Session Outline

- Production cost
- Types of Cost: Accounting/Economic Analysis
- Cost – Output Relationship
- Short run cost Analysis
Cost of Production

Business decisions are generally taken based on the monetary values of inputs and outputs.

The quantity of inputs multiplied by their respective unit prices will give the monetary value or the *cost of production*. 
Importance of Production cost
In all business decisions, especially those decisions concerning:
- the location of the weak points in production management;
- cost minimisation
- finding the optimal level of output;
- determination of price and dealers’ margin; and,
- estimation of the costs of business operation.
Category of cost

- Concepts used for accounting purposes; and,
- Analytical cost concepts used in economic analysis of business activities.
Accounting Cost Concepts

Opportunity Cost and Actual or Explicit Cost

Opportunity cost can be seen as the expected returns from the second best use of an economic resource which is foregone due to the scarcity of the resources
Accounting Cost Concepts

Opportunity Cost and Actual or Explicit Cost

The actual or explicit costs are those out-of-pocket costs of labour, materials, machine, plant building and other factors of production.
Accounting Cost Concepts

Business and Full Costs
All the expenses incurred to carry out a business are referred to as business costs.

Similar to actual or real costs, and include all the payments and contractual obligations made by the firm, together with the book cost of depreciation on plant and equipment.

Used in calculating business profits and losses and for filing returns for income tax and for other legal Purposes.
Full costs include business costs, opportunity costs and normal profit, while normal profit represents a necessary minimum earning in addition to the opportunity cost, which a firm must receive to remain in business.
Explicit and Implicit/Imputed Costs
These are costs falling under business costs and are those entered in the books of accounts. Payments for wages and salaries, materials, insurance premium, depreciation charges are examples of explicit costs.

These costs involve cash payments and are recorded in accounting practices.
Implicit/Imputed Costs

• Those costs that do not involve cash outlays or payments and do not appear in the business accounting system are referred to as implicit or imputed costs.
• Implicit costs are not taken into account while calculating the loss or gains of the business.
• The explicit and implicit costs together (explicit + implicit costs) form the economic cost.
Accounting Cost Concepts: Out-of-Pocket and Book Costs

Expenditure items that involve cash payments or cash transfers, both recurring and non-recurring, are referred to in economics as out-of-pocket costs.

All the explicit costs including wages, rent, interest, cost of materials, maintenance, transport expenditures, and the like are in this classification.
Accounting Cost Concepts: Out-of-Pocket and Book Costs

Some actual business costs which do not involve cash payments, but a provision is made in the books of account and they are taken into account while finalizing the profit and loss accounts.

Such costs are known as book costs.

These are somehow, payments made by a firm to itself.
Analytical Cost Concepts Used in Economic Analysis of Business Activities.

- Fixed and Variable Costs
- Total, Average, and Marginal Costs
- Short-Run and Long-Run Costs
- Incremental Costs and Sunk Costs
- Historical and Replacement Costs
- Private and Social Costs
Fixed and Variable Costs

Costs that are fixed in volume for a certain level of output. They do not vary with output. They remain constant regardless of the level of output. Fixed costs include:

(i) Cost of managerial and administrative staff; (ii) Depreciation of machinery; (iii) Land, maintenance.

Fixed costs are normally short-term concepts because, in the long-run, all costs must vary.
Fixed and Variable Costs

Variable Costs are those that vary with variations in output. It includes: (i) Cost of raw materials; (ii) Running costs of fixed capital, such as fuel, repairs, routine maintenance expenditure, direct labour charges associated with output levels; and (iii) The Costs of all other inputs that may vary with the level of output.
Total, Average, and Marginal Costs

- The *Total Cost (TC)* refers to the total expenditure on the production of goods and services.

- It includes both explicit and implicit costs.

- The explicit costs themselves are made up of fixed and variable costs.
Total, Average, and Marginal Costs

The Average cost (AC) is obtained by dividing total cost (TC) by total output (Q).

\[ AC = \frac{TC}{Q} \]
Total, Average, and Marginal Costs

Marginal Cost (MC) is the addition to total cost on account of producing one additional unit of a product.

It is the cost of the marginal unit produced.

\[ MC = \frac{\text{Change in TC}}{\text{Change in Q}} = \frac{\Delta TC}{\Delta Q} \]
Short-Run and Long-Run Costs

Short-Run Costs are costs which change as desired output changes, size of the firm remaining constant. These costs are often referred to as variable costs.

Long-Run costs, on the other hand are costs incurred on the firm’s fixed assets, such as plant, machinery, building, and the like.
Incremental Costs and Sunk Costs

Refers to the total additional cost associated with the decision to expand output or to add a new variety of product.

The concept of incremental cost is based on the fact that, in the real world, it is not practicable to employ factors for each unit of output separately due to lack of perfect divisibility of inputs.

It also arise as a result of change in product line, addition or introduction of a new product, replacement of worn out plant and machinery, replacement of old technique of production with a new one, and the like.
Incremental Costs and Sunk Costs

The Sunk costs are those costs that cannot be altered, increased or decreased, by varying the rate of output.

Once management decides to make incremental investment expenditure and the funds are allocated and spent, all preceding costs are considered to be the sunk costs since they accord to the prior commitment and cannot be reversed or recovered when there is a change in market conditions or a change in business decisions.
Historical and Replacement Costs

Historical cost refers to the cost an asset acquired in the past, whereas, replacement cost refers to the outlay made for replacing an old asset.

