



Chapter 3 COST CONCEPT AND DESIGN ECONOMICS

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COST

“Cost” is not a simple concept. It is important to distinguish between four different types - **fixed**, **variable**, **average** and **marginal**.

Monetary measure of resources given up to attain an objective (such as acquiring a good or delivering a service)

COST

- ❖ A *cost* may be defined as a sacrifice or giving up of resources for a particular purpose.
- ❖ Costs are frequently measured by the monetary units that must be paid for goods and services.

Cost and Cost Terminology

Cost is a resource sacrificed or forgone to achieve a specific objective.

An *actual cost* is the cost incurred (a historical cost) as distinguished from budgeted costs.

A *cost object* is anything for which a separate measurement of costs is desired.

Cost and Cost Terminology

Cost Assignment is both

- Tracing Direct Costs
- Allocating Indirect Costs

Cost Object

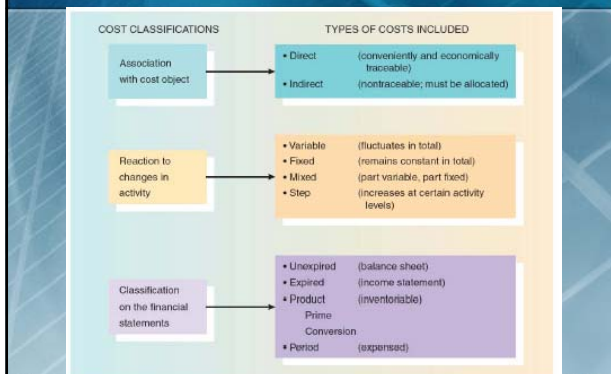
Cost Classifications

Association with cost object

Cost object is anything for which management wants to collect or accumulate costs

- Direct - traceable to a cost object
- Indirect - not conveniently or practically traceable to a cost object
 - treated as overhead
 - allocated

Cost Classifications Categories



Costing System

- **Cost Object**
anything for which a separate measurement of costs is desired
- **Direct Cost**
costs that are related to a particular cost object in an economically feasible (Cost-effective) manner
- **Cost Pool**
a grouping of individual cost items
- **Cost Allocation Base**
a factor that is the common denominator for systematically linking an indirect cost or group of indirect costs to a cost object

Cost Categories

- Association with cost object
- Reaction to changes in activity
 - Variable
 - Fixed
 - Mixed
 - Step

Relevant Range – normal operating range

Cost Allocation

- Same issue exists for merchandising firms
- Easier for merchandising,
 - purchase price (major)
 - shipping cost (minor)
 - taxes (minor)

Classification of Costs

This section concentrates on the big picture of how manufacturing costs are accumulated and classified.



Cost Objective

- A **cost objective** or **cost object** is defined as anything for which a separate measurement of costs is desired.

Examples include departments, products, activities, and territories.

Accounts could be type of cost, to which product, department?

Categories of Manufacturing Costs

All costs which are eventually allocated to products are classified as either

1. *direct materials*,
2. *direct labour*, or
3. *indirect manufacturing*.

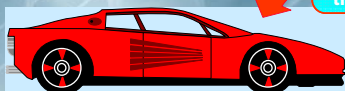
Direct-Material Costs

- *Direct-material costs* include the acquisition costs of all materials that are physically identified as a part of the manufactured goods and that may be traced to the manufactured goods in an economically feasible way.

Direct-Material Costs

Direct Materials

Materials that are clearly and easily identified with a particular product.



Example:
Steel used to manufacture the automobile.

Direct-Labour Costs

- *Direct-labour costs* include the wages of all labour that can be traced specifically and exclusively to the manufactured goods in an economically feasible way.

Direct-Labour Costs

Direct Labor

Labor costs that are clearly traceable to, or readily identifiable with, the finished product.



Example:
Wages paid to an automobile assembly worker.

Indirect Manufacturing Costs

- *Indirect manufacturing costs* or *factory overhead* include all costs associated with the manufacturing process that cannot be traced to the manufactured goods in an economically feasible way.

