Course Title: Cost Accounting for Decision Making

Professional Development Programme on Enriching Knowledge of the Business, Accounting and Financial Studies (BAFS) Curriculum <Elective Part>
Learning Outcomes

Upon completion of this course, teacher participants should be able to:

• apply cost-volume-profit analysis techniques to ascertain the inter-relationships among costs, selling price, units sold, breakeven point, target profit and margin of safety;
• state the assumptions and limitations of cost-volume-profit analysis;
• identify and differentiate relevant costs and irrelevant costs in different business scenarios; and
• make recommendation to short-term business decisions.
Syllabus in HKDSE Examination

- Identify the nature of various cost items and their relevance to decision-making: sunk costs, incremental costs and opportunity costs.
- Apply costing concepts and techniques in business decisions, e.g. “hire, make or buy”, “accept or reject an order at a special price”, “retain or replace equipment”, “sell or process further” and “eliminate or retain an unprofitable segment”.
- Conduct cost-volume-profit analysis to assess the effects of changes in costs, selling price and units sold on the breakeven point and target profit.
Contents

- Breakeven point
- Sale level required to achieve target profit
- Margin of safety
- What-if analysis (Illustrations 1 & 2)
- Sales mix (Illustration 3 & 4)
- Relevant costs vs. irrelevant costs (Illustrations 5 & 6)
- Accept or reject an order (Illustration 7)
- Hire decision (Illustration 8)
- Make or buy (illustration 9)
- Retain or replace equipment (Illustration 10)
- Sell or process further (Illustration 11)
- Eliminate or retain an unprofitable segment (Illustration 12)
Prior Knowledge Required

Variable Costs vs. Fixed Costs

Contribution Margin = Sales Revenue minus Variable Costs
Cost-Volume-Profit Analysis
(C-V-P Analysis)
(Breakeven Analysis)
What is it?

• Breakeven = no profit, or loss, that is,
  – Total Sales Revenue = Total Costs (Variable Costs + Fixed Costs)
  – Total Contribution = Fixed Costs
• It studies how cost, revenue and production/sales volume affect profit
• Two approaches:
  – By Formula
  – By Graph
Breakeven Point – By Formula

Breakeven Point (in units) = \frac{Fixed\ Costs}{Unit\ Contribution}

Breakeven Point (in $) = \frac{Fixed\ Costs}{Unit\ Contribution} \times Unit\ Selling\ Price

or

Breakeven Point (in $) = \frac{Fixed\ Costs}{Contribution\ Margin\ Ratio}

where \quad Contribution\ Margin\ Ratio = \frac{Unit\ Contribution}{Unit\ Selling\ Price}
Sales Level Required to Achieve Target Profit

\[
Sales \text{ Level (in units)} = \frac{Fixed \text{ Costs} + Target \text{ Profit}}{Unit \text{ Contribution}}
\]

\[
Sales \text{ Level (in $)} = \frac{Fixed \text{ Costs} + Target \text{ Profit}}{Unit \text{ Contribution}} \times Unit \text{ Selling Price}
\]

or

\[
Sales \text{ Level (in $)} = \frac{Fixed \text{ Costs} + Target \text{ Profit}}{Contribution \text{ Margin Ratio}}
\]
Margin of Safety – By Formula

Margin of Safety (in units)
\[ = \text{Actual or Budgeted Sales (in units)} - \text{Breakeven Point Sales (in units)} \]

Margin of Safety (in $)
\[ = \text{Actual or Budgeted Sales (in $)} - \text{Breakeven Point Sales (in $)} \]

Margin of Safety Ratio (in $) = \frac{\text{Profit}}{\text{Contribution Margin Ratio}}

Margin of Safety Ratio (in %)
\[ = \frac{\text{Margin of Safety (in units or in $)}}{\text{Actual or Budgeted Sales (in units or in $)}} \times 100\% \]
What-if Analysis

• It studies how the result will change if the original data changes.
• It answers questions such as:
  – What will be the breakeven point if variable cost per unit increased by 5%?
  – What will be the profit if sales volume increases by 5%?
Effects of Changes in Costs, Selling Price on the Breakeven Point

