Chapter 2

Lecture Notes

**Chapter theme**: This chapter explains how managers need to rely on different cost classifications for different purposes. The four main purposes emphasized in this chapter include **assigning costs to cost objects,** **preparing external financial reports, predicting cost behavior, and decision making**.

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1. **Summary** **of the types of cost classifications**

#### This slide summarizes the types of cost classifications that will be discussed in this chapter, namely cost classifications for assigning costs to cost objects, financial reporting, predicting cost behavior, and making business decisions.

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1. **Cost classifications for assigning** **costs to cost objects**

*Learning Objective 1: Understand cost classifications used for assigning costs to cost objects: direct costs and indirect costs.*

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#### Cost object − Anything for which cost data are desired including products, customers, jobs, organizational subunits, etc. For purposes of assigning costs to cost objects costs are classified two ways:

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* + 1. **Direct costs** − Costs that can be easily and conveniently traced to a specified cost object.
    2. **Indirect costs** − Costs that cannot be easily and conveniently traced to a specified cost object.
       1. **Common costs** − Indirect costs incurred to support a number of cost objects. These costs cannot be traced to any individual cost object.

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1. **Cost classifications for manufacturing companies** Manufacturing companies separate their costs into two broad categories—manufacturing and nonmanufacturing costs.

*Learning Objective 2: Identify and give examples of each of the three basic manufacturing cost categories.*

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* 1. **Classifications of manufacturing** **costs**
     1. **Direct materials** − Raw materials that become an integral part of the finished product and whose costs can be conveniently traced to it.

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* + 1. **Direct labor** − Labor costs that can be easily traced to individual units of product (also called touch labor).

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* + 1. **Manufacturing overhead** − Includes all manufacturing costs except direct materials and direct labor. These costs cannot be easily traced to specific units produced (also called indirect manufacturing cost, factory overhead, and factory burden).

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* + - 1. Includes **indirect materials** that are part of the finished product, but that cannot be easily traced to it.
      2. Includes **indirect labor costs** that cannot be conveniently traced to the creation of products.
      3. Other examples of manufacturing overhead include: maintenance and repairs on production equipment, heat and light, property taxes, depreciation and insurance on manufacturing facilities, etc.

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* 1. **Classifications of nonmanufacturing costs** (also called selling and administrative costs).
     1. **Selling costs** – Includes all costs necessary to secure customer orders and get the finished product into the hands of the customer. Selling costs can be either direct or indirect costs.

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* + 1. **Administrative costs** – Includes all costs associated with the general management of an organization. Administrative costs can be either direct or indirect costs.

*Learning Objective 3: Understand cost classifications used to prepare financial statements: product costs and period costs.*

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#### Cost classifications for preparing financial statements

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* + 1. **Product costs** – Includes all the costs that are involved in acquiring or making a product. More specifically, it includes direct materials, direct labor, and manufacturing overhead.
       1. Product costs are expensed in the income statement when the products are sold.
    2. **Period costs** – Includes all selling and administrative costs.

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* + - 1. These costs are expensed in the income statement in the period incurred.

*Quick Check − product versus period costs*

13-14

#### Prime costs and conversion costs

* + 1. **Prime cost** − Direct materials cost plus direct labor cost.

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* + 1. **Conversion cost** – Direct labor cost plus manufacturing overhead costs.

## **Cost** **classifications for predicting cost behavior**

*Learning Objective 4: Understand cost classifications used to predict cost behavior: variable costs, fixed costs, and mixed costs.*

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#### Cost behavior refers to how a cost will react to changes in the level of activity. The most commonly used classifications of cost behavior are variable, fixed, and mixed costs:

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* + 1. **Variable cost** − A cost that varies, in total, in direct proportion to changes in the level of activity. However, variable cost per unit is constant.

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* + - 1. An **activity base** (also called a cost driver) is a measure of what causes the incurrence of variable costs. As the level of the activity base increases, the total variable cost increases proportionally.

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* + 1. **Fixed cost** − A cost that remains constant, in total, regardless of changes in the level of the activity. However, if expressed on a per unit basis, the average fixed cost per unit varies inversely with changes in activity.

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* + - 1. **Committed fixed costs** represent investments with a multi-year planning horizon that cannot be easily adjusted in the short term.

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* + - 1. **Discretionary fixed costs** usually arise from annual decisions by management and they can be easily reduced in the short term.

