Managerial Accounting and Cost Concepts

Chapter 2

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Learning Objective 1

Identify and give examples of each of the three basic manufacturing cost categories.
Classifications of Manufacturing Costs

- Direct Materials
- Direct Labor
- Manufacturing Overhead

The Product
Direct Materials

Raw materials that become an integral part of the product and that can be conveniently traced directly to it.

Example: A radio installed in an automobile
Direct Labor

Those labor costs that can be easily traced to individual units of product.

Example: Wages paid to automobile assembly workers
Manufacturing Overhead

Manufacturing costs that cannot be easily traced directly to specific units produced.

Examples: Indirect materials and indirect labor

Materials used to support the production process.

Examples: lubricants and cleaning supplies used in the automobile assembly plant.

Wages paid to employees who are not directly involved in production work.

Examples: maintenance workers, janitors, and security guards.
Nonmanufacturing Costs

Selling Costs
Costs necessary to secure the order and deliver the product.

Administrative Costs
All executive, organizational, and clerical costs.
Learning Objective 2

Distinguish between product costs and period costs and give examples of each.
Product Costs Versus Period Costs

Product costs include direct materials, direct labor, and manufacturing overhead.

Period costs include all selling costs and administrative costs.
Quick Check ✓

Which of the following costs would be considered a period rather than a product cost in a manufacturing company?
A. Manufacturing equipment depreciation.
B. Property taxes on corporate headquarters.
C. Direct materials costs.
D. Electrical costs to light the production facility.
E. Sales commissions.
Quick Check ✓

Which of the following costs would be considered a period rather than a product cost in a manufacturing company?

A. Manufacturing equipment depreciation.
B. Property taxes on corporate headquarters.
C. Direct materials costs.
D. Electrical costs to light the production facility.
E. Sales commissions.

B. Property taxes on corporate headquarters.

E. Sales commissions.
Classifications of Costs

Manufacturing costs are often classified as follows:

- Direct Material
- Direct Labor
- Manufacturing Overhead

**Prime Cost**

**Conversion Cost**
Learning Objective 3

Understand cost behavior patterns including variable costs, fixed costs, and mixed costs.
Cost Classifications for Predicting Cost Behavior

Cost behavior refers to how a cost will react to changes in the level of activity. The most common classifications are:

- **Variable costs.**
- **Fixed costs**
- **Mixed costs.**
Variable Cost

Your **total texting bill** is based on how many texts you send.
Variable Cost Per Unit

The **cost per text** sent is constant at 5 cents per text message.
The Activity Base (Cost Driver)

A measure of what causes the incurrence of a variable cost

- Units produced
- Machine hours
- Miles driven
- Labor hours
Fixed Cost

Your monthly contract fee for your cell phone is fixed for the number of monthly minutes in your contract. The monthly contract fee does not change based on the number of calls you make.
Fixed Cost Per Unit

Within the monthly contract allotment, the average fixed cost **per cell phone call made** decreases as more calls are made.
Types of Fixed Costs

Committed
Long-term, cannot be significantly reduced in the short term.

Examples
Depreciation on Buildings and Equipment and Real Estate Taxes

Discretionary
May be altered in the short-term by current managerial decisions

Examples
Advertising and Research and Development
The Linearity Assumption and the Relevant Range

A straight line closely approximates a curvilinear variable cost line within the relevant range.

Activity

Economist’s Curvilinear Cost Function

Accountant’s Straight-Line Approximation (constant unit variable cost)
Fixed Costs and the Relevant Range

For example, assume office space is available at a rental rate of $30,000 per year in increments of 1,000 square feet.

Fixed costs would increase in a step fashion at a rate of $30,000 for each additional 1,000 square feet.
Fixed Costs and the Relevant Range

- The relevant range of activity for a fixed cost is the range of activity over which the graph of the cost is flat.
## Cost Classifications for Predicting Cost Behavior

<table>
<thead>
<tr>
<th>Cost</th>
<th>In Total</th>
<th>Per Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable</td>
<td>Total variable cost Increase and decrease in proportion to changes in the activity level.</td>
<td>Variable cost per unit remains constant.</td>
</tr>
<tr>
<td>Fixed</td>
<td>Total fixed cost is not affected by changes in the activity level within the relevant range.</td>
<td>Fixed cost per unit decreases as the activity level rises and increases as the activity level falls.</td>
</tr>
</tbody>
</table>
Quick Check ✓

Which of the following costs would be variable with respect to the number of cones sold at a Baskins & Robbins shop? (There may be more than one correct answer.)
A. The cost of lighting the store.
B. The wages of the store manager.
C. The cost of ice cream.
D. The cost of napkins for customers.
Quick Check ✓

Which of the following costs would be variable with respect to the number of cones sold at a Baskins & Robbins shop? (There may be more than one correct answer.)

