

**CHAPTER (1)**  
***(Relevance costs for decision making (Short-term decisions))***

**First: Identifying relevant costs and benefits:**

In chapter (2), we discussed four terms of costs that are: (Sunk costs, out-of-pocket costs, opportunity costs, and differential (Incremental) costs), also, we add a term (Differential (incremental) benefits).

The most important idea in this chapter is to identifying the relevant cost from irrelevant cost (For decision-making purpose), so the following basic can be use to determine if the costs and revenues are relevant or irrelevant:

***(Only those costs and benefits that differ in total between alternatives are relevant in a decision-making).***

That mean:

If a cost will be the same regardless of the alternatives selected, then the decision has no effect on the cost and it can be ignore.

**V. I. N.:**

▪ ***Avoidable cost:***

Is a cost that can be eliminated in whole or in part by choosing one alternative over another.

▪ To identify the costs that are avoidable (Differential) in a particular decision situation and are therefore relevant, these steps can be followed:

1. Eliminate costs and benefits that do not differ between alternatives. These irrelevant costs consist of:
  - a. Sunk costs.
  - b. Future costs that do not differ between alternatives.
2. Use the remaining costs that do differ between alternatives in making the decision. These cost that remain are the differential or (avoidable costs).

▪ The costs that are relevant in one decision situation are not necessarily relevant in another.

▪ ***Total and differential analysis approaches:***

There are two approaches we can use to choosing from two or more alternatives they are:

**First: Total approach:**

Which is take all the data we have (Sales revenues, V. C., and total F. C.) whether they are relevant or irrelevant.

**Second: Differential approach:**

This is focus only on the relevant costs and benefits.

For getting clear understanding of these two approaches, we will use the following example:

**Example:**

Manufacturing company considering a new labor-saving machine that rents for 3000 \$ per year. The following data about the company's annual sales and costs with and without the new machine:

	Current situation	Situation with the new machine
Units produced and sold	5000 unit	5000 unit
Selling price per unit	40 \$	40 \$
Direct material cost per unit	14 \$	14 \$
Direct labor cost per unit	8 \$	5 \$
Variable overhead cost per unit	2 \$	2 \$
Fixed costs (Other)	62000 \$	62000 \$
Fixed costs (Rent for new machine)	-----	3000 \$

**Required:**

Make an analysis show, which is the best alternative by using:

1. Total analysis approach.
2. Differential analysis approach.

**First: Total approach:**

Up to this approach, the analysis can be as following:

	Current situation	Situation with new machine	Differential costs and benefits
Sales revenues (5000 × 40)	200000	200000	0
- <u>V. C.:</u>			
Direct material (5000 × 14)	70000	70000	0
Direct labor (5000 × 8) (5000 × 5)	40000	25000	15000
Variable overhead (5000 × 2)	10000	10000	0
Contribution margin	80000	95000	
- <u>F. C.:</u>			
Fixed costs (Other)	62000	62000	0
Fixed costs (Rent of new machine)	-----	3000	(3000)
Net operating income	18000	30000	12000

**V. I. N.:**

1. The result (0) in the third column means that this cost element is irrelevant in this case. (That mean is no change in both situations).
2. The (Positive) result in the third column mean that this cost element is favorite in this case (Decreasing the V. C.).
3. The (Negative) result in the third column means that this cost element is not favorite in this case (Increasing the F. C.).

Second: Differential approach:

If we returned to the data of the previous example, we can see that the only costs that do differ between the alternatives are:  
(Direct labor costs per unit and the fixed rental costs of the new machine).

Hence:

These are the only relevant costs. The two alternatives can be comparing based on just these relevant costs:

***Net advantage from renting the new machine:***

Decrease in direct labor costs (5000 units at a cost saving of 3 \$ per unit)	15000
Increase in fixed costs (Rent of the new machine)	<u>(3000)</u>
Net annual costs saving from renting the new machine	12000

**Note:**

We will use both approaches to discuss the next decisions in this chapter.

**Second: Kinds of production decisions: (Short-term decisions or operating decisions):**

**First: Adding or dropping product lines and other segments:**

This decision depends on analyzing the impact of it on net operating income, and to assess this impact it is necessary to carefully analyze the costs.

