OPERATIONS MANAGEMENT
METHODS OF PRODUCTION

TYPES

1. Job Production
2. Batch Production
3. Flow Production
4. Mass Customization
5. Cell Production

} innovations of mass / flow production

JOB PRODUCTION

It involves the production of a single product at a line. It is generally used when orders for products are small and different from each other. Production is organized in such a way that one job is completed at a time and then you start the next job or the next product. Examples includes tailors, a doctors' client, design bridal wear, contractor constructing a building, bridge or flyover.

ADVANTAGES

6. Unique items can be produced
7. Motivated workforce
8. Better satisfaction of customers
9. Organisation of job is simple as co-ordination communication, supervisor and inspector can be regularly and easily carried out.

DISADVANTAGES

1. It is time-consuming
2. Highly skilled labour is required which is difficult to get and is expensive
3. Benefits such as bulk buying cannot be achieved.
4. Economics of scale is not possible
5. It is generally labour – intensive which again increase the production cost

BATCH PRODUCTION

It involves the production of products in separate batches or quantities where the products in a batch go through the whole production process together. This method may be used when demand for the firms products expand. Products can be produced in very large or very small batches depending on the level of demand. Production process is divided into a number of operations. E.g. furniture manufacturer making 100 chairs followed by 100 tables, houses bring built in sets of 20s or 30s, baker making birthday cake, doughnuts, breads in groups or sets.

ADVANTAGES

15. flexibility (each batch can be different)
16. employ as can concentration one operation rather than the whole task.
17. less variety of machinery as products are standarlised in one batch.
18. labour of lower skills can also be employed / managed.
19. it results in partly finished products so you can respond to demands quickly.
20. more economic of scale as compared to job production.

DISADVANTAGES

10. careful planning and co-ordination is needed which is difficult to manage.
11. work force may be less motivated as compared to job production.
12. more complex machinery is required as labour is not that skilled.
13. if batches are small than unit costs are high.
14. money will be tied up in work in progress so cash flow problems can occur.

FLOW PRODUCTION / MASS PRODUCTION

Main features of flow production

a. large quantities are produced
b. simplified or standardized products
c. a semi-skilled workforce specializing in one operation only is generally employed
d. large amounts of machinery and equipment is required
e. large stocks of raw materials and components may be kept

Examples:

Washing powders
Printing newspapers
Tea and coffee

ADVANTAGES

21. unit costs are reduced as firms gain from economics of scale
22. highly automated production process minimizing need for labour and so reducing costs.
23. the need to stockpile finished goods is reduced
24. constant output rate makes input planning easy
25. use of JIT and stock control.
26. quality is consistent and high and easy to check at various stages of the process

DISADVANTAGES

1. high initial set up cost of capital intensive, high technology production lines.
2. work is boring, demotivating and repetitive.
3. wide product range isn't available.
4. inability to meet all customers needs
5. independence in entire system means breakdowns in one area cause entire system to breakdown

MASS CUSTOMIZATION

Several important recent developments in the production process have occurred which try to combine the advantages of job production (namely worker satisfaction and product variety) with the benefits on flow production like lesser units costs. One such innovation to mass production is mass customization which uses advances in technology like

- Computer aided design (CAD)
- Computer aided manufacture (CAM)

The new technology combined with multi skilled labour has allowed the production of a range of varied products.

The main features or key paints of mass customization are as follows:

- allows focused or differentiated marketing to be used in the strategy
- allows for higher added value
- changes only a few components to meet specific needs of the customers while others are kept same
- maintains low unit cost but providing grater product choice due to advanced flexible robotic machinery which can make a range of products
- examples include the Pepsi Twist and Diet Pepsi variations of the basic drink "Pepsi"
- another example is of shampoos e.g. Sunsilk providing pro-vita variations as well as anti dandruff, silky hair, and dry hair specials
- drawback: Redesigning could be very expensive in practice

CELL PRODUCTION

Cell production fully known as cellular production is a form of flow production but it involves dividing the workplace into “cells”. The cells are a number of self-contained mini production units. Each cell occupies an area on the factory floor and focuses on the production of a “product family”.

A product family is a group of products which requires a sequence of similar operations e.g. metal body part of machine may have to be cut, punch, weld and dispatch.

An individual cell consists of a team of multi-skilled staff with a team leader. The cell may be responsible for tasks such as designing, schedule planning, maintenance and problem solving as well as the manufacturing tasks. The performance of each individual cell is checked against preset targets which would include things as output levels, quality, lead times and cash targets.

Cells are responsible for the quality of their own complete units of work. The advantages of cellular production are:

1. flour space is released because cells use less space than a linear production line
2. product flexibility is improved
3. lead liens are cut
4. movement of resources and handling time is reduced
5. there is less work – in – progress
6. teamworking is encouraged
7. worker commitment and motivation improve
8. leads to higher increase in productivity
9. there may be a safer working environment and more efficient maintenance.

CAPACITY UTILISATION

MAXIMUM CAPACITY

Maximum capacity is the highest output level possible from a business over a particular period of time.

CURRENT OUTPUT

The actual output that firm is producing at present is known as its current output.

CAPACITY UTILISATION

It is the actual output as the proportion of the maximum capacity of the business. It measures the firms’ operational efficiency and shows the current output as a percentage of the maximum output the firm can produce. increased capacity utilization will spread the fixed costs over more units of output which as a result lowers down the average cost per unit.

