relevant costs for this decision. In this example, the sum of direct labor, direct materials, and variable overhead is \$10 and that is the amount we will save if we choose not to make the part internally. The production supervisor has other duties and won’t be terminated; the depreciation is an allocation of a sunk cost and won’t change. The overhead from headquarters will not go away either, it will just be reallocated among the remaining products.

So, to find the relevant items in this example, we can either add the relevant costs ($\$5 + \$3 + \$2 = \10) or we can take the total cost and subtract the irrelevant items ($\$16 - \$1 - \$3 - \$2 = \$10$). Either way, we find \$10 is the relevant cost, and so the correct decision would be to continue making the part internally, not buy it. Buying it would actually *increase* costs by \$2 per unit, a different answer than we would give were we not aware of relevant costs for decision making.

Relevant costs of making	\$10
Outside supplier’s price	<u>(12)</u>
Net additional cost of buying outside	<u>\$ (2)</u>

Sometimes, opportunity costs can modify a decision because opportunity costs are relevant if they will differ between the alternatives being considered.

Continuing on with the above example, assume 10,000 of these parts are produced by the company annually. Therefore, the calculations above indicate that it would cost the company \$20,000 (10,000 units x \$2) if the company chose to buy the parts instead. But what if the space used to produce the part could be used for something else (rented out or used to make another part, for instance)? What if that alternate use would yield rent income or net profit from production of \$30,000? The \$30,000 in this example is an opportunity cost of making this part internally. Because we are making this part, we cannot take advantage of the opportunity to earn the \$30,000 by using the facilities for the alternative purpose. This is an example of an opportunity cost that is relevant cost, and it would change our decision.

Original loss caused if decision to buy	\$(20,000)
Opportunity cost – alternate use of space	<u>30,000</u>
Net benefit from buying not making	<u>\$ 10,000</u>

So, decision-making requires identifying the relevant costs (which may include opportunity costs) and using them to make the decision, while disregarding the irrelevant costs. Usually irrelevant costs come in the form of sunk costs (depreciation), allocated costs (headquarters' overhead), or costs that just won't change between the alternatives because of the situation (supervisor). Failure to separate relevant costs from irrelevant costs will many times produce a wrong decision (as described above - if you compare \$14 as the cost to make the part internally versus \$12 to buy it).

Drop or Retain a Segment of Business

The same concepts described above apply to decisions regarding whether a segment of business should be continued or not. Frequently, segments can *appear* to be losing money when they are not because of allocated costs. Sunk costs (e.g., depreciation) can also contribute to losses but they are not relevant to the decision because they do not change in any circumstance (they would not be eliminated if the choice were made to drop the segment).

Consider the following segment of business:

Sales		\$ 50,000
Less variable costs		<u>20,000</u>
Contribution margin		30,000
Less fixed costs		
Advertising	\$ 5,000	
Wages	12,000	
Rent	3,000	
Utilities	6,000	
Depreciation	8,000	
Allocated costs	<u>6,000</u>	<u>40,000</u>
Net operating income		<u><u>\$(10,000)</u></u>

At first glance, the segment appears to be losing money and should be discontinued. But some of the costs are not relevant; they will not go away if the segment is discontinued. Specifically, the depreciation is sunk and so it is irrelevant. Whether the segment is retained or discontinued, depreciation will not change. Additionally, the allocated costs will not go away, they will be reallocated among the remaining segments. This means that \$14,000 of the costs above are not avoidable (\$8,000 depreciation + \$ 6,000 allocated costs), and should not be considered in the decision to drop or retain the segment.

A restatement of the segment of business clearly segregating the irrelevant costs illustrates that it should be retained:

Sales		\$ 50,000
Less variable costs		<u>20,000</u>
Contribution margin		30,000
Less relevant fixed costs		
Advertising	\$ 5,000	
Wages	12,000	
Rent	3,000	
Utilities	<u>6,000</u>	<u>26,000</u>
Net segment contribution		4,000
Less depreciation		<u>8,000</u>
Net segment margin		<u><u>\$ (4,000)</u></u>

The segment is losing money even when the allocated costs are removed, but the depreciation is a sunk cost and will not go away if the segment is discontinued and so should be ignored for this decision. Since depreciation is also a non-cash expense and merely an allocation of an asset purchased previously, the segment is actually contributing \$4,000 cash flow toward the allocated costs. If the segment is discontinued, that contribution would be lost and the company will be worse off because it will lose the net segment contribution of \$4,000.