To make clear understanding of this decision we can use the data in the following examples:

**Example (1):**

Manufacturing company work with (Three) major product lines, they are (drugs, cosmetics and house-ware). The sales and cost data for the preceding month for each separate product line and for the company in total are as given bellow: (All amounts in \$)

Data		Product lines			Total
		Drugs	Cosmetics	House-ware	
	Sales revenues	125000	75000	50000	250000
Less	Variable costs (Expenses)	(50000)	(25000)	(30000)	(105000)
	Contribution margin	75000	50000	20000	145000
Less	<u>Fixed costs (Expenses)</u>				
	Salaries	29500	12500	8000	50000
	Advertising	1000	7500	6500	15000
	Utilities	500	500	1000	2000
	Depreciation- fixtures	1000	2000	2000	5000
	Rent	10000	6000	4000	20000
	Insurance	2000	500	500	3000
	General administrative	15000	9000	6000	30000
	Total fixed costs	(59000)	(38000)	(28000)	(125000)
	Net operating income (Loss)	16000	12000	(8000)	20000

To show how should proceed in a product-line analysis. Suppose that the management of the company has analyzed the fixed costs of the three product lines and has determined the following:

1. The salaries expenses represent salaries paid to employees working directly on a product. All of the employees working in house wares would be discharged if the product line were dropped.
2. The advertising expenses represent product advertising specific to each product line and is avoidable if the dropped.
3. The utilities expenses represent costs for the entire company, and is not avoidable if the product line were dropped.
4. The depreciation expenses represent depreciation on fixtures used for display of the various product lines, and is not avoidable if the product line is dropped.
5. The rent expenses represents rent on the entire building of the company, and is not avoidable if the product line were dropped.

6. The insurance exp. represents insurance carried on inventories within each of the three product-lines.
7. The general administrative exp. represents the exp. of accounting, purchasing, and general management. Total administrative exp. will not change if the house-wares line is dropped or not.

**Required:**

Make an analysis to show what your opinion about (dropping the product line or not)?

**V. I. N.:**

▪ Avoidable costs or expense:

Are amounts the company would not incur if it eliminates the segment.

Unavoidable costs or expenses:

Are amounts that would continue even if the segment were eliminating.

- Our decision in this case will be up to this important rule:  
(A segment is a candidate to elimination if its contribution margin is (Less) than its avoidable expenses).
- Additionally, to the analyses based on revenues and costs, the managers may choose to retain an unprofitable line if the line is necessary to the sale of other product or if it serves as a “Magnet” to attract customers.

**Example (2):**

Naza Co. is considering that has (Three) major departments (Groceries, General merchandise, and Drugs). Management is considering dropping the (Drugs) department, which has consistently shown operating loss. The following table reports the company's annual operating income:

Details	Department			Total
	Groceries	General merchandise	Drugs	
Sales revenue	10000	80000	100000	190000
(-) V.C.	(6000)	(56000)	(80000)	(142000)
T. C. M.	4000	24000	20000	48000
(-) <u>T. F. C.:</u>				
Avoidable	1500	10000	15000	26500
Unavoidable	2000	10000	6000	18000
Total F. C.	(3500)	(20000)	(21000)	(44500)
Net operating income	500	4000	(1000)	3500

**Required:**

1. What is the management decision, (Continue with three departments or dropping the (Drugs) department?).
2. The company's manager believed that the company can use the empty space available by dropping (Drugs) department to expanding the (General merchandise) department. The suggested project expected to:

(Increase) the sales revenues worth 50000 \$

(Increase) (T. V. C.) worth 35000 \$.

(Increase) (T. F. C.) worth 7000 \$.

What is the decision will be in this case?

**Second: The make or buy decision:**

This decision concerning whether an items should be produced internally, or to be purchased from an outside supplier.

This kind of decision depends on analyzing the impact of costs for alternatives (Incremental costs).

To make clear understanding of this decision we can use the following examples:

**Example (1):**

Manufacturing company is now producing a main part (Shift) used in its product line of mountain bikes. The company's accounting department reports the following costs of producing 8000 units of the (Shift) internally each year:

	Per unit	8000 units
Direct material	6 \$	48000 \$
Direct labor	4 \$	32000 \$
Variable overhead	1 \$	8000 \$
Supervisor's salary	3 \$	24000 \$
Depreciation of special equipment	2 \$	16000 \$
Allocated general overhead	5 \$	40000 \$
Total costs	21 \$	168000 \$

An outside supplier has offered to sell 8000 units (Shifts) a year at a price of only 19 \$ each.

**Required:**

Should the company stop producing the (Shifts) internally and start purchasing them from the outside supplier?