Approach

Adjust the nominator and/or denominator of the breakeven point formula to work out the breakeven point
Illustration 1
Effect of Changes in Costs on Breakeven Point

• A manufacturing company produces and sells a single product as follows:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Selling price per unit</td>
<td>$250</td>
</tr>
<tr>
<td>Variable costs per unit</td>
<td>$150</td>
</tr>
</tbody>
</table>

• The fixed cost per annum is estimated to be $600,000.
Illustration 1
Effect of Changes in Costs on Breakeven Point

• The sales manager would like to propose a change to pay a salesman on commission basis of $10 per unit sold rather than on fixed monthly salaries of $8,000 per month.

• What would be the breakeven points in units for the situations before and after the change?
Illustration 1
Effect of Changes in Costs on Breakeven Point

Breakeven point before change:
$600,000/(\$250-\$150)
= 6,000 units

Breakeven point after change:
($600,000 - \$8,000 \times 12)/[\$250-(\$150+\$10)]
= 5,600 units
Illustration 1
Effect of Changes in Costs on Breakeven Point

• It does not mean that the proposed scenario is better than the original scenario because of lower breakeven point.
• It all depends on the actual sales volume.
• For example, if the sales volume is 10,000 units, the profit in the original scenario will be $400,000 (10,000 x $100 - $600,000) while that in proposed scenario it will only be $396,000 (10,000 x $90 – $504,000).
Effects of Changes in Costs, Selling Price and Units Sold on the Profit

Approach

Prepare Contribution Income Statement
Illustration 2
Effects of Changes in Costs and Units Sold on the Profit

• A company produces and sells a single product. In the current year, 20,000 units will be sold at $50 each. The fixed cost is $300,000 and the profit is $100,000.

• The company is considering spending $30,000 to launch a promotion campaign in the next year to boost the sales volume by 5%.

• The selling price and other fixed overhead will keep constant over the two years.
Illustration 2
Effects of Changes in Costs and Units Sold on the Profit

Required
1) For the current year, calculate:
   a) the breakeven point in units, and
   b) the margin of safety in %
2) Prepare the income statements for both current year and next year.
3) Explain whether the promotion campaign should be launched.
Illustration 2
Effects of Changes in Costs and Units Sold on the Profit

1) a) Total contribution = $300,000 + $100,000 = $400,000
   Contribution per unit = $400,000/20,000 = $20
   Breakeven point in units = $300,000/$20 = 15,000 units
   b) Margin of safety in % = (20,000-15,000)/20,000 x 100%
   = 25%
**Illustration 2**

**Effects of Changes in Costs and Units Sold on the Profit**

2)

<table>
<thead>
<tr>
<th>Contribution Income</th>
<th>Current Year</th>
<th>Next Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales ($50 per unit)</td>
<td>$1,000,000</td>
<td>$1,050,000</td>
</tr>
<tr>
<td>Variable cost ($30 per unit)</td>
<td>$600,000</td>
<td>$630,000</td>
</tr>
<tr>
<td>Total contribution</td>
<td>$400,000</td>
<td>$420,000</td>
</tr>
<tr>
<td>Less: Fixed cost</td>
<td>$300,000</td>
<td>$330,000</td>
</tr>
<tr>
<td>Net Profit</td>
<td>$100,000</td>
<td>$90,000</td>
</tr>
</tbody>
</table>
Illustration 2
Effects of Changes in Costs and Units Sold on the Profit

3) The promotion should not be launched as it would lower the net profit.
Activity 1
Illustrative Integrated Question
Cost-Profit-Volume Analysis
A manufacturing company produces and sells a single product. The accountant has just prepared the company’s budget for the coming year. The budgeted data is extracted as follows:

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales volume</td>
<td>90,000 units</td>
</tr>
<tr>
<td>Fixed costs</td>
<td>$440,000</td>
</tr>
<tr>
<td>Variable costs per unit</td>
<td>$10</td>
</tr>
<tr>
<td>Loss</td>
<td>$80,000</td>
</tr>
</tbody>
</table>
Question (2)