Disadvantages related to continuous maximum capacity

1. workers can get demotivated and tried at full capacity all the time. No relaxation time
2. machinery can get stressed out and get damaged quickly. It would require higher maintenance for which again workers are required
3. if always working on full capacity then orders may have to be turned down saying that maximum capacity is being used. So priorities may have to be taken into account
4. especially in service sector, if hotels and hospitals are always full then potential customers may be turned away and loss of existing customers
    - So firms working at maximum capacity should think about expanding its operations or closing down certain areas of operations

Q.1. A production house has installed a machine which has the maximum capacity of producing 2000 units per year. Today reached the level of 80%, 75% and 90% capacity utilization in years 1,2, 3 respectively. Calculate yearly production for these years:

$$\text{Capacity Utilisation} = \frac{Current\,Output}{Max.PossibleOutput} \times 100$$

Year 1: $= \frac{80}{100} \times = 1600\,units$

Year 2: $= \frac{75}{100} \times 2000 = 1500\,units$

Year 3: $= \frac{90}{100} \times 2000 = 1800\,units$

Q.2. A food processing plant is capable of working 20 hours per day. Calculate the capacity utilization for the following situation:

1. when the plant is working for 14 hours a day
2. when the production lunch operating in two eight hour shifts per day

1. Capacity utilization = $\frac{14}{20} \times 100 = 70\%$
2. Capacity utilization = $\frac{8+8}{20} \times 100 = 80\%$

COST, REVENUE AND PROFIT ANALYSIS

Cost Analysis:

Cost analysis is important to:

1. analyze profitability
2. make respective decision for various departments
   e.g. pricing decisions for marketing departments
3. make comparisons with past records
4. assess efficiency
5. set budgets in future
6. set target returns for future

Classification of costs

Costs can be classified in the following ways

1. By type (whether they are direct or indirect costs)
2. By behaviour (according to the effect of change in output)
   e.g. foxed, variable, semi-variable or step-fixed costs.
3. By function (according to the bus function they are associate with)
   e.g. production, administration selling & personnel cost.
4. By the nature of resource for material to how

DIRECT COSTS

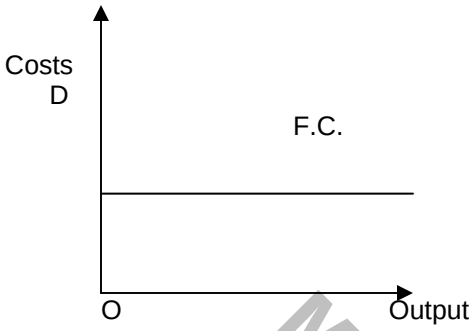
Direct costs are costs which can be identified with a particular product or process e.g. raw materials, packaging and direct labour.

INDIRECT COSTS

Indirect costs or overheads are usually associated with performing a range of tasks or producing a range of products. It is not possible to associate then directly with a particular product or production process e.g. rent, insurance, salaries of managers, etc. – factory overheads.

FIXED COSTS

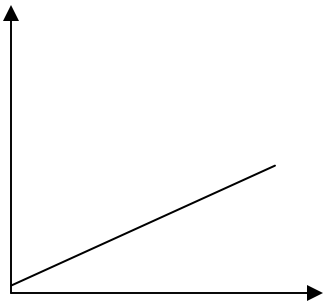
They are the costs which stay the same at all levels of output in the short run e.g. insurance, heating bills, as well as capital costs such as factories and machinery. They remain same whether the business process nothing or works at full capacity.



It is worth nothing that fixed here means that the costs don't increase as a result of change in output in the short run.

VARIABLE COSTS

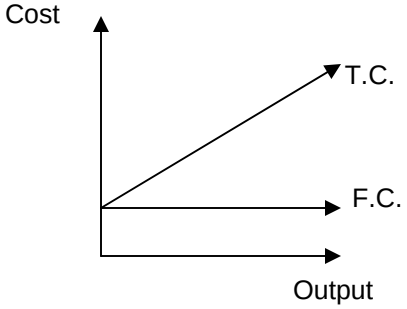
Costs of production which increase directly as output rises are called variable costs e.g. raw materials, fuel, packaging and wages. If the firm does not produce anything than variable costs will be zero.



Notice that the graph is linear i.e. it is an upward sloping straight line.

TOTAL COST:

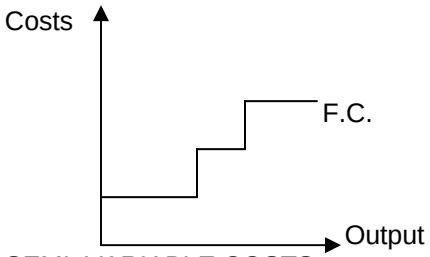
If fixed and variable costs are added together they show total cost of a business. The cost of producing at any given level of output is total cost.



F.C. =$10,000
V = $10 / unit
q = 100
T.C. = ?
T.C. = F.Cr V.C.
= 10,000 +1000
= $11,000

STEP–FIXED COST

Step–fixed cost illustrates what happens to fixed costs over a longer period of lime. E.g. if a firm is at full capacity but needs to raise production it might decide to invest in more equipment. The new machine + raise overall fixed costs as well as capacity. The rise in fixed costs is shown by a step with graph.



SEMI–VARIABLE COSTS

Some production costs are not entirely fixed or variable. E.g. labour. If a firm employs a member of staff on permanent basis, no matter what level of output, then this is fixed cost. But if the same member is asked to work overtime, then this extra cost is variable.

AVRAGE COST:

$$\text{A.C.} \frac{T.C.}{Units\ of\ Output} \qquad \text{A.F.C.} = \frac{T.F.C.}{Output}$$

$$\text{A.V.C.} = \frac{T.V.C.}{Output}$$

MARGINAL COST

$$\text{M.C.} = \frac{\Delta\, in\, T.C.}{\Delta\, in\, Output}$$

Marginal cost is the cost of increasing output or the extra cost incurred by producing one more unit.

REVENUE:

R = price / unit × No. of units sold

The amount of money which a firm receives from selling its product is referred to as revenue. It is found by multiplying the number of units sold by the price of each unit.

PROIFT

P = Revenue – Total Cost

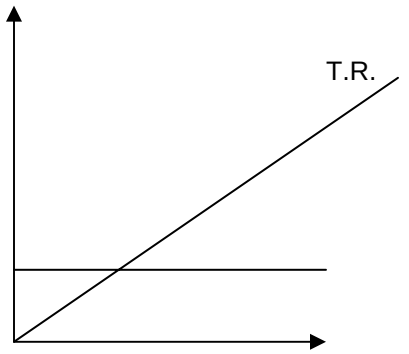
Profit is the surplus which is left after the costs are deducted from the sales revenue. All firms operate to make profits to provide returns for their owners.