**V. I. N.:**

If the avoidable costs are (**Less**) than the outside purchase price, then the company should continue to manufacture its own parts and reject the outside supplier's offer.

**Example (2):**

Azad manufacturing Co. produces and sold 10000 unit of a product. The following data is about the costs of this product:

D.M. per unit	8 \$	
D.L. per unit	5 \$	
T.M.O.H.	50000 \$	(40 % Variable)
F.S. and A. expenses	28000 \$	

And if you know that:

- From cost analyzing the accountant know that all the fixed costs are unavoidable.
- The manager received an offer from another manufacturer to sell the same number of units by 14 \$ per unit.

**Required:** What the decision will be? (Make or buy?)

**Example (3):**

Rania M. Co. is manufacturing automobile accessories. The following are the total processing costs:

D. M.	5000 \$
D. L.	8000 \$
V. F. O. H.	6000 \$
F. Costs	50000 \$ (Including manufacturing, marketing, and administrative)

The same units are available in the local market. The price of these units in the market is (24000 \$) (As total).

**Required:**

1. If you know that in the case of purchasing (Buy) the total fixed costs can be (reduction) by (2000 \$) (maintenance expenses). What the decision will be (Make or Buy?).
2. If you know that in the case of purchasing the company can be rented out the machines to another manufacturer for (7000 \$). What the decision will be (Make or Buy?) (We must notice that the total fixed costs unchanged in this case).
3. In case of purchasing the company can use the idle capacity to produce a new product. The following are data about the revenues and costs of this product:

Sales revenues	25000 \$
D. M.	4000 \$
D. L.	9000 \$
V. M. O. H	7000 \$

(What the decision will be?)

**Third: Special order accepting decision (Only one time order):**

Managers must often evaluate whether a special order should be accepted or not, and if the order is accepted what the price that should be charged?

This decision depends on the net profit of the alternatives.

**Example (1):**

(MGC) company (Which product motor cycles) has just received a request from one of the police departments to produce 100 special modified motor bikes at a price of 1790 \$ each. The normal selling price of the bikes is 2490 \$, and its unit product cost is 1820 \$ as shown below:

Direct material	860 \$
Direct labor	450 \$
Manufacturing overhead	510 \$
Unit product cost	1820 \$



The variable overhead costs are 60 \$ per unit. The order would have no effect on the company's total fixed manufacturing overhead costs. The modifications requested would add 170 \$ an incremental variable cost. In addition, the company would have to pay a graphics design 12000 \$ that would be used for painting the bikes in the order. This order should have no effect on the company's other sales.

**Required:**

What effect would be accepting this order have on the company's net operating income?

**V. I. N.:**

We can accept the special order if:

1. Incremental revenues from the special order exceeds over the incremental costs of the order.
2. There is indeed idle capacity.
3. The special order does not cut into normal sales or undercut normal prices.
4. The price in the order (As in total or per unit) must be exceed (More than) or at least (Equal) the V. C. (As in total or per unit).

**Example (2):**

One of the manufacturing companies is operating at its normal level of 80 % of full capacity. At this level, it produces and sales nearly 100000 units of product annually. It's per unit and annual total costs are shown in the bellow table:

		<u>Per unit</u>	<u>Annual total</u>
Sales (100000 units)		10.0	1000000
Direct materials		(3.5)	(350000)
Direct labor		(2.2)	(220000)
Overhead (V. + F.)	(0.6 V. + 0.5 F.)	(1.1)	(110000)
Selling expenses	(0.7 V. + 0.7 F.)	(1.4)	(140000)
Administrative expenses		<u>(0.8)</u>	<u>(80000)</u>
Total costs and expenses		<u>(9.0)</u>	<u>900000</u>
Operating income		1.0	100000

A current buyer of this company product wants to purchase additional units of its product and export them to another country. This buyer offers to buy 10000 units of the product at 8.5 \$ per unit.

**Required:**

Determine whether to accept or reject this order if you know:

- The additional units adds 5000 \$ of incremental overhead costs for power, packaging, and indirect labor.
- Incremental commissions and selling expenses from the additional units 2000 \$.
- Incremental administrative expenses of 1000 \$ for clerical efforts are needed with the sale of additional units.



**Example (3):**

The (N. M.) company has an annual plant capacity of 2400 units. Suppose its predicted operating results for the year are:

- Production and sales of 2000 units.
- Selling price per unit 90 \$.
- V. C. per unit 26 \$.
- F. M. O. H. costs 60000 \$.
- Selling and administrative costs 50000 \$ (Includes 40 % as V. selling expenses).

