2 AN INTRODUCTION TO COST TERMS AND PURPOSES

2.1 The Build-up of Total Costs

Direct Materials	+	Indirect Materials	=	Total Materials
(+)		(+)		+
Direct Labour	+	Indirect Labour	=	Total Labour
(+)		(+)		+
Direct Expenses	+	Indirect Expenses	=	Total Expenses
Direct Costs ***(Prime Costs)***	+	**Indirect Costs** ***(Overheads)***	=	**TOTAL COSTS**

Direct costs are those costs which can be directly identified with a cost object.

Direct Materials
The raw materials used in a product.
Examples: Fabric, timber and hardware for making furniture

Direct Labour
The remuneration paid to production workers for work directly related to production, the salaries directly attributable to a saleable service.
Examples: Labour of machine operators and assemblers

Direct Expenses
Expenses incurred specifically for a particular product, job, batch or service.
Examples: Royalty, special designed costs relating to the product

The total of direct costs is known as prime cost.

All material, labour and expense costs which cannot be identified as direct costs are termed indirect costs (overheads).

Indirect Materials
Materials which are difficult and/or cost inefficient to attempt to charge directly to specific cost units.
Examples: spare parts for machinery, consumable materials, stationery, etc.

Indirect Labour
The wages paid to workers whose efforts cannot be readily identified with specific product units or batches.
Examples: maintenance wages, storemen's wages, factory supervision, etc.

Indirect Expenses
Usually called overheads, items which have not previously been defined as direct costs will fall into this category.
Examples: plant insurance, rent and rates for the factory, etc.

2.2 Cost Behaviour

Time Span

- Whether a cost is variable or fixed with respect to a particular activity depends on the time span

- more costs are variable with longer time spans

Relevant Range

- Variable and fixed cost behavior patterns are valid for linear cost functions only within the given relevant range

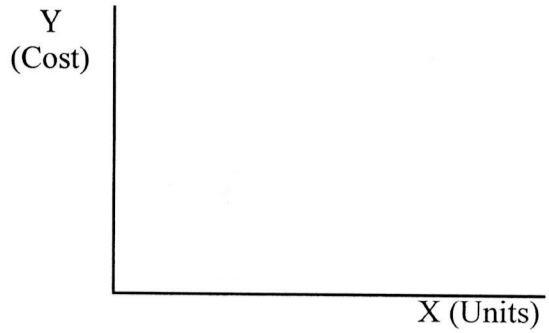
- Costs may behave nonlinear outside the range

2.2.1 **Linear Cost Function**

- Costs versus a single cost driver forms a straight line (within the relevant range)

Types of Costs

Variable Costs

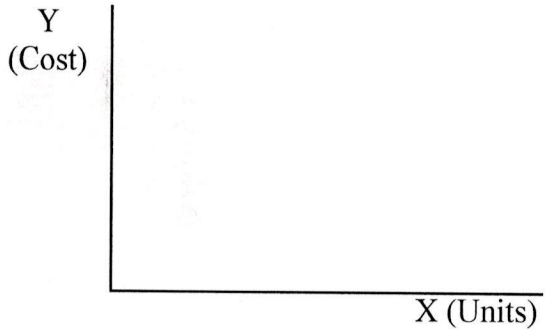


$y = bx$

Direct Materials : $2 per unit

0	units :
1,000	units :
2,000	units :

Fixed Costs

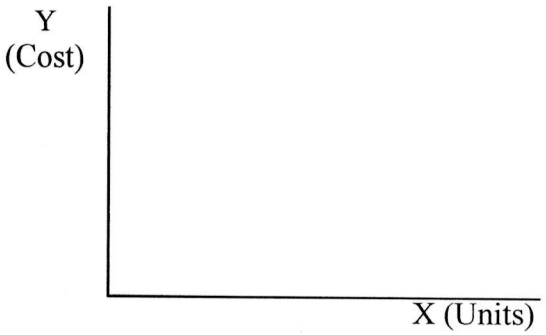


$y = a$

Rent : $2,000 per month

0	units :
1,000	units :
2,000	units :