LOSS

L = Total Cost – Revenue

It is the excess amount of total costs which is found after deducting the revenue from the costs.

BREAK – EVEN POINT



Deviation:-

T.R. = T.C.
$p \times q$ = F.C. + V.C.
pq = F.C. + vq
q (p – v) = F.C.

p = price / unit
q = quantity in units
v = variable cost / unit
F.C. = fixed cost

$$q = \frac{F.C.}{p - v}$$

where (p – v) is the contribution per unit.

formula to calculate B.E. level of output in units.

B.E. levels of sales = $q_{BE} \times$ price

Margin of safety = Current Output – B.E. Output

M.O.S. in % = $\frac{margin\ of\ safety}{Break\ even} \times 100$

It target profit is given, how to find required quantity:

$$q = \frac{F.C. Target\ Profit}{Contribution}$$

BREAK – EVEN ANALYSIS

Exercises

(Business Studies: Bruce R. Jewell, page 398)

Q.1.a. Contribution is the difference between setting price and variable costs because this difference contributes to the total fixed costs of the business and its profits

Contribution = Selling price – Variable Cost
= £ 10 - £ 4
= £ 6

b. Break even point $= \frac{Fixed\ Costs}{Contribution}$

$= \frac{90{,}000}{6}$

= 15,000 units

c. Current output $= \frac{Fixed\ Costs + Target\ Profit}{Contribution}$

$= \frac{90{,}000 + 270{,}000}{6}$

$= \frac{360{,}000}{6}$

= 60,000 units

d.i. Sales revenue = price × quantity
= 10 × 60,000
= £ 600,000

ii. Sales after implementation of proposal
= 25% (current output) + Current Output
= 25% (60,000) + 60,000 = 75000 units
Sales Revenue = 75,000 × 9
= £ 675,000

e.i. change in revenue = New revenue – Original revenue
= £ 675,000 - £ 600,000
= £ 75,000

ii. Change in costs:
Original Costs = 60,000 (4) + 90,000
= £ 330,000
New Costs = 75,000 (4) + 90,000
= £ 390,000

Change = New Costs – Original costs
= 390,000 – 330,000
= £ 60,000

f. Yes, it should because the resulting change in revenue is higher i.e. increases more than the increase in costs. This would cause the profits to increase by £ 15,000.

(Business Studies: Bruce R. Jewell, page 399)

Q.2.a. At <u>price A</u> = £ 2.20

$$\text{BEP} = \frac{Fixed\ Costs}{Contribution}$$

$$= \frac{1200{,}000}{2.2 - 1.25}$$

= 1,263,158 units

At <u>price B</u> = £ 2.00

$$\text{BEP} = \frac{1200{,}000}{2.2 - 1.25}$$

= 1,600,000 units

At <u>price C</u> = £ 1.80

$$\text{BEP} = \frac{1200{,}000}{1.7 - 1.25}$$

= 2,666,667 units

b. Margin of safety = Current Output – Break even output

<u>For Price A:</u>

Most at full capacity = 2700,000 – 1,263,158
= 1,436,842 units

Most at current output = 2600,000 – 1,263,158
= 1,336,842 units

<u>For Price B:</u>

Most at full capacity = 2700,000 – 1,600,000
= 1100,000 units

Most at current output = 2600,000 – 1, 600,000
= 1000,000 units

<u>For Price C:</u>

Most at full capacity = 2700,000 – 2,181,818
= 518,182 units

Most at current output = 2600,000 – 2,181,818
= 418,182 units

<u>For Price D:</u>

Most at full capacity = 2700,000 – 2,666,667
= 33,333 units

Most at current output = 2600,000 – 2,666,667
= 66,667units

i.e. output is below BEP
so there is no margin of safety

c. For Price A:

Profit at full capacity = MOS × Contribution
= 1436842 × 0.95
= £ 1,364,999.90

Profit at current output = 1336842 × 0.95
= £ 1,269,999.90

For Price B:

Profit at full capacity = 1100,000 × 0.75
= £ 825,000.0

Profit at current output = 1000,000 × 0.75
= £ 750,000.0

For Price C:

Profit at full capacity = 518,182 × 0.55
= £ 285,000.1

Profit at current output = 418,182 × 0.55
= £ 230,000.1

For Price D:

Profit at full capacity = 33,333 × 0.45
= £149,99.85

Loss at current output = 66,667 0.45
= £ 30,000.15

d. BE output (%age) = $\frac{BEP}{Current\ Outpue} \times 100$

For Price A

%BEP at full capacity = $\frac{1263158}{2700,000} \times 100$
= 46.8%

% BEP current output = $\frac{1263158}{2600,000} \times 100$
= 48.6%

For Price B

%BEP at full capacity = $\frac{1600,000}{2700,000} \times 100$
= 59.3%

% BEP current output = $\frac{1600,000}{2600,000} \times 100$
= 61.5%

For Price C

%BEP at full capacity = $\frac{2{,}181{,}818}{2700{,}000} \times 100$

= 80.8%

% BEP current output = $\frac{2{,}181{,}818}{2600{,}000} \times 100$

= 83.95%

For Price D

%BEP at full capacity = $\frac{2{,}666{,}667}{2700{,}000} \times 100$

= 98.8%

% BEP current output = $\frac{2{,}666{,}667}{2600{,}000} \times 100$

= 102.6%

OPERATIONS MANAGEMENT
BREAK – EVEN ANALYSIS

EALUATION OF BEA

Advantages:

1. Charts are relatively easy to construct and interpret.
2. It provides useful guidelines to management on break – even points, safety margins and profit or loss levels at different levels out output.
3. Comparisons can be made between different options by constructing new chars to show changed circumstances.
4. The equations produce precise output, break-even and price results.
5. It helps in making decisions of choosing a particular location or setting a particular price.