These concepts derive from the unstable nature of price behaviour. When prices become stable over time, other things being equal, historical and replacement costs will be at par with each other.
Private and Social Costs

Private and social costs are those costs which arise as a result of the functioning of a firm, but neither are normally reflected in the business decisions nor are explicitly borne by the firm.

Costs in this category are borne by the society.
Private and Social Costs

Total cost generated in the course of doing business may be divided into two categories:

(i) those paid out by the firm; and,
(ii) those not paid or borne by the firm, including the use of resources that are freely available plus the disutility created in the process of production.

Costs under the first category are known as *private costs*. Those of the second category are known as *external or social costs*. 
Private and Social Costs

Examples of such social costs include:

- water pollution from oil refineries,
- air pollution costs by mills and factories located near a city etc

From a firm’s point of view, such costs are classified as external costs, and from the society’s point of view, they are classified as social costs.
The theory of costs basically deal with cost-output relations.

The basic economic principle states that total cost increases with increase in output.

However, focus is not the absolute increase in total cost, but the direction of change in the average cost (AC) and the marginal cost (MC).

The direction of changes in AC and MC will depend on the nature of the cost function.
Cost – Output Relationship

A cost function is a symbolic statement of the technological relationship between the cost and output.

\[ C = TC = f(Q), \text{ and } \Delta Q > 0, \]

The specific form of the cost function depends on the time framework for cost analysis: short-or long-run.
Short Run Costs

- **Total Variable cost** (*TVC*)
  - Total amount paid for variable inputs
  - Increases as output increases

- **Total Fixed Cost** (*TFC*)
  - Total amount paid for fixed inputs
  - Does not vary with output

- **Total Cost** (*TC*) = *TVC* + *TFC*
# Short-Run Total Cost Schedules

<table>
<thead>
<tr>
<th>Output (Q)</th>
<th>Total Fixed cost (TFC)</th>
<th>Total Variable cost (TVC)</th>
<th>Total Cost (TC=TFC+TVC)</th>
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Total Cost Curves

Cost (dollars)

Units of output

TC

TVC

TFC

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Average Costs

\[ AVC = \frac{TVC}{Q} \]

\[ AFC = \frac{TFC}{Q} \]

\[ ATC = \frac{TC}{Q} = AVC + AFC \]
Short Run Marginal Cost

- Short run marginal cost \((SMC)\) measures rate of change in total cost \((TC)\) as output varies

\[
SMC = \frac{\Delta TC}{\Delta Q} = \frac{\Delta TVC}{\Delta Q}
\]
## Average & Marginal Cost Schedules

<table>
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<tr>
<th>Output (Q)</th>
<th>Average fixed cost (AFC=TFC/Q)</th>
<th>Average variable cost (AVC=TVC/Q)</th>
<th>Average total cost (ATC=TC/Q=AFC+AVC)</th>
<th>Short-run marginal cost (SMC=ΔTC/ΔQ)</th>
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Average & Marginal Cost Curves
Short-Run Production & Cost Relations

Panel A

Panel B

Panel A - Product curves

Panel B - Cost curves

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Relations Between Short-Run Costs & Production

• When marginal product (average product) is increasing, marginal cost (average cost) is decreasing

• When marginal product (average product) is decreasing, marginal cost (average variable cost) is increasing
Relations Between Short-Run Costs & Production

- When marginal product = average product at maximum \( AP \), marginal cost = average variable cost at minimum \( AVC \)
Short run Cost Function

Cost-output relations are normally determined by the cost function and are exhibited by cost curves.

The shape of cost curves depends on the nature of the cost function which are derived from actual cost data.
**Linear Cost Function.**

TC = C = a + bQ

where a = Total Fix Cost (TFC), bQ = Total Variable Cost (TVC)

The Average and Marginal cost functions can be obtained from the Total Cost Function as follows:

Average Cost (AC) = TC = a + bQ = a/Q + b Q / Q

Marginal Cost (MC) = dTC/dQ = b
Quadratic Cost Function.

$$TC = C = a + bQ + Q^2$$

$$AC = TC = a + bQ + Q^2 = a/Q + bQ/Q + Q$$

$$MC = dTC/dQ = b + 2Q$$

Example, if $$TC = C = 150 + 10Q + Q^2$$

Then, $$AC = 150/Q + 10Q + Q^2$$

$$= 150/Q + 10 + Q$$

$$MC = dTC/dQ = 10 + 2Q$$
Cubic Cost Function

\[ TC = C = a + bQ - cQ^2 + dQ^3 \]
\[ AC = \frac{TC}{Q} = a + b - cQ + dQ^2 \]
\[ MC = \frac{dT\!C}{dQ} = b - 2cQ + 3dQ^2 \]

Assume that the cost function is empirically and explicitly estimated as:
\[ TC = 10 + 6Q - 0.9Q^2 + 0.05Q^3 \]
And, \( TVC = 6Q - 0.9Q^2 + 0.05Q^3 \)
AFC = FC/Q = 10/Q
AVC = TVC/Q = 6Q − 0.9Q^2 + 0.05Q^3 /Q
= 6 − 0.9Q + 0.05Q^2

ATC = TC/Q = 10 + 6Q - 0.9Q^2 + 0.05Q^3/Q
= 10/Q + 6 − 0.9Q + 0.05Q^2
MC = dTC/dQ = 6 − 1.8Q + 0.15Q^2
Session References

Managerial Economics; D N Dwivedi, 7th Edition
Managerial Economics – Christopher R Thomas, S Charles Maurice and Sumit Sarkar
Micro Economics : ICFAI University Press