Mixed Costs



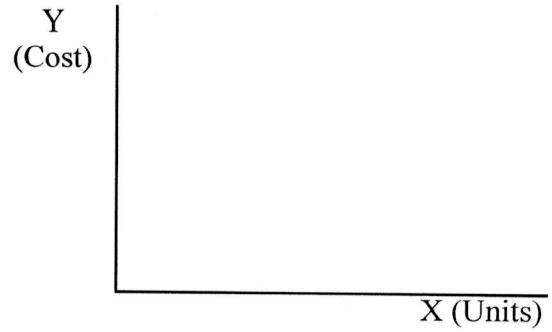
$y = a + bx$

Direct Materials : $2 per unit
Rent : $2,000 per month

0	units :
1,000	units :
2,000	units :

Estimation Methods

High-Low Method

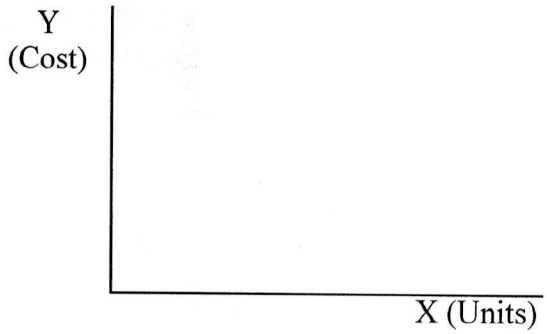


1,000	units :	$4,000
2,000	units :	$6,000
4,000	units :	

Regression Analysis

- estimates the relationship between the dependent variable and one independent variable
- uses all available data to estimate the cost function
- more accurate than the high-low method

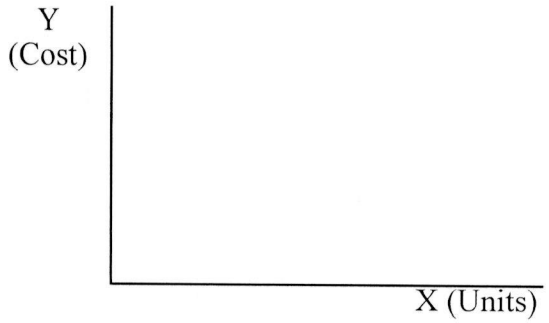
$$y = a + bx$$



2.2.2 **Non-linear Cost Function**

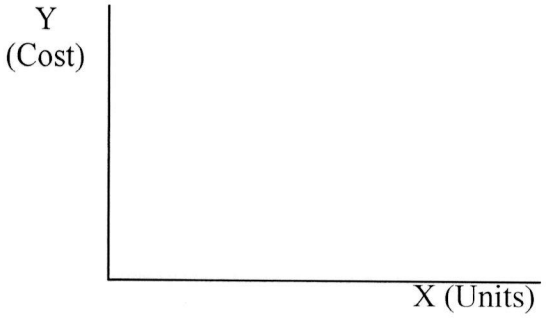
- Costs versus a single cost driver does not form a straight line (within the relevant range)

Step Variable Cost Function



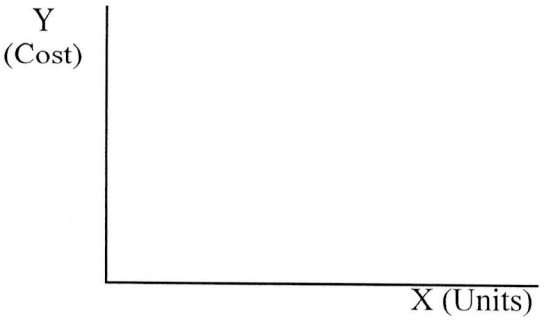
y = bx	
0 - 100	b = $10
101 - 200	b = $10
201 - 300	b = $10
301 - 400	b = $10