*Helpful Hint: To illustrate fixed costs, ask students for the cost of a large pizza. Then ask: What would be the cost per student if two students buy a pizza? What if four students buy a pizza? This makes it clear why average fixed costs change on a per unit basis. To illustrate variable costs, add that a beverage costs $1 and each student eating the pizza has one beverage. So, if two people were eating the pizza, the total beverage bill would come to $2; if four people, $4. The cost per beverage remains the same, but the total cost depends on the number of people ordering a beverage.*

* + 1. **The linearity assumption and the relevant range** − Accountants usually assume that costs are strictly linear; however, economists point out that many costs are actually curvilinear**.** Nonetheless, within a narrow band of activity known as the relevant range, a curvilinear cost can be **satisfactorily approximated** by a straight line.

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* + - 1. The **relevant range** is that range of activity within which the assumptions made about cost behavior are valid.
    1. The relevant range of activity **pertains to fixed cost as well as variable costs**.
       1. For example, assume office space is available at a rental rate of **$30,000** per year in increments of **1,000** square feet.

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* + - 1. Fixed costs would increase in a step fashion at a rate of $30,000 for each additional 1,000 square feet.
    1. The relevant range for a fixed cost is the range of activity over which the graph of the cost is flat.

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* + 1. It is helpful to think about variable and fixed cost behavior in a **2x2 matrix**.

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*Quick Check – variable vs. fixed costs*

28-29

* + 1. **Mixed cost** – A cost that contains both variable and fixed elements.

1. For example, utility bills often contain fixed and variable cost components.
   * + - 1. The fixed portion of the utility bill is constant regardless of kilowatt hours consumed. This cost represents the minimum cost that is incurred to have the service ready and available for use.

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* + - * 1. The variable portion of the bill varies in direct proportion to the consumption of kilowatt hours.
    1. An equation can be used to express the relationship between mixed costs and the level of the activity. This equation can be used to calculate what the total mixed cost would be for any level of activity.
       1. The equation is *Y* = *a + bX*

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* + - * 1. *Y =* The total mixed cost.
        2. *a =* The total fixed cost (the vertical intercept of the line).
        3. *b =* The variable cost per unit of activity (the slope of the line).
        4. *X =* The level of activity.
    1. For example*,* if your fixed monthly utility charge is $40, your variable cost is $0.03 per kilowatt hour, and your monthly activity level was 2,000 kilowatt hours, this equation can be used to calculate your total utility cost of $100.

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1. **The** **analysis of mixed costs**
   1. Account analysis and the engineering approach
      1. In **account analysis**, each account under consideration is classified as variable or fixed based on the analyst’s prior knowledge about how costs behave.
         1. This approach is limited in value in the sense that it glosses over the fact that some accounts may have both fixed and variable components.

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* + 1. The **engineering approach** classifies costs based upon an industrial engineer’s evaluation of production methods, material specifications, labor requirements, equipment usage, power consumption, and so on.
       1. This approach is particularly useful when no past experience is available concerning activity and costs.
  1. **Diagnosing** **cost behavior with a scattergraph plot**

*Learning Objective 5: Analyze a mixed cost using a scattergraph plot and the high-low method.*

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* + 1. Before analyzing a mixed cost you should plot the data on a scattergraph. For illustrative purposes, assume the following information, which would be plotted as follows:

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* + - 1. The maintenance cost, which is known as the dependent variable, is plotted on the *Y* (vertical) axis.
      2. The activity (hours of maintenance), which is known as the independent variable, is plotted on the *X* (horizontal) axis.
    1. After plotting the data, examine the dots on the scattergraph to see if they are linear, such that a straight line can be drawn that approximates the relation between cost and activity.

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* + - 1. If the dots are not linear, do not analyze the data any further. Instead, search for another independent variable that bears a stronger linear relationship with the dependent variable.
      2. In this example, the dots are linear so we can proceed to the high-low method.
  1. The **high-low method**
     1. This method can be used to analyze mixed costs if a scattergraph plot reveals a linear relationship between the *X* and *Y* variables. Let’s continue with our data from the scattergraph plot.

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* + 1. The first step is to choose the data points pertaining to the highest and lowest activity levels (high = 850 units; low = 450 units).
       1. Notice, this method relies on two data points to estimate the fixed and variable portions of a mixed cost.
    2. The second step is to determine the total costs associated with the two chosen points (high = $9,800; low = $7,400).