A. The cost of lighting the store.
B. The wages of the store manager.
C. The cost of ice cream.
D. The cost of napkins for customers.
Mixed Costs
(also called semivariable costs)

A mixed cost contains both variable and fixed elements. Consider the example of utility cost.

Total mixed cost

Activity (Kilowatt Hours)

Total Utility Cost

Variable Cost per KW

Fixed Monthly Utility Charge
Mixed Costs

The total mixed cost line can be expressed as an equation: \( Y = a + bX \)

Where:
- \( Y \) = The total mixed cost.
- \( a \) = The total fixed cost (the vertical intercept of the line).
- \( b \) = The variable cost per unit of activity (the slope of the line).
- \( X \) = The level of activity.
Mixed Costs - An Example

If your fixed monthly utility charge is $40, your variable cost is $0.03 per kilowatt hour, and your monthly activity level is 2,000 kilowatt hours, what is the amount of your utility bill?

\[ Y = a + bX \]

\[ Y = $40 + ($0.03 \times 2,000) \]

\[ Y = $100 \]
Analysis of Mixed Costs

Account Analysis and the Engineering Approach

In **account analysis**, each account is classified as either variable or fixed based on the analyst’s knowledge of how the account behaves.

The **engineering approach** classifies costs based upon an industrial engineer’s evaluation of production methods, and material, labor, and overhead requirements.
Learning Objective 4

Analyze a mixed cost using a scattergraph plot and the high-low method.
Scattergraph Plots - An Example

Assume the following hours of maintenance work and the total maintenance costs for six months.

<table>
<thead>
<tr>
<th></th>
<th>Month</th>
<th>Hours of Maintenance</th>
<th>Total Maintenance Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>January</td>
<td>625</td>
<td>$7,950</td>
</tr>
<tr>
<td>3</td>
<td>February</td>
<td>450</td>
<td>$7,400</td>
</tr>
<tr>
<td>4</td>
<td>March</td>
<td>700</td>
<td>$8,275</td>
</tr>
<tr>
<td>5</td>
<td>April</td>
<td>550</td>
<td>$7,625</td>
</tr>
<tr>
<td>6</td>
<td>May</td>
<td>775</td>
<td>$9,100</td>
</tr>
<tr>
<td>7</td>
<td>June</td>
<td>850</td>
<td>$9,800</td>
</tr>
</tbody>
</table>
The Scattergraph Method

Plot the data points on a graph (Total Cost $Y$ vs. Activity $X$).
The High-Low Method - An Example

The variable cost per hour of maintenance is equal to the change in cost divided by the change in hours.

\[
\frac{\$2,400}{400} = \$6.00/\text{hour}
\]
The High-Low Method - An Example

Total Fixed Cost = Total Cost – Total Variable Cost
Total Fixed Cost = $9,800 – ($6/hour × 850 hours)
Total Fixed Cost = $9,800 – $5,100
Total Fixed Cost = $4,700
The High-Low Method - An Example

The Cost Equation for Maintenance

\[ Y = $4,700 + $6.00X \]
Quick Check ✓

Sales salaries and commissions are $10,000 when 80,000 units are sold, and $14,000 when 120,000 units are sold. Using the high-low method, what is the variable portion of sales salaries and commission?

a. $0.08 per unit  
b. $0.10 per unit  
c. $0.12 per unit  
d. $0.125 per unit
Sales salaries and commissions are $10,000 when 80,000 units are sold, and $14,000 when 120,000 units are sold. Using the high-low method, what is the variable portion of sales salaries and commission?