- The directors are dissatisfied with the budgeted loss and suggest proposals for improvement.
- Director A suggests spending $50,000 on advertising to increase sales. He wishes to achieve a target profit of $100,000.
- Director B suggests reducing selling price by $1 per unit to increase sales. He expects that the sales volume would increase by 80%.
- Director C suggests buying a more efficient machine which would reduce unit variable costs by 50%. The useful life of the machine is 1 year.
Question (3)

Required

a) For Director A’s proposal, what is the percentage increase in sales required to achieve the target profit?

b) For Director B’s proposal, what would be the profit or loss?

c) For Director C’s proposal, what would be the maximum cost of the machine for breakeven?
Answers

a) 50%
b) Profit $46,000
c) $370,000
By Graph – Breakeven Chart

Sales revenue/Costs

- Sales
- Profit
- Variable costs
- Fixed costs
- Loss
- Total costs

Activity (Sales units)

Break-even point

Profit

Fixed costs
By Group – Contribution Graph

Sales revenue/Costs

- Activity (Sales units)
- Sales revenue/Costs
- Break-even point
- Total costs
- Loss
- Variable costs
- Contribution
- Profit
- Fixed costs
By Graph – Profit-Volume Graph

Profit / Loss ($’000)

Break-even point

Profit

Loss

Profit

Activity (Sales units)

Fixed costs

Contribution
Breakeven Point for Sales Mix

When a company produces multiple products, it is assumed that the relative combination of the products sold (sales units) will be constant.
Illustration 3
Breakeven Point for Sales Mix

- Product X and Product Y are sold in sales mix of 3:1. Details about the two products are:

<table>
<thead>
<tr>
<th></th>
<th>Product X</th>
<th>Product Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>Selling price per unit</td>
<td>$5</td>
<td>$10</td>
</tr>
<tr>
<td>Variable cost per unit</td>
<td>$4</td>
<td>$3</td>
</tr>
<tr>
<td>Unit contribution</td>
<td>$1</td>
<td>$7</td>
</tr>
</tbody>
</table>

- The fixed cost is $30,000.
- What is the breakeven point in units and dollars?
Illustration 3
Breakeven Point for Sales Mix

Breakeven Point (in standard batches)
Fixed Cost

= Contribution of 1 standard batch

\[
\frac{30,000}{1 \times 3 + 7 \times 1} = 3,000 \text{ batches}
\]

Since 1 standard batch consists of 3 units of product X and 1 unit of product Y, the breakeven point is 9,000 units of product X and 3,000 units of product Y.
Illustration 3
Breakeven Point for Sales Mix

Breakeven point (in $)

<table>
<thead>
<tr>
<th>Sales</th>
<th>$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product X: 9,000 x $5</td>
<td>45,000</td>
</tr>
<tr>
<td>Product Y: 3,000 x $10</td>
<td>30,000</td>
</tr>
<tr>
<td>Breakeven point</td>
<td>75,000</td>
</tr>
</tbody>
</table>
Alternatively, the breakeven point in $ can be calculated by using the contribution margin ratio:

Contribution in standard sales mix
= $1 \times 3 + $7 \times 1 = $10

Selling price in standard sales mix
= $5 \times 3 = $10 \times 1 = $25
Hence, the contribution margin ratio is

$$\frac{10}{25} = 0.4$$

The breakeven point in $ is

$$\frac{30,000}{0.4} = 75,000$$
Continue with illustration 3. As the marketing manager observes that Product Y is more profitable, he is considering spending additional $5,000 on marketing campaign to boost the sales of Product Y. It is estimated that sales volume of Product Y can be increased by 1/3.