Disadvantages:

1. The assumption that costs and revenue are always, expressed in straight lines is unrealistic. Not all variable costs change directly or smoothly with output. Even revenue can be curved line which can cause two break – evens which makes the analysis useless.
2. Not all cost can be classified into fixed and variable costs. The introduction of semi-variable cost will make the technique much more complicated.
3. There is no allowance made for stock levels on the break – even charts is assumed that all units produced are sold which is an unlikely situation.
4. It is also unlikely that fixed cost would remain unchanged at different output levels.

BRUCE JEWELL
BREAK – EVEN ANALYSIS

(Business Studies: Bruce R. Jewell, page 399)

Exercises:

3.a.i. Contribution = Selling Price – Variable Cost

= £ 0.60 - £ 0.20
= £ 0.40

ii. Break – even point $= \frac{Fixed\ Costs}{Contribution}$

$= \frac{20{,}000}{0.40}$

= 50,000 units (mugs)

iii. Margin of Safety = Current Output – Break – even point
= 90,000 – 50,000
= 40,000

iv. Profits at full capacity = Margin of Safety × Contribution
= (120,000 – 50,000) × 0.40
= 70,000 × 0.40
= £ 28,000

b. Quantity $= \frac{Total\ Cost + Target\ Profit}{Selling\ Price}$

$= \frac{40{,}000 + 120{,}000\,(0.2) + 40{,}000}{Selling\ Price}$

Selling Price $= \frac{84000}{120{,}000}$

Selling Price = £ 0.70
= 70p

(Business Studies: Bruce R. Jewell, page 399)

Q.4. Break – Even graph for Smith Limited

b.i. Break – even output $= \frac{Fixed\ Costs}{Contribution}$

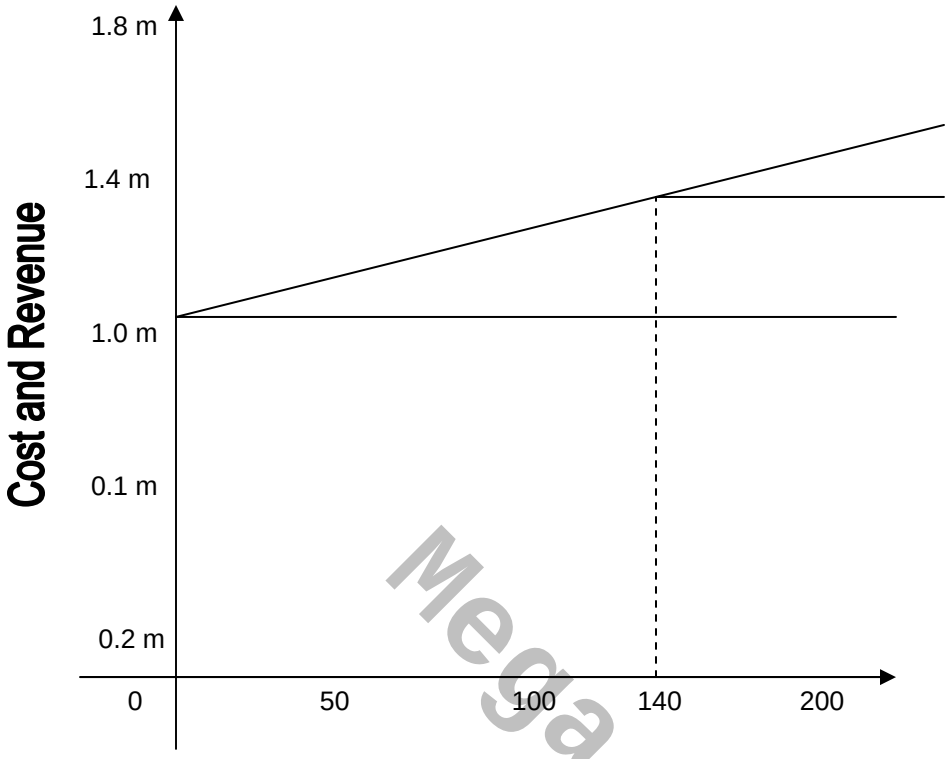
$= \frac{1{,}000{,}000}{10-2}$

$= \frac{1{,}000{,}000}{8}$

= 125,000 units

ii. Margin of safety = Current Output – Break – even output
= 150,000 – 12500
= 25000 units

iii. Profits = 25,000 x 8 (MOS & Contribution
= £ 200,000



Profit from Graph
= Total Revenue = Total Costs
= 1800,000 – 1400,000
= 400,000

d. The marketing manager's proposal is a good idea as the profit level is higher than before by (400,000 – 200,000) £ 200,000 as the variable costs continue to be lesser than selling price.
The drawback is that the break – even won't be a problem. Therefore the proposal should be implemented.
The margin of safety has also increased which is another proof of the higher profit levels. It must evertheless be kept in mind that it is being assumed that sales would increase. There is no knowledge of customer demand being given. So market research must be undertaken to find the trend in the demand. If it is increasing and the business is sure to require the higher output level then only should the manager's proposal be put into.

(Business Studies: Bruce R. Jewell, page 400)
Q.5.ai. Monthly profit = Total Revenue – Total Costs
= $150,000 (21) – [800,000 + (4) 150,000]
= 3,150,000 – 2900,000
= £ 250,000