Step Fixed Cost Function



y = a	
0 - 1,000	a = $1,000
1,001 - 2,000	a = $1,500
2,001 - 3,000	a = $2,000

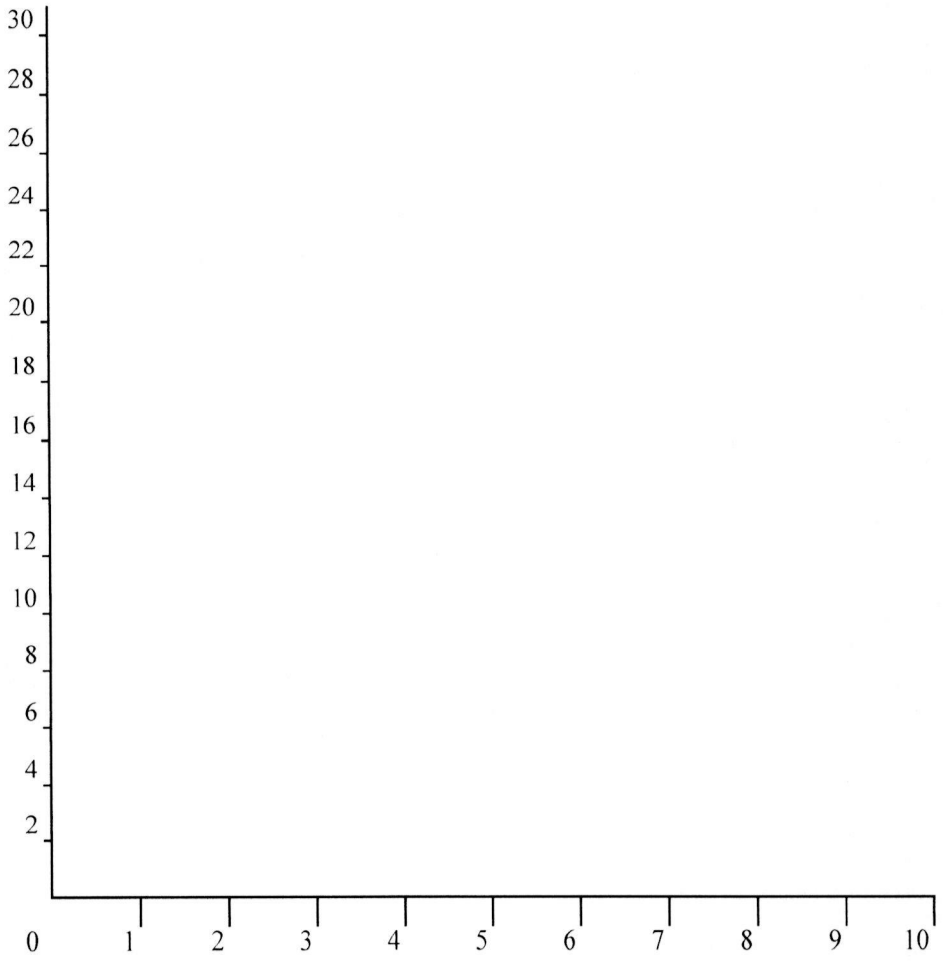
Effects of Quantity Discounts
on Direct Materials Cost Function



y = bx	
0 - 1,000	b = $10
1,001 - 2,000	b = $9
2,001 - 3,000	b = $8

2.3 Illustration

No. of shirts		0	1	2	3	4	5	6	7	8	9	10
Variable Costs (Direct Materials)	$ 2	-										
Fixed Costs (Rent)	$ 10	10										
Total Cost		10										



CW 1 Direct, Indirect, and Unallocated Costs

Refer to the Lopez Plastics Company example on pages 152–155 and to Exhibit 4-7. The following list gives various resources used by Lopez Plastics Company. Use the letters *D*, *I*, and *U* to indicate how the cost of each resource cost would be classified; *D* = direct, *I* = indirect, and *U* = unallocated.