How many units of Product X should be sold at least in order to achieve breakeven?
Illustration 4
Effect of Change in Expenses on Sales Mix

<table>
<thead>
<tr>
<th></th>
<th>$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Original fixed cost</td>
<td>30,000</td>
</tr>
<tr>
<td>Marketing expenses</td>
<td>5,000</td>
</tr>
<tr>
<td>Contribution from Product Y ($7 x 3,000 x 4/3)</td>
<td>(28,000)</td>
</tr>
<tr>
<td>Uncovered fixed cost</td>
<td>7,000</td>
</tr>
</tbody>
</table>

Hence, number of units of Product X to be sold for achieving breakeven =

\[
\frac{7,000}{\text{Unit Contribution of Product X}} \times \frac{7,000}{1} = 7,000 \text{ units}
\]
Assumptions of C-V-P Analysis

• Selling price per unit and variable cost per unit are constant.
• Fixed cost per period is constant.
• Production units equal sales units.
• A single product is sold or the sales mix is constant.
Limitations of C-V-P Analysis

• Unit selling price may vary, e.g. due to bulk discounts offered to customers.
• Unit variable costs per unit may vary, e.g. due to economies of scales or overtime premium etc.
• Fixed costs may change at different levels of activity, e.g. step costs, i.e. in different relevant ranges, the fixed cost will vary.
Cost Classification & Items
Costs Classification in Decision Making

- Relevant Costs
  - Incremental Costs
  - Opportunity Costs
- Irrelevant Costs
  - Sunk Costs
  - Committed Costs
# Relevant Cost vs. Irrelevant Cost

<table>
<thead>
<tr>
<th>Relevant Cost</th>
<th>Irrelevant Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost that <strong>will be</strong> changed by a decision</td>
<td>Cost that <strong>will not be</strong> changed by a decision</td>
</tr>
<tr>
<td>Incremental Cost</td>
<td>Opportunity Cost</td>
</tr>
<tr>
<td>------------------</td>
<td>------------------</td>
</tr>
<tr>
<td>Additional cost which will be specifically incurred because of a decision</td>
<td>Benefit which will be forgone when the choice of one course of action requires an alternative course of action be given up</td>
</tr>
</tbody>
</table>
Irrelevant Cost

<table>
<thead>
<tr>
<th>Sunk Cost</th>
<th>Committed Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost of a resource already acquired and are unaffected by choice between alternatives</td>
<td>Cost which has been committed although it has not been incurred or paid.</td>
</tr>
</tbody>
</table>
Material Cost: How Relevant?

- Materials
  - Purchase
    - Incremental Cost
      - Estimated Purchase Price
    - Taken from inventory
      - Opportunity Cost
        - Sold
        - Regularly Used
          - Net Realizable Value
          - Replacement Cost (Estimated Purchase Price)
        - Specifically used for another alternative
          - Benefits from the alternative
Illustration 5
Material Cost: How Relevant?

• A job requires 1,000 units of material X which have already been in the inventory.
• They were purchased at a cost of $8 per unit.
• The materials can be sold at a net realizable value of $12 per unit.
• It can also be used in another job as substitute for 1,500 units of material Y of which the current purchasing price is $10.
Illustration 5
Relevant Cost for Material X

Analysis:
- The original purchase price of material X is irrelevant since it is a sunk cost
- The opportunity cost would be the higher of NRV or Costing Savings, i.e. $15,000
- Therefore, the relevant cost of material X is $15,000

Opportunity Cost

- Sold
  - Net Realizable Value (NRV) = $12 x 1,000 = $12,000

- Used as Substitute for Material Y
  - Cost Savings = $10 x 1,500 = $15,000
Labour Cost: How Relevant?

Labour

- Additionally Hire
  - Incremental Cost

- Full capacity and limited supply
  - Divert from existing production
    - Incremental Cost + Opportunity Cost (usually contribution lost)
Illustration 6
Labour Cost: How Relevant?

A company has been offered a special order which requires 1,000 direct skilled labour hours at $400 per hour. Because of full capacity and limited supply, the direct skilled labour hours have to be diverted from existing production of 500 units of Product X which gives contribution of $300 per unit.
# Illustration 6
Labour Cost: How Relevant?