- a. $0.08 per unit
- b. $0.10 per unit
- c. $0.12 per unit
- d. $0.125 per unit

\[
\begin{array}{c|c|c}
\text{Units} & \text{Cost} \\
\hline
\text{High level} & 120,000 & $14,000 \\
\text{Low level} & 80,000 & 10,000 \\
\text{Change} & 40,000 & $4,000 \\
\end{array}
\]

\[
\begin{align*}
$4,000 & \div 40,000 \text{ units} \\
& = $0.10 \text{ per unit}
\end{align*}
\]
Quick Check ✓

Sales salaries and commissions are $10,000 when 80,000 units are sold, and $14,000 when 120,000 units are sold. Using the high-low method, what is the fixed portion of sales salaries and commissions?

a. $ 2,000  
b. $ 4,000  
c. $10,000  
d. $12,000
Sales salaries and commissions are $10,000 when 80,000 units are sold, and $14,000 when 120,000 units are sold. Using the high-low method, what is the fixed portion of sales salaries and commissions?

a. $ 2,000
b. $ 4,000
c. $10,000
d. $12,000

Total cost = Total fixed cost + Total variable cost

$14,000 = Total fixed cost + ($0.10 × 120,000 units)

Total fixed cost = $14,000 - $12,000

Total fixed cost = $2,000
Least-Squares Regression Method

A method used to analyze mixed costs if a scattergraph plot reveals an approximately linear relationship between the $X$ and $Y$ variables.

This method uses \textit{all} of the data points to estimate the fixed and variable cost components of a mixed cost.

The goal of this method is to fit a straight line to the data that \textit{minimizes the sum of the squared errors}. 
Least-Squares Regression Method

• Software can be used to fit a regression line through the data points.

• The cost analysis objective is the same: $Y = a + bX$

Least-squares regression also provides a statistic, called the $R^2$, which is a measure of the goodness of fit of the regression line to the data points.
## Comparing Results From the Two Methods

<table>
<thead>
<tr>
<th>The two methods just discussed provide different estimates of the fixed and variable cost components of a mixed cost.</th>
</tr>
</thead>
<tbody>
<tr>
<td>This is to be expected because each method uses differing amounts of the data points to provide estimates.</td>
</tr>
<tr>
<td>Least-squares regression provides the most accurate estimate because it uses all the data points.</td>
</tr>
</tbody>
</table>
Learning Objective 5

Prepare income statements for a merchandising company using the traditional and contribution formats.
The Traditional and Contribution Formats

<table>
<thead>
<tr>
<th></th>
<th>Traditional Format</th>
<th>Contribution Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales</td>
<td>$100,000</td>
<td>$100,000</td>
</tr>
<tr>
<td>Cost of goods sold</td>
<td>70,000</td>
<td>60,000</td>
</tr>
<tr>
<td>Gross margin</td>
<td>$30,000</td>
<td>$40,000</td>
</tr>
<tr>
<td>Selling &amp; admin. expenses</td>
<td>20,000</td>
<td>Fixed expenses</td>
</tr>
<tr>
<td>Net operating income</td>
<td>$10,000</td>
<td>Net operating income</td>
</tr>
</tbody>
</table>

Used primarily for external reporting.

Used primarily by management.
Uses of the Contribution Format

The contribution income statement format is used as an internal planning and decision-making tool. We will use this approach for:

1. Cost-volume-profit analysis (Chapter 5).
2. Budgeting (Chapter 8).
3. Segmented reporting of profit data (Chapter 6).
4. Special decisions such as pricing and make-or-buy analysis (Chapter 12).
Learning Objective 6

Understand the differences between direct and indirect costs.
Assigning Costs to Cost Objects

Direct costs
- Costs that can be easily and conveniently traced to a unit of product or other cost object.
- Examples: direct material and direct labor

Indirect costs
- Costs that cannot be easily and conveniently traced to a unit of product or other cost object.
- Example: manufacturing overhead
Learning Objective 7

Understand cost classifications used in making decisions: differential costs, opportunity costs, and sunk costs.
Cost Classifications for Decision Making

- Every decision involves a choice between at least two alternatives.
- Only those costs and benefits that differ between alternatives are relevant in a decision. All other costs and benefits can and should be ignored as irrelevant.
Differential Cost and Revenue

Costs and revenues that differ among alternatives.

Example: You have a job paying $1,500 per month in your hometown. You have a job offer in a neighboring city that pays $2,000 per month. The commuting cost to the city is $300 per month.

Differential revenue is: $2,000 – $1,500 = $500

Differential cost is: $300
Opportunity Cost

The potential benefit that is given up when one alternative is selected over another.