1. Salary of plant manager
2. Salaries of cost accountants
3. Depreciation on computers used by engineers to design cell phone casings
4. Depreciation of the plant
5. Resin used to make pen casings
6. Salaries of engineers
7. Salaries of operating labor processing pen casings
8. Travel costs of purchasing agent while investigating potential new suppliers of resin

CW2 Identifying Cost Behavior Patterns

At a seminar, a cost accountant spoke on identification of different kinds of cost behavior. Tammy Li, a hospital administrator who heard the lecture, identified several hospital costs of concern to her. After her classification, Li presented you with the following list of costs and asked you to (1) classify their behavior as one of the following: variable, step, mixed, fixed.

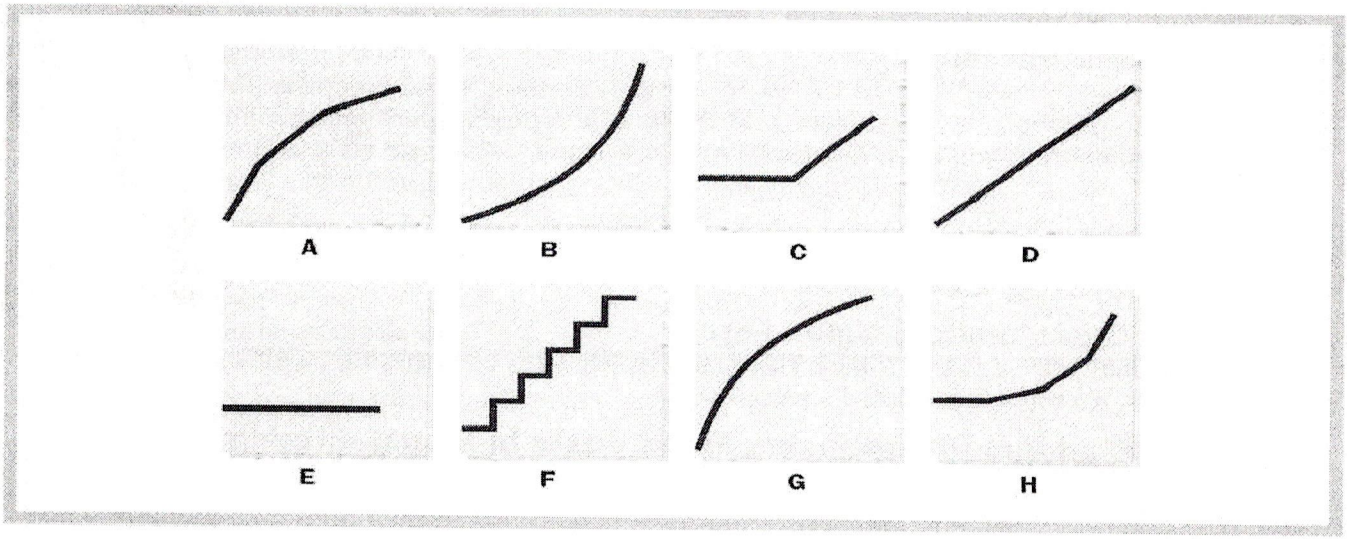
1. Operating costs of X-ray equipment ($95,000 a year plus $3 per film)
2. Health insurance for all full-time employees
3. Costs incurred by Dr. Rath in cancer research
4. Repairs made on hospital furniture
5. Training costs of an administrative resident
6. Straight-line depreciation of operating room equipment
7. Costs of services of King Hospital Consulting
8. Nursing supervisors' salaries (a supervisor is needed for each 45 nursing personnel)

CW 3 Various Cost-Behavior Patterns

In practice, there is often a tendency to simplify approximations of cost-behavior patterns, even though the "true" underlying behavior is not simple. Choose from graphs A through H on the top of page 120, the one that matches the numbered items. Indicate by letter which graph best fits each of the situations described. Next to each number-letter pair, identify a likely cost driver for that cost.