ii. Break even level = $\frac{Fixed\ Costs}{Contribution}$

$$= \frac{800,000}{21-14}$$

$$= \frac{800,000}{7}$$

= 114,286 units

bi. Output = $\frac{Fixed\ Costs + Target\ profit}{Contribution}$

$$= \frac{800,000 + 200,000}{21-14}$$

$$= \frac{1000,000}{7}$$

= 142,857 units

ii. Output = $\frac{Fixed\ Costs + Target\ profit}{Selling - V.C.}$

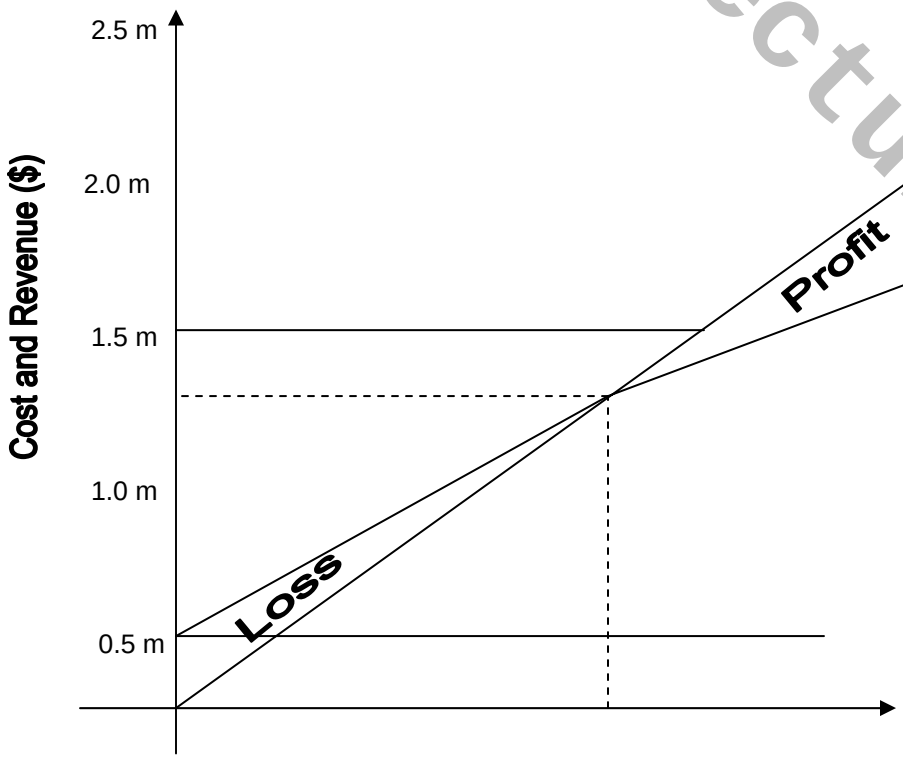
$$\frac{800,000 + 200,000}{Selling\ Price - 14} = 100,000$$

Selling price - 14 $\frac{1000,000}{100,000}$

Selling price = 10 + 14
= £ 24

(Business Studies: Bruce R. Jewell, page 400)

6.a. Break – even graph for Richardson Pen-Company



0	1m	2m	3m	4 m	5m

b. Contribution = selling price – variable cost
= £ 0.50 - £ 0.30
= £ 0.20

c.i. Break-even output = $\frac{Fixed\ Costs}{Contribution}$
= $\frac{500{,}000}{0.20}$
= 2500,000 units

ii. Margin of Safety = Current Output – Break even output
= 5000,000 – 2500,000
= 2500,000 units

iii. Profit at full capacity = Margin of safety x Contribution
= (Current Output (full capacity) – BE Output) x contribution
= (6000,000 – 250,000) x 0.2
= £ 700,000

d. Since the extra pens that have to be produced will continue to give a contribution of £ 0.5 to wards the fixed costs as well as profits of the firm. Also the business isn't utilizing or working at its full capacity and has capacity to produce another 1 million pens, therefore taking this order world also improve its capacity utilisation.
Also, the extra plus have a fixed cost of £10,000 which after being covered, the order still generates a profit of £15000 which would go towards the final profits of the firm. Therefore, if there is no other order, then Richardson Pen Company should take up the order.
However, it must keep in mind that £ 10,000 aren't the only fixed costs that have to be taken into account. Therefore other costs as well. Also when other customers get to know of this special offer then they may also ask the company to reduce prices to £35 for them instead of the usual £ 50. So if the company knows how to deal with such a situation, then it should take up the order.

(Business Studies: Bruce R. Jewell, page 400)

Q.7ai. Contribution is the difference between the selling price and variable costs. This amount shows how much each units produced contributes to the fixed costs and then the target profit.

ii. Break even point is the place or the level of output at which there is no profit nor loss i.e. the total costs is equal to the total revenue.

iii. Margin of safety is the difference between the current output and the break even output showing the area of profit.

bi. Contribution = Selling price – Variable Cost
= 0.15 – 0.10
= £ 0.05

ii. Break even output = $\frac{Fixed\ Costs}{Contribution}$
= $\frac{1000{,}000}{0.05}$
= 20,000,000
= 20 million units

iii. Margin of Safety = Current Output – Break even output
= 32 million – 20 million
= 12 million

iv. Profits = Margin of Safety x contribution
= 12,000,000 x 0.05
= £ 600,000

c. Yes, Davidson should accept the smartprice contract in the absence of the Goodprice after. This is because the variable cost of 10 pence is still below the selling price offered of 11 pence. So even though the profits for these 5 million units would be less than that from the standard price, however, these units would also contribute towards the fixed costs i.e. the fixed cost would how be spread over 37 million units instead of 32 million. Therefore, the profits would also be higher.
Accepting the smartprice offer would also improve the capacity utilization by 12.5% which would otherwise be wasted for that year. Also overall productivity is increased as the same machinery was being used to produce 82 m units before and now of ten the acceptance of offer it would produce 37 m units.
However, certain assumptions are made. Firstly that there would be no rise in fixed costs as capacity is available. At times even then F.C. increases e.g. yearly electric or gas supplies. Also variable costs are assumed constant while it may be that extra labour has to be appointed or overtime paid.

d. The Goodprice offer in essence is excellent when seen quantitatively. It allows capacity utilization to reach 95% which is a very good level. Also the price is only 1p less than the standard price and is generating a very good level of profit of £240,000. This also means that the safety margin of the business improves by 6 million units.
However, the other customers may also pressurize the business to sell them at 14 pence instead of 15 pence when they hear of this contract. This wasn't a problem with smartprice contract since they would sell under 'own be and' i.e. no one would know of the real manufacturers nor of the lower price contract. So if Goodprice offer leaks out then profit margin may fall. Also Goodprice wants a too – year contract. It may be that the next year demand rises and the company may be able to sell at the standard price. However due to the contract the business would have to lose profits the next way. Therefore careful market research into sales turned is required.