Indirect Manufacturing Costs

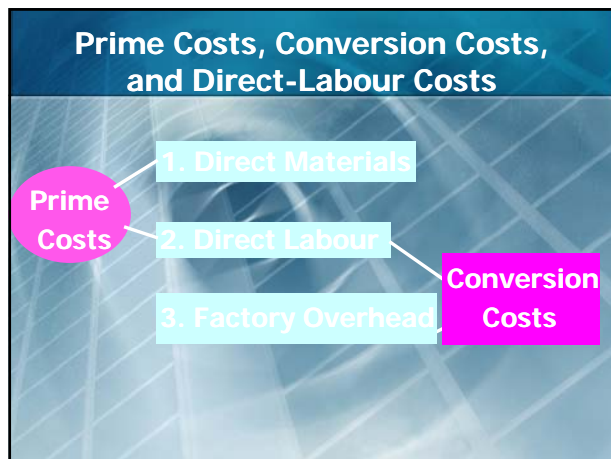
Factory Overhead

All factory costs except direct material and direct labor.

Factory costs that cannot be traced directly to specific units produced.

Examples:

Indirect labor – maintenance
Indirect material – cleaning supplies
Factory utility costs
Supervisory costs



Product Costs

- Product costs are costs identified with goods produced or purchased for resale.

Product Costs

- Direct material**
 - Measurable part of a product
- Direct labor**
 - Labor used to manufacture a product or perform a service
- Overhead**
 - Indirect production cost

Product Costs

- Product costs are initially identified as part of the inventory on hand.
- These product costs (inventoriable costs) become expenses (in the form of cost of goods sold) only when the inventory is sold.
- First appear on the balance sheet in inventory accounts

Transferred to the income statement when product is sold

Period Costs

- Period costs are costs that are deducted as expenses during the current period without going through an inventory stage.

				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

Period Costs

- **Selling and administrative costs**
- **Distribution costs**
 - Cost to warehouse, transport, and/or deliver a product or service
 - Major impact on managerial decision making

Period Costs

- **Appear on the income statement when incurred**
- **Expensed when incurred**

Classification By Function

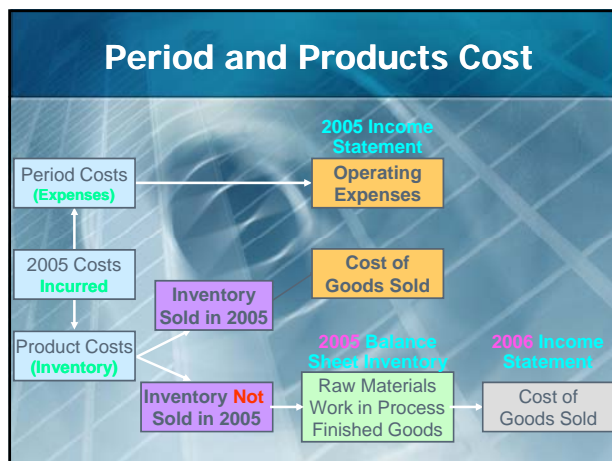
Period costs are expenses not charged to the product.

Selling Costs

Costs incurred to obtain customer orders and to deliver finished goods to customers – advertising and shipping.

Administrative Costs

Non-manufacturing costs of staff support and administrative functions – accounting, data processing, personnel, research and development.



Product Cost - Direct

- **Direct Material**
 - Conveniently and economically traced to cost object
- **Direct Labor**
 - to manufacture a product or perform a service
 - includes wages paid to direct labor employees, production bonuses, payroll taxes
 - may include holiday and vacation pay, insurance, retirement benefits



Product Cost - Indirect

- **Overhead - indirect production costs**
 - Fringe benefits, if cannot be easily traced to product
 - Overtime, if due to random scheduling
 - Cost of quality
 - Prevention costs
 - Appraisal costs
 - Failure costs



Product Cost vs. Period Cost

- **Product cost**
 - All costs incurred in getting product to saleable condition
 - Three main elements:
 - Raw Materials
 - Labour
 - Factory overheads
- **Period cost**
 - All costs incurred for a period of time regardless of production

Sometimes classified into:

 - Marketing expenses
 - General (administrative) expenses
 - Financial expenses

Direct Costs

- *Direct costs* can be identified specifically and exclusively with a given cost objective in an economically feasible way.