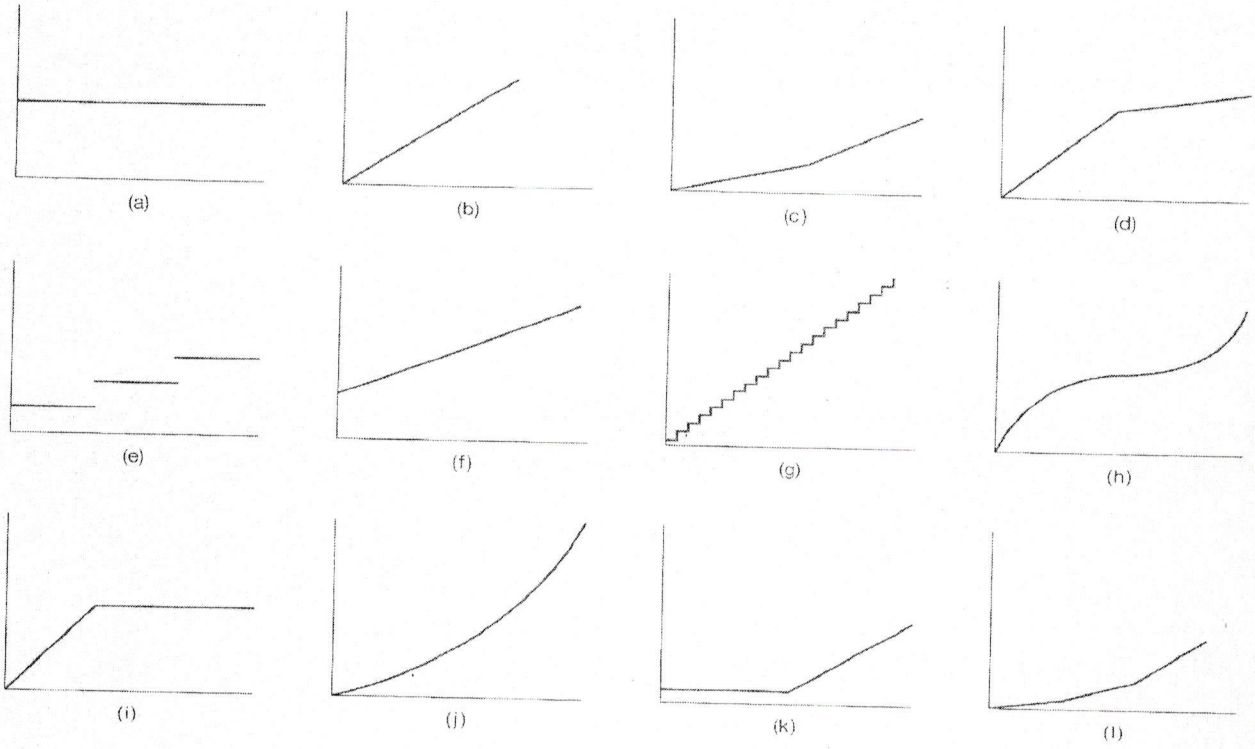
The vertical axes of the graphs represent total dollars of costs incurred, and the horizontal axes represent levels of cost driver activity during a particular time period. The graphs may be used more than once.

1. Cost of machining labor that tends to decrease as workers gain experience
2. Price of an increasingly scarce raw material as the quantity used increases
3. Guaranteed annual wage plan, whereby workers get paid for 40 hours of work per week even at zero or low levels of production that require working only a few hours weekly
4. Water bill, which entails a flat fee for the first 10,000 gallons used and then an increasing unit cost for every additional 10,000 gallons used
5. Availability of quantity discounts, where the cost per unit falls as each price break is reached
6. Depreciation of office equipment
7. Cost of sheet steel for a manufacturer of farm implements
8. Salaries of supervisors, where one supervisor is added for every 12 phone solicitors
9. Natural gas bill consisting of a fixed component, plus a constant variable cost per thousand cubic feet after a specified number of cubic feet are used



For each of the cost items described below, choose the graph here that best represents it.