(Business Studies: Bruce R. Jewell, page 401)
Q.8ai. Contribution = Selling price – Variable Costs
= 500 – (100 – 200)

= 500 – 300
= £200 / units

ii. Break even output = $\frac{Fixed\ Costs}{Contribution}$

= $\frac{110{,}000}{200}$

= 550 units

iii. Profits = Margin of Safety x Contribution
= (2000 – 550) x 200
= 1450 x 200
= £290,000

b. Output = $\frac{Fixed\ Cost + Target\ Profit}{Selling\ price - Variable\ Cost}$

2000 = $\frac{110{,}000 + 150{,}000}{Selling\ price - 300}$

Selling price – 300 = $\frac{260{,}000}{2000}$

Selling price = 130 + 300
Selling price = £430

(Business Studies: Bruce R. Jewell, page 401)

Q.9.ai. Sales revenue at BEP = BE output x Price per unit
= 100,000 x 2.50
= £250,000

ii. Variable Costs = Total Costs – Fixed Costs
= 250,000 – 40,000
= £210,000

iii. Contribution per unit = Selling price – Variable Costs
= 2.50 – 210,000/100,000
= 2.50 -2.1
= £0.40

b. Output = $\frac{Fixed\ Costs - Target\ Profit}{Contribution}$

= $\frac{40{,}000 + 66{,}000}{0.40}$

= $\frac{106{,}000}{0.40}$

= £265,000

c. Loss = Margin of loss x Contribution
= (100,000 – 90,000) x 0.40
= 10,000 x 0.40
= £4000

d. New fixed costs = 40000 + 25% x 40,000
= £50,000

New BE output = $\frac{50,000}{0.40}$
= £125,000

Q.10.ai. Capacity Utilization = $\frac{Current\ Output}{Full\ Capacity} \times 100$

= $\frac{12\,million}{15\,million} \times 100$

= 80%

ii. Break even output = $\frac{Fixed\ Costs}{Contribution}$

= $\frac{5000,000}{1.40-0.70}$

= $\frac{5000,000}{0.70}$

= 7142,857 units

iii. Margin of Safety = Current Output – Break even Output
= 1200,000 – 7142857
= 4857,143 units

iv. Profits = Margin of Safety x Contribution
= 4857, 143 x 0.70
=£3400,000

v. Unit Costs = $\frac{Total\ Costs}{Total\ Units}$

= $\frac{5000,000+12000000(0.70)}{12000000}$

= $\frac{13400000}{12000000}$

= £1.12

b. Super market chain offer:
Quantity = 1 million units
Price = 80p = £0.8
Since the company has a capacity utilization of 80%, it may be tempted to accept the offer which would improve the capacity utilization to 86.7% which means an improvement in productivity. Also the selling price in the contract is higher than the variable cost. So this means that all of the extra units sold do contribute towards the fixed costs and profits i.e. they won't generate a loss.
However, 80 pence is 60 pence less than the standard price of £1.40. So if existing customers team of the offer and stand demanding a similar treatment then the business may find it very difficult of may be impossible to earn any profits at all.
Also if the company is purposefully charging higher prices to establish exclusivity of brand then lower prices could destroy the image. Also these lower priced goods may leak

into higher priced market and result in complete disithursioning of certain customers who may think the lower price a symbol of low quality.
So the firm must weigh its advantages and disadvantages of the contract. If it is sure that its other customers are loyal and won't complain nor its image is going to be damaged them I would strongly recommend it to accept the contact as the offer does increase sales and profits and marginal safety and prevents the extra capacity available from being wasted.

COSTS, BREAK-EVEN & COSTING METHODS

(Business Studies: Stimpson, page 332)
ACTIVITY
SITE A

Break – even $= \frac{Fixed\ Costs}{Contribution}$
$= \frac{60{,}000}{6.3}$
= 20,000 units

Safety margin = Current Output – Break even
= 40,000 – 20,000
= 20,000

Maximum profit = Safety margin – Contribution
= 20,000 x 3
= $60,000

SITE B

Break – even $= \frac{80{,}000}{6-2.50}$
= 22.857 units

Safety margin = 50,000 – 22,857
= 27143 units

Maximum profit = 27,143 x 35
= $95,000

2. As can be seen from the lable, SITE A has lower fixed costs than SITE B and so it has a lower break – even output i.e. the point until which the business must produce to cover all its costs and so not have a loss (nor profit). This means that for SITE B, the firm must produce 22,857 units to avoid losses which is 2,857 units higher than the BE level of sales of Site A.
However, a larger capacity of production is available at SITE B and so the safety margin that the firm achieves when producing at high capacity is greater than that of SITE A. This also gives the firm locating at SITE B to have a higher chance of profit pen product as the contribution towards profit is higher than at SITE A by (3 – 2.50), $0.50 on each product. So the maximum profit on SITE B is £95,000 which is £35,000 more than the chances of maximum profit that the firm locating at SITE A has.

Therefore, if the business has high demand for the product it aims to produce, then I would advise the firm to locate on SITE B due to the higher capacity avail able as well as the higher maximizing profit opportunities.

3. Five other factors affecting the locating decision are:-

i. Information:- the quality of the communication links and the transportation facilities available.

ii. Industrial inertia:- the frequency of similar industries in the same area which could be beneficial due to supply of qualified staff.

iii. Financial incentives:- like grants from the government in accordance with their regional policy.