Indirect Costs



- *Indirect costs* cannot be identified specifically and exclusively with a given cost objective in an economically feasible way.



Direct vs. Indirect Costs

- **Direct Costs**
 - Major costs that can be directly attributable to the final product or service. Includes:
 - Direct materials
 - Direct labour
 - Other: subcontractors, tender document preparation
- **Indirect Costs**
 - All other costs that cannot be directly attributable to the final product or service. Includes
 - Indirect materials: factory supplies, small items of material
 - Indirect labour: admin, cleaning or security staff
 - Factory overheads; rates, rent, insurance, telephone, stationery

Classification by Traceability

Direct costs	Indirect costs
<ul style="list-style-type: none"> ● Costs incurred for the benefit of one specific cost object. ● Examples: material and labor cost for a product. 	<ul style="list-style-type: none"> ● Costs incurred for the benefit of more than one cost object. ● Example: maintenance expenditures benefiting two or more departments.
	

Fixed Cost vs. Variable Cost

- **Fixed costs**
 - Those costs that in total will remain the same for a period of time and over a relevant range or output. Includes:
 - Rent, rates, insurance, depreciation
- **Variable costs**
 - Those costs that in total will tend to increase as output level increase. Includes:
 - Direct Materials and Direct Labour

Overhead Cost Allocation

Assign indirect costs to one or more cost objects

- To determine full absorption cost (GAAP)
- To motivate management
- To compare alternative courses of action for planning, controlling, and decision making

Allocation process should be **rational** and **systematic**

Allocating Overhead Actual Cost System

Product Cost	Cost Used
Direct Materials	Actual
Direct Labor	Actual
Overhead	Actual


Allocating Overhead Actual Cost System

- The Actual Cost System is not timely
- All costs must be known before calculating product cost

Allocating Overhead Actual vs. Normal

Product Cost	Actual Cost System	Normal Cost System
Direct Materials	Actual	Actual
Direct Labor	Actual	Actual
Overhead	Actual	Predetermined Overhead Rate


Classification By Behavior



Cost behavior means how a cost will react to changes in the level of business activity.

- **Total fixed costs** do not change when activity changes.
- **Total variable costs** change in proportion to activity changes.

Classification By Behavior



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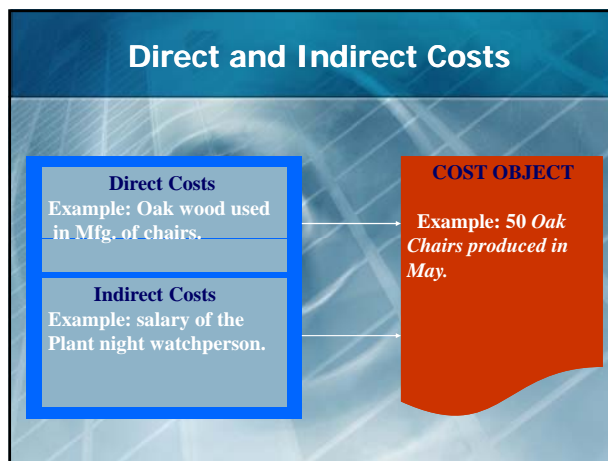
Product Cost Behavior

- > Direct Material **Variable**
- > Direct Labor **Variable**
- > Overhead **Variable, Fixed, or Mixed**

Potential Multiple Cost Classifications

Cost Item	Behavior	Traceability	Function
Material	Variable	Direct	Product
Assembly Wages	Variable	Direct	Product
Advertising	Fixed	Indirect	Period
Production Manager's Salary	Fixed	Indirect	Product
Office Depreciation	Fixed	Indirect	Period