<table>
<thead>
<tr>
<th>Relevant Costs for Direct Labour</th>
<th>$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incremental Cost ($400 x 1,000)</td>
<td>400,000</td>
</tr>
<tr>
<td>Contribution Lost ($300 x 500)</td>
<td>150,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>550,000</td>
</tr>
</tbody>
</table>
Short-Term Business Decisions
Factors to Consider in Business Decision Making

- Quantitative factors: cost vs. benefit analysis in monetary terms.
- Qualitative factors: social responsibility, corporate goodwill, employee morale etc.
Accept or Reject an Order at a Special Price

Decision

Accept

Reject

Change

No Change

Incremental Benefits

Relevant Costs
Accept or Reject an Order at a Special Price

Decision Rule

Benefits of “Accepting” > Costs

Yes

Accept

No

Reject
Approach

Accept or Reject an Order at a Special Price

Prepare a cost-benefit analysis for “accepting”
### Illustration 7

**Accept or Reject an Order at a Special Price**

A firm currently makes 50,000 units of product per annum and sells at $30 each. The operating statement is as follows:

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales (50,000 x $30)</td>
<td>1,500,000</td>
</tr>
<tr>
<td>Less: Materials</td>
<td>(500,000)</td>
</tr>
<tr>
<td>Labour</td>
<td>(680,000)</td>
</tr>
<tr>
<td>Contribution</td>
<td>320,000</td>
</tr>
<tr>
<td>Less: Fixed Costs</td>
<td>(200,000)</td>
</tr>
<tr>
<td>Net Profit</td>
<td>120,000</td>
</tr>
</tbody>
</table>
Illustration 7
Accept or Reject an Order at a Special Price

A customer offers an order for 10,000 units at selling price of $28 each.

If the order is accepted:

• Fixed cost would increase to $250,000.
• Extra labour would be required at overtime premium of 20%.
• 4% discount would be obtained for all materials.
### Illustration 7

**Accept or Reject an Order at a Special Price**

<table>
<thead>
<tr>
<th>Cost-Benefit Analysis for Accepting</th>
<th>$</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Incremental Benefits</strong></td>
<td></td>
</tr>
<tr>
<td>Increase in sales revenue (10,000 x $28)</td>
<td>280,000</td>
</tr>
<tr>
<td>Savings in material cost for existing production (500,000 x 4%)</td>
<td>20,000</td>
</tr>
<tr>
<td></td>
<td>300,000</td>
</tr>
<tr>
<td><strong>Incremental Costs</strong></td>
<td></td>
</tr>
<tr>
<td>Material cost for additional production ($500,000/50,000 x 10,000 x 96%)</td>
<td>96,000</td>
</tr>
<tr>
<td>Labour cost for additional production ($680,000/50,000 x 10,000 x 120%)</td>
<td>163,200</td>
</tr>
<tr>
<td>Increase in fixed cost ($250,000-$200,000)</td>
<td>50,000</td>
</tr>
<tr>
<td></td>
<td>309,200</td>
</tr>
</tbody>
</table>

Decrease in net profit: 9,200
Illustration 7
Accept or Reject an Order at a Special Price

• Conclusion: As the incremental benefit is less than the increment cost, the order should be rejected.
Hire or Not Hire

Decision

Hire

Change

Incremental Benefits

Not Hire

No Change

Relevant Costs (Hire charge and associated costs)
Hire or Not Hire

Decision Rule

Benefits of Hiring > Costs

Yes
  - Hire

No
  - Not Hire
Approach

Prepare a cost-benefit analysis for “hiring”

Hire or Not Hire
Illustration 8
Hire or Not Hire

• A company currently produced 1,000 units of product X per month at unit variable costs of $50.

• Product X was sold at $120 per unit.

• The company is considering hiring an additional machine which can reduce the unit variable costs to $48 and increase production by 20%.