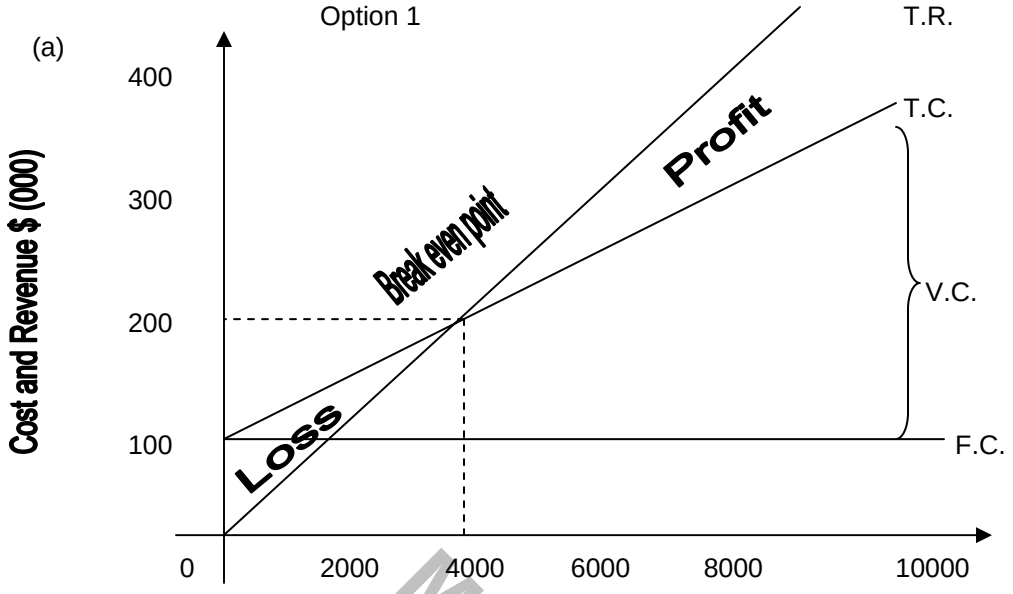
iv. Physical features, weather and quality of land:- e.g. if land can withstand the factory structure i.e. is not swampy.

v. Personal preference and interest of the owners:- looking for certain quality of life benefits like schooling and medical facilities.

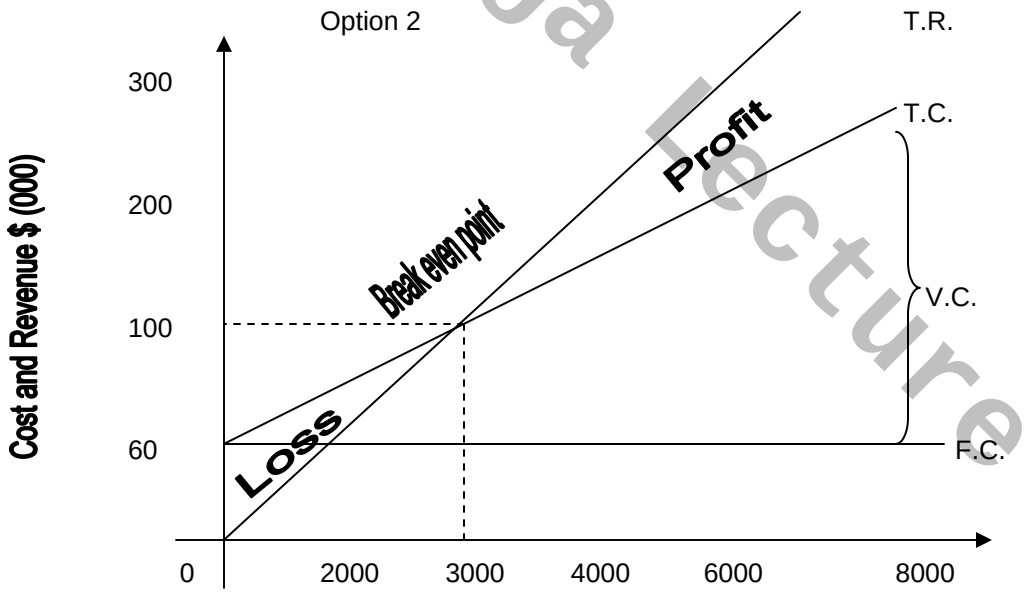
(Business Studies: Peter Stimpson, page 333)

ACTIVITY

(a)



Break – even output = 4500 units



Break – even output = 3000 units

ARITHMETIC CHECK ON BEP:

Option 1: Break – even $= \frac{Fixed\ Costs}{Contribution}$

$= \frac{54000+27000}{40-(10+12)} = 4500$

Option 2: Break - even $= \frac{54000+6000}{40-20}$

$= 3000$

Option 1:
Maximum profit = Total Revenue – Total Costs
= 10,000 (40) – [81000 + 10000(22)]
= 400,000 – 301,000
= $99,000

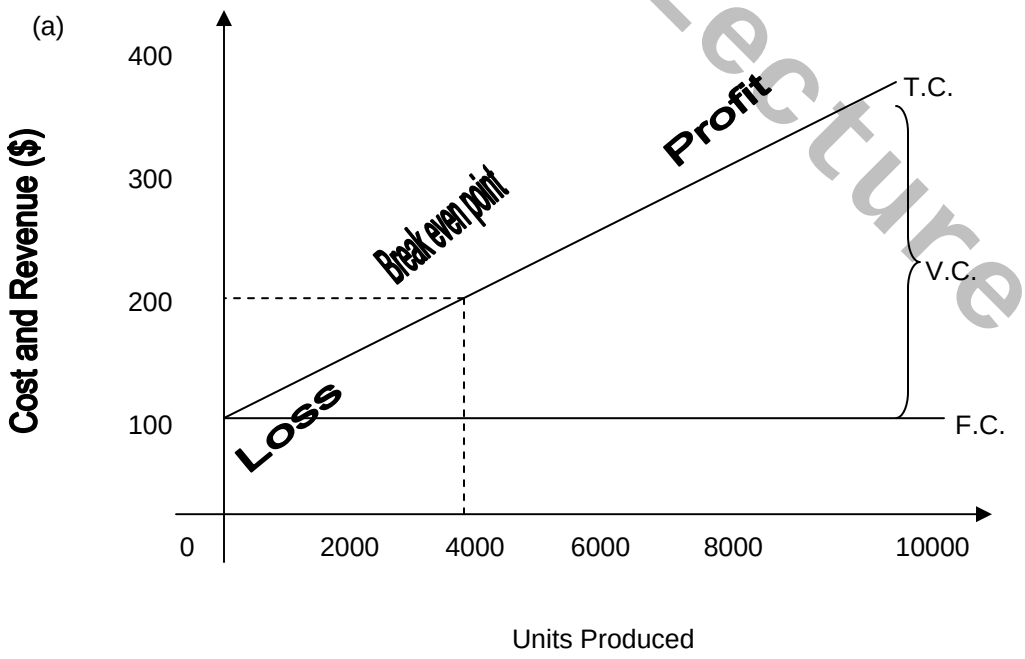
Option 2:
Maximum profit = 75000 (40) – [60,000 + 75000 (20)]
= 300,000 – 210,000
= $90,000