EXERCISE



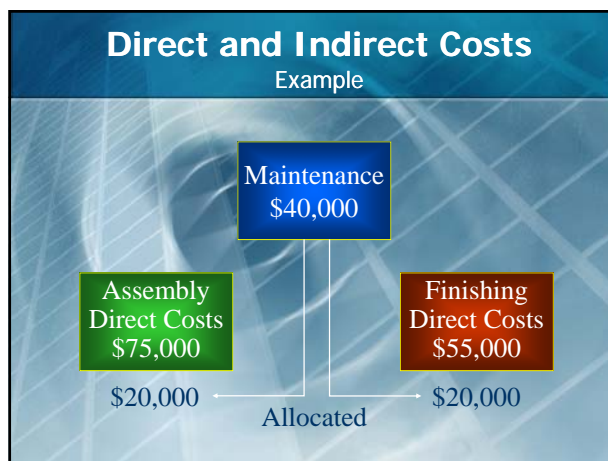
Direct and Indirect Costs

Example

Direct Costs:	
Maintenance Department	\$40,000
Personnel Department	\$20,600
Assembly Department	\$75,000
Finishing Department	\$55,000

Assume that Maintenance Department costs are allocated equally among the production departments.

How much is allocated to each department?



Cost Behavior Patterns

Example

Bicycles by the Sea buys a handlebar at \$52 for each of its bicycles.

What is the total handlebar cost when 1,000 bicycles are assembled?

Cost Behavior Patterns

Example

$$1,000 \text{ units} \times \$52 = \$52,000$$

What is the total handlebar cost when 3,500 bicycles are assembled?

$$3,500 \text{ units} \times \$52 = \$182,000$$



Cost Behavior Patterns

Example

Bicycles by the Sea incurred \$94,500 in a given year for the leasing of its plant.

This is an example of fixed costs with respect to the number of bicycles assembled.

Cost Behavior Patterns

Example

What is the leasing (fixed) cost per bicycle when Bicycles assembles 1,000 bicycles?

$$\$94,500 \div 1,000 = \$94.50$$

What is the leasing (fixed) cost per bicycle when Bicycles assembles 3,500 bicycles?

$$\$94,500 \div 3,500 = \$27$$

Cost Drivers

The cost driver of variable costs is the level of activity or volume whose change causes the (variable) costs to change proportionately.

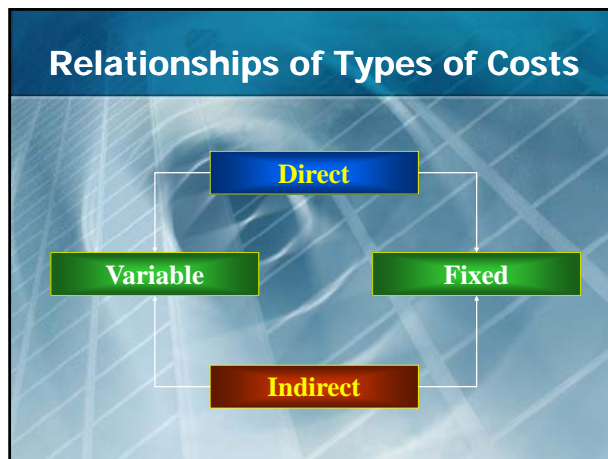
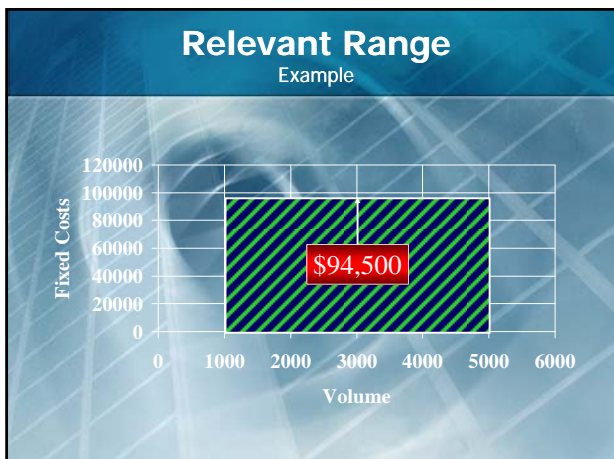
The number of bicycles assembled is a cost driver of the cost of handlebars.

Relevant Range

Example

Assume that fixed (leasing) costs are \$94,500 for a year and that they remain the same for a certain volume range (1,000 to 5,000 bicycles).

1,000 to 5,000 bicycles is the relevant range.