• The monthly hire charge is $200,000.
### Illustration 8

**Hire or Not Hire**

<table>
<thead>
<tr>
<th>Cost-Benefit Analysis for Hiring</th>
<th>$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Savings in variable costs for existing production [(($50-$48) \times 1,000)]</td>
<td>2,000</td>
</tr>
<tr>
<td>Increase in contribution from additional production [(($120-$48) \times (1,000 \times 20%))]</td>
<td>14,400</td>
</tr>
<tr>
<td>Increase in contribution</td>
<td>16,400</td>
</tr>
<tr>
<td>Less: Hire charge</td>
<td>20,000</td>
</tr>
<tr>
<td>Decrease in profit</td>
<td>3,600</td>
</tr>
</tbody>
</table>
• Conclusion: Since hiring would lead to a decrease in profit, it should not be hired.
Make or Buy

Make

Change

Relevant Costs

Buy

Change

Relevant Costs
Make or Buy

Decision Rule

Relevant Costs of “Make” > Relevant Costs of “Buy”

Yes

Buy

No

Make
Approach

Prepare relevant cost statements for both alternatives

Make or Buy
Illustration 9
Make or Buy

• A company requires 800 units of component X specifically for a single order and is considering making the components itself or buying them from outside supplier.
• In making, it requires $3,000 materials, 100 labour hours at hourly rate of $28 to be diverted from other teams which are idle but cannot be fired because of the employment contract.
• If the company makes the components itself, the existing production of product Y will fall by 100 units. Product Y provides a contribution of $8 per unit.
• The components are sold at a multiple of 1,000 units at $4,500 per 1,000 units. Any excess of the demand can be re-sold at a price of $1 per unit.
### Illustration 9
Make or Buy

<table>
<thead>
<tr>
<th>Relevant Cost for Making</th>
<th>$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Materials</td>
<td>3,000</td>
</tr>
<tr>
<td>Contribution lost ($8 x 100)</td>
<td>800</td>
</tr>
<tr>
<td><strong>Total Relevant Cost</strong></td>
<td><strong>3,800</strong></td>
</tr>
</tbody>
</table>

Since the labour is idle, the cost is irrelevant.
### Illustration 9
Make or Buy

<table>
<thead>
<tr>
<th>Relevant Cost for Buying</th>
<th>$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purchase cost</td>
<td>4,500</td>
</tr>
<tr>
<td>Re-sale of excess [ (1,000-800) \times 1 ]</td>
<td>(200)</td>
</tr>
<tr>
<td>Total Net Relevant Cost</td>
<td>4,300</td>
</tr>
</tbody>
</table>
Illustration 9
Make or Buy

• Conclusion: Since the relevant cost for making is lower than that of buying, the components should be made.
Retain or Replace Equipment

Decision

- Replace
  - Change
    - Incremental Benefits
  - No Change
    - Relevant Costs

- Retain
IVE Business Administration

Decision Rule

Benefits of “Replacement” > Costs

Yes
Replace

No
Retain

Retain or Replace Equipment
IVE Business Administration

Approach

Prepare a cost-benefit analysis for "replacement"

Retain or Replace Equipment
A company is considering replacing an old machine with a new one. Details about the old machine and the new machine are as follows:

<table>
<thead>
<tr>
<th>Old Machine</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Original Cost</td>
<td>$1,000,000</td>
</tr>
<tr>
<td>Depreciated amount</td>
<td>$800,000</td>
</tr>
<tr>
<td>Remaining useful life</td>
<td>3 years</td>
</tr>
<tr>
<td>Current disposal value</td>
<td>$10,000</td>
</tr>
<tr>
<td>Disposal value after 3 years</td>
<td>Nil</td>
</tr>
</tbody>
</table>
Illustration 10
Retain or Replace Equipment

<table>
<thead>
<tr>
<th>New Machine</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Current purchase cost</td>
<td>$300,000</td>
</tr>
<tr>
<td>Useful life</td>
<td>3 years</td>
</tr>
<tr>
<td>Disposal value after 3 years</td>
<td>$60,000</td>
</tr>
</tbody>
</table>

The new machine can reduce operating costs by $80,000 per annum.
Illustration 10
Retain or Replace Equipment