Option 1:
Margin of Safety = Current Output – Break–even Output
=7000 – 4500
= 2500 units

Option 2:
Margin of Safety: = 7000 – 3000
= 4000 units

b. Fixed costs are 20% higher
T.C. = 209 x 81000 + 81000
= 162000 + 81000
= $97,200

(a)



From the chart
Break – even point ≈ 5000 units – 5500 units

Verification

BEP $= \frac{Fixed\ Costs}{Contribution}$

$= \frac{97,200}{40.22}$

= 5400 units

c. Since the new machinery is being purchased which would work faster and more efficiently so this would result in increased productivity and so the labour cost per unit may fall. It may also be that less labour is required. The since there is less wastage of raw materials so this would lower the cost of material again leading to a fall in variable cost as due to efficient use less material is required per product.

Break – even point $= \frac{Fixed\ Costs}{Contribution}$

$= \frac{54000+8000}{(10+12)-2.50}$

$= \frac{62000}{19.5}$

= 3179 units

PROBLEMS OF CLASSIFICATION OF COSTS

1. Labour costs can not be easily classification into direct variable costs or indirect costs e.g. if the season for a particular type of good is of them it is not possible to lay of all the workers that were appointed on a particular production line. It is not practical to make workers redundant when the reason ends and then expect them to join again when reason begins. So these workers would still have to be paid even if production was zero, and the wages would have to be indirect costs since they aren't related to any one particular product. Same is the case in case of machinery breakdown.
2. Also not all costs can be classified directly into fixed costs or variable costs e.g. line rent and electricity charges. It may be that a fixed line rent has to be paid annually while the per phone call charges vary. Also electricity standing charge is fixed while per unit consumed cots vary. So these are semi – variable costs which have to be taken into account when preparing BEP chants and finding BEP.
3. Also it is wrong to equate variable costs with direct costs and fixed costs with indirect costs. E.g. Depreciation and rent are both fixed cots but the former can be directly associated with a particular product while factory rent is can't. Also despite both being variable costs, energy costs can't be directly related to specific types of production while raw material costs can.

WORK STUDY

Definition:
Work study is an attempt to find the best or most efficient way of using labour, machines and materials. It includes a number of techniques which are all directed towards improving the productivity of labour. F.W. Taylor's scientific management is said to have formed the basis of work study methods. Taylor presented the argument that by observing and analyzing the different work methods and rates, it would be possible to deduce the most productive and efficient way of working or continuing production.

Work Study Techniques:
There are two techniques involved in work study:

- Method Study
- Work Measurement

Method Study
It involves identifying all the specific activities in a job, analyzing them and finding the most effective way of undertaking a task or job. This could be an existing job or a new one.
However, method study usually aims at the progress of existing work practices.

STAGES INVOLVED IN METHOD STUDY

1. the selection of the task which is required for analysis
2. observing the current method of carrying out the task wile making notes of the material flow, worker movement as well as the equipment layout.
3. analyzing the collected data
4. suggestion of improvement of the method e.g. reducing movement of partly finished goods round the factory.
5. putting the new method into practice
6. recording the impact of the new methods on productivity

BENEFITS OF METHOD STUDY

i. identify an optimum way to carry out a task
ii. improve the layout of the factory or the workplace to enable the most efficient use of the available space
iii. minimize effort and reduce fatigue
iv. improve the effectiveness of process
v. improve the use of labour, machines and materials

Work Measurement

It involves recording output levels using different methods and arriving at a standard or target time for each task. It aims to measure how long workers take to perform each task.

STAGES INVOLVED IN WORK MEASUREMENT

1. decide on the task to be recorded
2. record the time taken for the task
   - allowances for necessary stoppages must be taken into acc.
3. rate the performance against standard performance of an average, experienced, motivated worker. Workers may exceed the scale
4. establish the average time for a job (if done by an average trained and competent worker)

BENEFITS OF WORK MEASUREMENT

i. working out price rates if this type of payment system is used
ii. establish the costs of particular activities to help with accounting\
iii. help with the planning of production schedules
iv. achieve results in the least time
v. help to judge future performances by comparisons

In summary work study means identifying the best work method and then using work measurement to find the effort needed to carry out a task to an acceptable standard. The results can be used to design incentive schemes and determine staffing levels.

Evaluation of Work Study

Introducing work study programs is not easy. Work study assessors are often disliked by employees.

The major problem is the workers resistance to this process. Workers feel that observing and analyzing their work habits is part of inspection of individual practices and so they feel distrust. Therefore stress should be put by higher management that work study is infact a method of improving efficiency and determining the task length. It is not appraisal of individuals and so no disciplinary measures can arise from it.

Workers generally feel less secure because they think that redundancies will arise due to work study as better methods may mean less labour requirements. Also they find difficulty in changing or adapting to changes to practices they are at ease at. Their fears can be alleviated by involving the staff in the work study through discussions on areas requiring improvement and benefits of efficiency.

Accurate measurements are difficult as staff may work fast during study to impress and increase their wages or slowly to increase the set standard time. Therefore, skilled consultants should be able to identify workers at an unusually high or slow pace during work study.