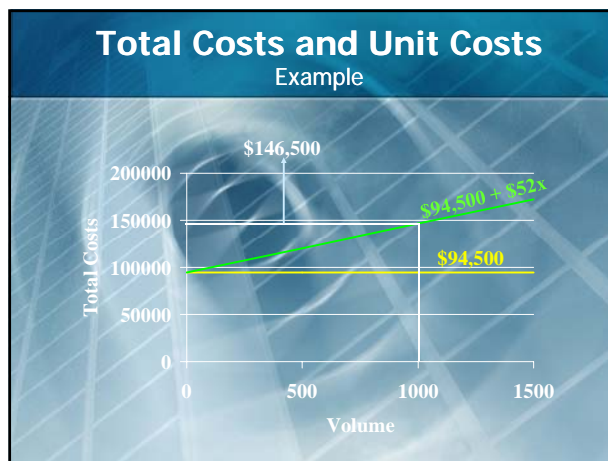
Total Costs and Unit Costs

Example

What is the unit cost (leasing and handlebars) when Bicycles assembles 1,000 bicycles?

Total fixed cost \$94,500
 + Total variable cost \$52,000 = \$146,500

$\$146,500 \div 1,000 = \146.50



Use Unit Costs Cautiously

Assume that Bicycles management uses a unit cost of \$146.50 (leasing and wheels).

Management is budgeting costs for different levels of production.

What is their budgeted cost for an estimated production of 600 bicycles?

$600 \times \$146.50 = \$87,900$

Use Unit Costs Cautiously

What is their budgeted cost for an estimated production of 3,500 bicycles?

$3,500 \times \$146.50 = \$512,750$

What should the budgeted cost be for an estimated production of 600 bicycles?

Use Unit Costs Cautiously

Total fixed cost	\$ 94,500
Total variable cost (52×600)	<u>31,200</u>
Total	\$125,700

$$\$125,700 \div 600 = \$209.50$$

Using a cost of \$146.50 per unit would underestimate actual total costs if output is below 1,000 units.

Use Unit Costs Cautiously

What should the budgeted cost be for an estimated production of 3,500 bicycles?

Total fixed cost	\$ 94,500
Total variable cost ($52 \times 3,500$)	<u>182,000</u>
Total	\$276,500

$$\$276,500 \div 3,500 = \$79.00$$

Merchandising

Merchandising companies purchase and then sell tangible products without changing their basic form.



Service

Service companies provide services or intangible products to their customers.

Labor is the most significant cost category.

Types of Inventory

Manufacturing-sector companies typically have one or more of the following three types of inventories:

1. Direct materials inventory
2. Work in process inventory (work in progress)
3. Finished goods inventory

Types of Inventory

Merchandising-sector companies hold only one type of inventory – the product in its original purchased form.

Service-sector companies do not hold inventories of tangible products.

Classification of Manufacturing Costs

Direct materials costs

Direct manufacturing labor costs

Indirect manufacturing costs

Inventoriable Costs

Inventoriable costs (assets)...

become cost of goods sold...

after a sale takes place.

Period Costs

Period costs are all costs in the income statement other than cost of goods sold.

Period costs are recorded as expenses of the accounting period in which they are incurred.

Flow of Costs

Example

Bicycles by the Sea had \$50,000 of direct materials inventory at the beginning of the period.

Purchases during the period amounted to \$180,000 and ending inventory was \$30,000.

How much direct materials were used?

$$\$50,000 + \$180,000 - \$30,000 = \$200,000$$

Flow of Costs

Example

Direct labor costs incurred were \$105,500.

Indirect manufacturing costs were \$194,500.

What are the total manufacturing costs incurred?

Direct materials used	\$200,000
Direct labor	105,500
Indirect manufacturing costs	<u>194,500</u>
Total manufacturing costs	\$500,000

Flow of Costs

Example

Assume that the work in process inventory at the beginning of the period was \$30,000, and \$35,000 at the end of the period.

What is the cost of goods manufactured?

Beginning work in process	\$ 30,000
Total manufacturing costs	500,000
Ending work in process	<u>35,000</u>
Cost of goods manufactured	\$495,000

Flow of Costs Example

Assume that the finished goods inventory at the beginning of the period was \$10,000, and \$15,000 at the end of the period.

What is the cost of goods sold?