<table>
<thead>
<tr>
<th>Cost-Benefit Analysis for Replacement</th>
<th>$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incremental Benefits of Replacement</td>
<td></td>
</tr>
<tr>
<td>Total costs saving (3 x $80,000)</td>
<td>240,000</td>
</tr>
<tr>
<td>Disposal value of new machine after 3 years</td>
<td>60,000</td>
</tr>
<tr>
<td>Current disposal value of old machine</td>
<td>10,000</td>
</tr>
<tr>
<td></td>
<td>310,000</td>
</tr>
<tr>
<td>Less: Incremental Costs</td>
<td></td>
</tr>
<tr>
<td>Purchase cost of new machine</td>
<td>(300,000)</td>
</tr>
<tr>
<td>Net Incremental Benefits of Replacement</td>
<td>10,000</td>
</tr>
</tbody>
</table>

Note: Time value of money is ignored.
Conclusion: Since replacement would make a net incremental benefit, it should be replaced.
Sell or Process Further

- Process Further
  - Change
    - Increase in Selling Price
  - No Change
    - Further Costs to Completion
- Sell
Sell or Process Further

Decision Rule

Benefits of "Processing Further" > Costs

Yes

Process Further

No

Sell
Approach

Prepare a cost-benefit analysis for “Further Processing”

Sell or Process Further
Illustration 11
Sell or Process Further

• A company is considering whether to process a semi-finished product which has been produced at total variable cost of $60,000 and can be sold at $100,000.
• If the semi-finished product is further processed to make it a finished product, it can be sold at $220,000. The costs involved in the process are as follows:

<table>
<thead>
<tr>
<th></th>
<th>$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct materials</td>
<td>150,000</td>
</tr>
<tr>
<td>Direct labour</td>
<td>10,000</td>
</tr>
<tr>
<td>Overheads</td>
<td>180,000</td>
</tr>
</tbody>
</table>
Illustration 11
Sell or Process Further

• Contract has been signed for the purchase of the $150,000 materials. The materials are for special purpose and cannot be used in another alternative. If it is not used, it can be sold at $30,000.

• Overheads include $70,000 specific to further process and allocated general overheads of $110,000.

• The finished product after the further process can be sold at $220,000.
## Illustration 11
Sell or Process Further

<table>
<thead>
<tr>
<th></th>
<th>$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incremental Benefits from Further Processing</td>
<td></td>
</tr>
<tr>
<td>Increase in sales revenue ($220,000 - $100,000)</td>
<td>120,000</td>
</tr>
<tr>
<td>Relevant Costs to Completion</td>
<td></td>
</tr>
<tr>
<td>Direct materials</td>
<td>30,000</td>
</tr>
<tr>
<td>Direct labour</td>
<td>10,000</td>
</tr>
<tr>
<td>Overheads</td>
<td>70,000</td>
</tr>
<tr>
<td></td>
<td>110,000</td>
</tr>
<tr>
<td>Net Incremental Benefits</td>
<td>10,000</td>
</tr>
</tbody>
</table>
Illustration 11
Sell or Process Further

• Conclusion: Since the benefit of further processing is greater than the costs, further processing is recommended.
Eliminate or Retain an Unprofitable Segment

- Eliminate
- Retain

- Change
- No Change

- Loss in Contribution
- Avoidable Fixed Costs
IVE Business Administration
工商管理

Eliminate or Retain an Unprofitable Segment

Decision Rule

Whether the unprofitable segment makes positive contribution?