1. The cost of utilities at a university. For low student enrolments, utility costs increase with enrolment, but at a decreasing rate. For large student enrolments, utility costs increase at an increasing rate.
2. The cost of telephone service, which is based on the number of message units per month. The charge is $.79 per message unit, for up to 650 message units. Additional message units (above 650) are free.
3. The cost of outsourcing diagnostic blood testing by a hospital. The hospital pays an independent lab a fee of $1,000 per month plus $3 for each test done.



4. The salary costs of the shift supervisors at a truck depot. Each shift is eight hours. The depot operates with one, two, or three shifts at various times of the year.
5. The salaries of the security personnel at a factory. The security guards are on duty around the clock.
6. The wages of table-service personnel in a restaurant. The employees are part-time workers, who can be called upon for as little as two hours at a time.
7. The cost of electricity during peak-demand periods is based on the following schedule:

Up to 10,000 kilowatt-hours (kWh)	$.09/kWh
Above 10,000 kilowatt-hours	$.12/kWh

The price schedule is designed to discourage overuse of electricity during periods of peak demand.

8. The cost of sheet metal used to manufacture automobiles.
9. The cost of chartering a private airplane. The cost is $410 per hour for the first three hours of a flight. Then the charge drops to $305 per hour.
10. Under a licensing agreement with a South American import/export company, your firm has begun shipping machine tools to several countries. The terms of the agreement call for an annual licensing fee of $95,000 to be paid to the South American import company if total exports are under $4,500,000. For sales in excess of $4,500,000, an additional licensing fee of 9 percent of sales is due.
11. Your winery exports wine to several Pacific Rim countries. In one nation, you have to pay a tariff for every case of wine brought into the country. The tariff schedule is the following:

0 to 6,000 cases per year	$11 per case
6,001 to 12,000 cases per year	$14 per case
Above 12,000 cases per year	$19 per case

Rio Bus Tours has incurred the following bus maintenance costs during the recent tourist season. (The *real*, R$, plural *reais*, is Brazil's national monetary unit. On the day this exercise was written, the real was equivalent in value to .5976 Canadian dollar.)

Month	Kilometres Travelled by Tour Buses	Cost (R$)
November	12,750	17,100
December	15,900	17,400
January	19,050	17,550
February	22,500	18,000
March	30,000	18,750
April	12,000	16,500

Required:

1. Use the high-low method to estimate the variable cost per tour mile travelled and the fixed cost per month.
2. Develop a formula to express the cost behaviour exhibited by the company's maintenance cost.
3. Predict the level of maintenance cost that would be incurred during a month when 34,000 tour miles are driven. (Remember to express your answer in terms of the real.)

Capital Fitness, Inc. operates a chain of fitness centres in the Ottawa area. The firm's controller is accumulating data to be used in preparing its annual profit plan for the coming year. The cost behaviour pattern of the firm's equipment maintenance costs must be determined. The accounting staff has suggested the use of an equation, in the form of $Y = a + bX$, for maintenance costs. Data regarding the maintenance hours and costs for last year are as follows:

Month	Hours of Maintenance Service	Maintenance Costs
January	525	$ 4,710
February	505	4,310
March	310	2,990
April	495	4,200
May	315	3,000
June	485	4,215
July	315	2,950
August	405	3,680
September	475	4,100
October	345	3,250
November	350	3,260
December	335	3,015
Total	4,860	$43,680
Average	405	$ 3,640

Required:

1. Using the high-low method of cost estimation, estimate the behaviour of the maintenance costs incurred by Capital Fitness, Inc. Express the cost behaviour pattern in equation form.
2. Using your answer to requirement (1), what is the variable component of the maintenance cost?
3. Compute the predicted maintenance cost at 600 hours of activity.
4. Compute the variable cost per hour and the fixed cost per hour at 610 hours of activity. Explain why the fixed cost per hour could be misleading.

(CMA, adapted)