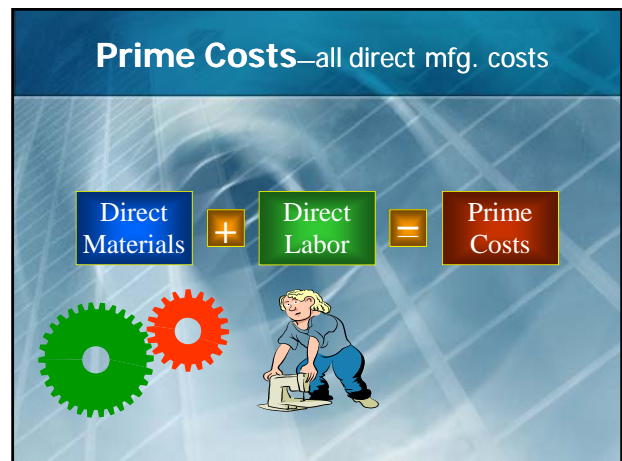
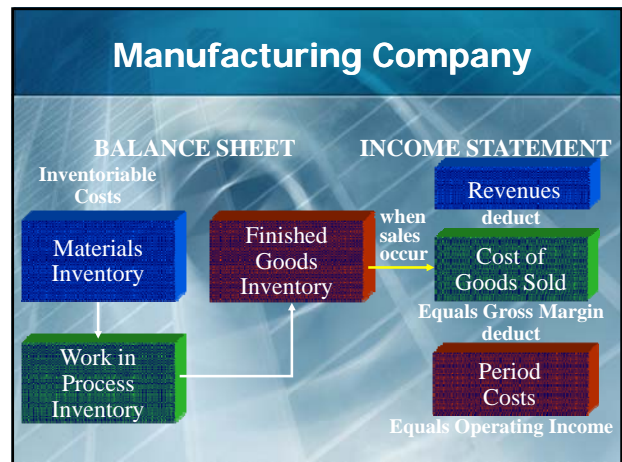
Beginning finished goods	\$ 10,000
Cost of goods manufactured	495,000
Ending finished goods	<u>15,000</u>
Cost of goods sold	<u>\$490,000</u>

Flow of Costs Example

	Work in Process	
Beg. Balance	30,000	<u>495,000</u>
Direct mtl's. used	200,000	
Direct labor	105,500	
Indirect mfg. costs	<u>194,500</u>	
Ending Balance	35,000	

Flow of Costs Example

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Prime Costs

What are the prime costs for Bicycles by the Sea?

Direct materials used	\$200,000
+ Direct labor	<u>105,500</u>
=	\$305,000

Conversion Costs

Direct Labor

+

Manufacturing Overhead

=

Conversion Costs

Indirect Labor
Indirect Materials
Other

Conversion Costs

What are the conversion costs for Bicycles by the Sea?

Direct labor	\$105,500
+ Indirect manufacturing costs	<u>194,500</u>
=	\$300,000

Conversion cost = all mfg. cost except direct materials

Measuring Costs Requires Judgment

Manufacturing labor-cost classifications vary among companies.

The following distinctions are generally found:

Direct manufacturing labor
Manufacturing overhead

Measuring Costs Requires Judgment

Manufacturing overhead		
Indirect labor	Managers' salaries	Payroll fringe costs
Forklift truck operators (internal handling of materials)		
Janitors	Rework labor	
Overtime premium	Idle time	

Measuring Costs Requires Judgment

Overtime premium is usually considered part of overhead.

Assume that a worker gets \$18/hour for straight time and gets time and one-half for overtime.

Measuring Costs Requires Judgment

How much is the overtime premium?

$\$18 \times 50\% = \9 per overtime hour

If this worker works 44 hours on a given week, *how much are his gross earnings?*

Direct labor	44 hours \times \$18 =	\$792
Overtime premium	4 hours \times \$ 9 =	<u>36</u>
Total gross earnings		\$828

Many Meanings of Product Cost

A product cost is the sum of the costs assigned to a product for a specific purpose.

1. Pricing and product emphasis decisions
2. Contracting with government agencies
3. Preparing financial statements for external reporting under generally accepted accounting principles