Example: If you were not attending college, you could be earning $15,000 per year. Your opportunity cost of attending college for one year is $15,000.
Sunk Costs

Sunk costs have already been incurred and cannot be changed now or in the future. These costs should be ignored when making decisions.

Example: 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? You may say, “Yes” even though the $400 purchase is a sunk costs.
Quick Check ✓

Suppose you are trying to decide whether to drive or take the train to Portland to attend a concert. You have ample cash to do either, but you don’t want to waste money needlessly. Is the cost of the train ticket relevant in this decision? In other words, should the cost of the train ticket affect the decision of whether you drive or take the train to Portland?

A. Yes, the cost of the train ticket is relevant.
B. No, the cost of the train ticket is not relevant.
Quick Check ✓

Suppose you are trying to decide whether to drive or take the train to Portland to attend a concert. You have ample cash to do either, but you don’t want to waste money needlessly. Is the cost of the train ticket relevant in this decision? In other words, should the cost of the train ticket affect the decision of whether you drive or take the train to Portland?

A. Yes, the cost of the train ticket is relevant.

B. No, the cost of the train ticket is not relevant.
Quick Check ✔

Suppose you are trying to decide whether to drive or take the train to Portland to attend a concert. You have ample cash to do either, but you don’t want to waste money needlessly. Is the annual cost of licensing your car relevant in this decision?

A. Yes, the licensing cost is relevant.
B. No, the licensing cost is not relevant.
Quick Check ✓

Suppose you are trying to decide whether to drive or take the train to Portland to attend a concert. You have ample cash to do either, but you don’t want to waste money needlessly. Is the annual cost of licensing your car relevant in this decision?

A. Yes, the licensing cost is relevant.
B. No, the licensing cost is not relevant.
Quick Check ✓

Suppose that your car could be sold now for $5,000. Is this a sunk cost?
A. Yes, it is a sunk cost.
B. No, it is not a sunk cost.
Quick Check ✓

Suppose that your car could be sold now for $5,000. Is this a sunk cost?
A. Yes, it is a sunk cost.
B. No, it is not a sunk cost.
Summary of the Types of Cost Classifications

- Financial Reporting
- Predicting Cost Behavior
- Assigning Costs to Cost Objects
- Making Business Decisions
Least-Squares Regression Computations

Appendix 2A

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Learning Objective 8

Analyze a mixed cost using a scattergraph plot and the least-squares regression method.
Simple Regression Analysis

Matrix, Inc. wants to know its average fixed cost and variable cost per meals served.

Using the data to the right, let’s see how to do a regression using Microsoft Excel.
Simple Regression Using Excel

You will need three pieces of information from your regression analysis:

1. Estimated Variable Cost Per Unit (line slope)
2. Estimated Fixed Costs (line intercept)
3. Goodness of fit, or $R^2$

To get these three pieces of information we will need to use *three* Excel functions.

SLOPE, INTERCEPT, and RSQ
Simple Regression Using Excel

Place your cursor in cell F4 and press the = key. Click on the pull down menu and scroll down to “More Functions . . .”
Simple Regression Using Excel

<table>
<thead>
<tr>
<th>Month</th>
<th>Total Cost</th>
<th>Units (Meals)</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>$6,720</td>
<td>1,280</td>
</tr>
<tr>
<td>February</td>
<td>$7,260</td>
<td>1,810</td>
</tr>
</tbody>
</table>

Scroll down to the "Statistical" functions. Now scroll down the statistical functions until you highlight "SLOPE"
Simple Regression Using Excel

1. In the Known_y’s box, enter C4:C19 for the range.
2. In the Known_x’s box, enter D4:D19 for the range.
Here is the estimate of the slope of the line.

1. In the Known_y’s box, enter C4:C19 for the range.
2. In the Known_x’s box, enter D4:D19 for the range.
Simple Regression Using Excel

With your cursor in cell F5, press the = key and go to the pull down menu for “Special Functions.” Select **Statistical** and scroll down to highlight the **INTERCEPT** function.
1. In the Known_y’s box, enter C4:C19 for the range.
2. In the Known_x’s box, enter D4:D19 for the range.

Here is the estimate of the fixed costs.
Finally, we will determine the “goodness of fit”, or $R^2$, by using the RSQ function.
1. In the Known_y’s box, enter C4:C19 for the range.
2. In the Known_x’s box, enter D4:D19 for the range.