Yes
Retain

No
Eliminate
Eliminate or Retain an Unprofitable Segment

Approach

Prepare contribution income statement by segments including the unprofitable segment
Illustration 12
Eliminate or Retain an Unprofitable Segment

A Company has two departments producing products X and Y respectively. The budgeted operating statement for the coming year is summarized as follows:

<table>
<thead>
<tr>
<th></th>
<th>Product X</th>
<th>Product Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales</td>
<td>$60,000</td>
<td>$100,000</td>
</tr>
<tr>
<td>Less: Total Cost</td>
<td>$70,000</td>
<td>$80,000</td>
</tr>
<tr>
<td>Net Profit / (Loss)</td>
<td>-(10,000)</td>
<td>$20,000</td>
</tr>
</tbody>
</table>

Of the total cost 70% is variable, 10% is specific fixed and 20% is general fixed.
**Illustration 12**

Eliminate or Retain an Unprofitable Segment

<table>
<thead>
<tr>
<th>Contribution Income Statement</th>
<th>Product X</th>
<th>Product Y</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$</td>
<td>$</td>
<td>$</td>
</tr>
<tr>
<td>Sales</td>
<td>60,000</td>
<td>100,000</td>
<td>160,000</td>
</tr>
<tr>
<td>Less: Variable cost (70% of total cost)</td>
<td>49,000</td>
<td>56,000</td>
<td>105,000</td>
</tr>
<tr>
<td>Contribution</td>
<td>11,000</td>
<td>46,000</td>
<td>55,000</td>
</tr>
<tr>
<td>Less: Specific fixed cost (10% of total cost)</td>
<td>7,000</td>
<td>8,000</td>
<td>15,000</td>
</tr>
<tr>
<td></td>
<td>4,000</td>
<td>36,000</td>
<td>40,000</td>
</tr>
<tr>
<td>Less: General fixed cost (20% of $150,000)</td>
<td></td>
<td></td>
<td>30,000</td>
</tr>
<tr>
<td>Net profit</td>
<td></td>
<td></td>
<td>10,000</td>
</tr>
</tbody>
</table>
Illustration 12
Eliminate or Retain an Unprofitable Segment

• Conclusion: Since the department producing product X makes contribution, it should be retained. If it is eliminated, the profit will be only $6,000 instead of $10,000.
Activity 2
Integrated Illustrative Question
Question (1)

A manufacturing company has been asked to quote for a one-off job which would require the following resources:

Material A

1,000 kg would be required. The material is used regularly in other jobs. Currently there are 4,000 kg in the inventory which was purchased at $8 per kg. It can be sold at $7 if not used. The current replacement cost is $9 per kg.
Question (2)

Material B or Material C

100 kg would be required. Material B is not in the inventory and has to be ordered at a current price of $15 per kg. However, material C can be used to substitute material B. Material C is in inventory and has been purchased at a cost of $20 per kg. It was specifically purchased for use in a product line which has now been discontinued. It can be sold at a net realizable value of $8 per kg. If it is used to substitute material B, additional conversion cost of $6 per kg has to be incurred.
Question (3)

Skilled labour

Direct skilled labour cost for the job would be $40,000. Skilled labour is in short supply. If the workers work for this job, they cannot work for another job which would make a total contribution of $5,000.
Question (4)

Unskilled labour

Unskilled labour receiving pay totaling $16,000 will be transferred from another department which will recruit additional labour at a total cost of $17,000 including pay and recruitment costs.
Question (5)

Machine hours
50 machine hours would be required. A machine currently lying idle will be used in the job. Details about the machinery are as follows:

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depreciation due to use</td>
<td>$10,000</td>
</tr>
<tr>
<td>Current net realization value</td>
<td>$240,000</td>
</tr>
<tr>
<td>Estimated net realizable value after use</td>
<td>$200,000</td>
</tr>
</tbody>
</table>

If the machine is not used, the machine hours can be hired from a leasing company which charges $1,000 per hour.
Question (6)

Required

Calculate the minimum price that should be quoted for the job.
### Answer

<table>
<thead>
<tr>
<th>Relevant Costs</th>
<th>$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material A</td>
<td>9,000</td>
</tr>
<tr>
<td>Material C</td>
<td>1,400</td>
</tr>
<tr>
<td>Skilled labour</td>
<td>45,000</td>
</tr>
<tr>
<td>Unskilled labour</td>
<td>17,000</td>
</tr>
<tr>
<td>Machine hours</td>
<td>40,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>112,400</td>
</tr>
</tbody>
</table>
Further Readings