*Helpful Hint: Emphasize that the high and low points are identified by the level of activity and not by the level of the cost.*

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* + 1. The third step is to calculate the change in cost between the two data points ($2,400) and divide it by the change in activity level between the two data points (400 units).
       1. The quotient represents an estimate of variable cost per unit of activity ($6.00 per unit).
    2. The fourth step is to take the total cost at either activity level (in this case, $9,800) and deduct the variable cost component ($5,100). The residual represents the estimate of total fixed costs ($4,700).

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* + - 1. The variable cost component ($5,100) is determined by multiplying the level of activity (850 units) by the estimated variable cost per unit of the activity ($6.00 per unit).
    1. The fifth step is to construct an equation that can be used to estimate the total cost at any activity level (*Y* = $4,700 + $6.00*X*).

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*Quick Check − the high-low method*

40-43

* 1. The **least-squares regression method**
     1. This method can be used to analyze mixed costs if a scattergraph plot reveals an approximately linear relationship between the *X* and *Y* variables.
     2. This method uses **all of the data points** to estimate the fixed and variable cost components of a mixed cost. This method is superior to the high-low method that uses only two data points to estimate the fixed and variable cost components of a mixed cost.

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* + 1. The basic goal of this method is to fit a straight line to the data that **minimizes the sum of the squared errors**. The regression errors are the vertical deviations from the data points to the regression line.
    2. The formulas that are used for least-squares regression are complex. Fortunately, computers can perform the calculations quickly. The observed values of the *X* and *Y* variables are entered into the computer and the software does the rest.

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* + - 1. The output from the regression analysis can be used to create an equation that enables you to estimate total costs at any activity level.
    1. The high-low and least-squares regression methods provide **different estimates** of the fixed and variable cost components of a mixed cost. This is to be expected because each method uses differing amounts of the data points to provide estimates. Least-squares regression provides the most accurate estimates because it uses all of the data points.

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1. **Traditional and** **contribution format income statements**

*Learning Objective 6: Prepare income statements for a merchandising company using the traditional and contribution formats.*

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* 1. The traditional and contribution formats differ as follows:
     1. The traditional approach separates product costs as required for external reporting purposes from selling and administrative expenses. It does not focus on cost behavior.

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* + 1. The contribution approach separates costs into fixed and variable categories. Sales − variable costs = contribution margin. The contribution margin − fixed costs = net operating income.
    2. The contribution approach is used as an internal planning and decision-making tool. For example, this approach is useful for:
       1. Cost-volume-profit analysis (Chapter 5).

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* + - 1. Budgeting (Chapter 8).
      2. Segmented reporting of profit data (Chapter 6).
      3. Special decisions such as pricing and make or buy analysis (Chapter 12).

*Helpful Hint: The income statement from the annual report of a well-known local manufacturing firm can be used to illustrate the functional income statement. Ask if the various expense categories on the income statement contain both fixed and variable costs. Also ask how to estimate the increase in profit that would result from a 4% increase in sales using the functional statement. There is no way to do this with reasonable accuracy, since there is no way to tell on a functional income statement what costs would increase*.

1. **Cost classifications for decision making**

*Learning Objective 7: Understand cost classifications used in making decisions: differential costs, opportunity costs, and sunk costs.*

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#### It is important to realize that every decision involves a choice between at least two alternatives. The goal of making decisions is to identify those costs that are either relevant or irrelevant to the decision. To make decisions, it is essential to have a grasp on three concepts:

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* + 1. **Differential costs** (or **incremental costs**) − A difference in cost between any two alternatives (a difference in revenue between two alternatives is called **differential revenue**).

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* + - 1. Differential costs can be either fixed or variable.
    1. **Opportunity cost** − The potential benefit that is given up when one alternative is selected over another.

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* + - 1. These costs are not usually entered into the accounting records of an organization, but must be explicitly considered in all decisions.

*Helpful Hint: Ask students what opportunity costs they incur by attending class. Their opportunity cost is the value to them of the activity they would be doing otherwise (e.g., working, sleeping, partying, studying, etc.)*

* + 1. **Sunk cost** − A cost that has already been incurred and that cannot be changed now or in the future.

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Helpful Hint: Ask students: “Suppose you had purchased gold for $400 an ounce, but now it is selling for $250 an ounce. Should you wait for the gold to reach $400 an ounce before selling it?” Many students will say “yes” even though the $400 purchase is a sunk cost.

Quick Check − relevant costs

55-60