And if you know that:

One of the costumers is offered to buy 300 units with price 40 \$ per unit, what is the decision of the company's manager will be? (Accepting or rejecting the order)? If you know that:

- The order will have no effect on the regular sales and prices.
- The order yield 2 \$ per unit as a variable transportation expenses if the order is accepted.
- To producing the units of the order the company must rent a machine that will increase the monthly fixed costs worth 1200 \$.

**Fourth: Utilization of constraint resources:**

In this kind of decisions, the managers have to decide how constrained resources are going to be utilized. The course of action that will maximize the company's (Total) contribution margin should ordinarily be selected. The orders that provide the highest unit contribution margin in (Relation to the constrained resources). Limited factors or constraint resources include (Labor hours, machine hours, and square feet of floor space.....eta).

The following formula must be applied in this kind of decision:

$$\text{C.M. per unit of the limiting factor} = \frac{\text{C.M. per unit}}{\text{Limiting factor (Necessary time for product)}} =$$

$$\text{The number of necessary hours for a product (Assigned capacity)} = \frac{\text{Demand of product}}{\text{Necessary time per unit}}$$

$$\text{Remaining capacity for next product} = \text{Total capacity} - \text{Assigned capacity}$$

**Example (1):**

A manufacturing company produces (Two) models of the product (M and T). Revenues and costs data for the two models of the products follow:

	Model	
	M	T
Selling price per unit	25 \$	30 \$
- V. C. per unit	10 \$	18 \$
Contribution M. per unit	15 \$	12 \$
Contribution margin ratio	60 %	40 %

And if you have this additional information:

- The company have a machine that can be used at a limited time that is:  
The M model requires 2 minutes.  
The T model requires 1 minute.

**Required:**

In this situation, which product is more profitable?

To answer this question the manager should look at the (Contribution margin per unit of the constrained resources).

	Models	
	M	T
Contribution margin per unit	15 \$	12 \$
Time on the machine required to produce (One) unit	2 minutes	1 minute
Contribution margin per unit of the constrained resource	7.5 \$/minute	12 \$/minute

Up to above analyzing the (T) model provides the larger contribution margin in relation to the constrained resource.

To verify (proof) that the (T) model is indeed the more profitable product, suppose an (1hour) of additional time is available.

- The additional (Hour) could be used to make 30 unit from (M) model ( $60 / 2 = 30$  unit) and the additional contribution margin will be ( $30 \times 7.5 = 225$  \$).
- The additional (Hour) could be used to make 60 unit from (T) model ( $60 / 1 = 60$  unit) and the additional contribution margin will be ( $60 \times 12 = 720$  \$).

**Example (2):**

Manufacturing company produced (Two) kinds of products (X and Y) and there are some data about them:

Kind of product	Selling price per unit (\$)	V.C. per unit (\$)	Time needed to produce one unit (Hours)	Expected demand on products (Units)
X	10	4	3	400
Y	20	8	4	150

And if you know that:

- The T. F. C. is (1300 \$).
- The capacity available for the company is (1500 hours).

**Required:**

Which orders would you recommend that can be achieve the greatest profit for the company?

**Example (3):**

Banner Co. produces (Three) products (A, B, and C). The selling price, variable costs, and demands on products are follows:

Data	Product A	Product B	Product C
Selling price per unit	60 \$	90 \$	80 \$
Less: V. c. per unit			
D.M.	27 \$	14 \$	40 \$
D.L.	12 \$	32 \$	16 \$
V.M.O.H.	3 \$	8 \$	4 \$
Demand on products of the company	20 unit	30 unit	20 unit
Time needed to produce one unit	1.5 hours	4 hours	2 hours

***And if you know:***

Demand for the company's product for exceeds its capacity to produce. Management is trying to determine which product to concentrate on next month in filing its backlog of order? If there is only (160 hours) of labor time are available each month.

**Required:**

1. Which orders would you recommend that the company must produce on next month? (Show computation).
2. Find net operating income, if you know that the T.F.C. are 1250 \$.

**Fifth: Selling or process further decision:**

In this kind of decisions, we must to decide whether a joint product should be sold at the split-off point or sold after further processing.

**Joint products:**

Are two or more items that are produced from a common input.

**Joint costs:**

This term is used to describe the costs incurred up to the split- off point.

**Split-off point:**

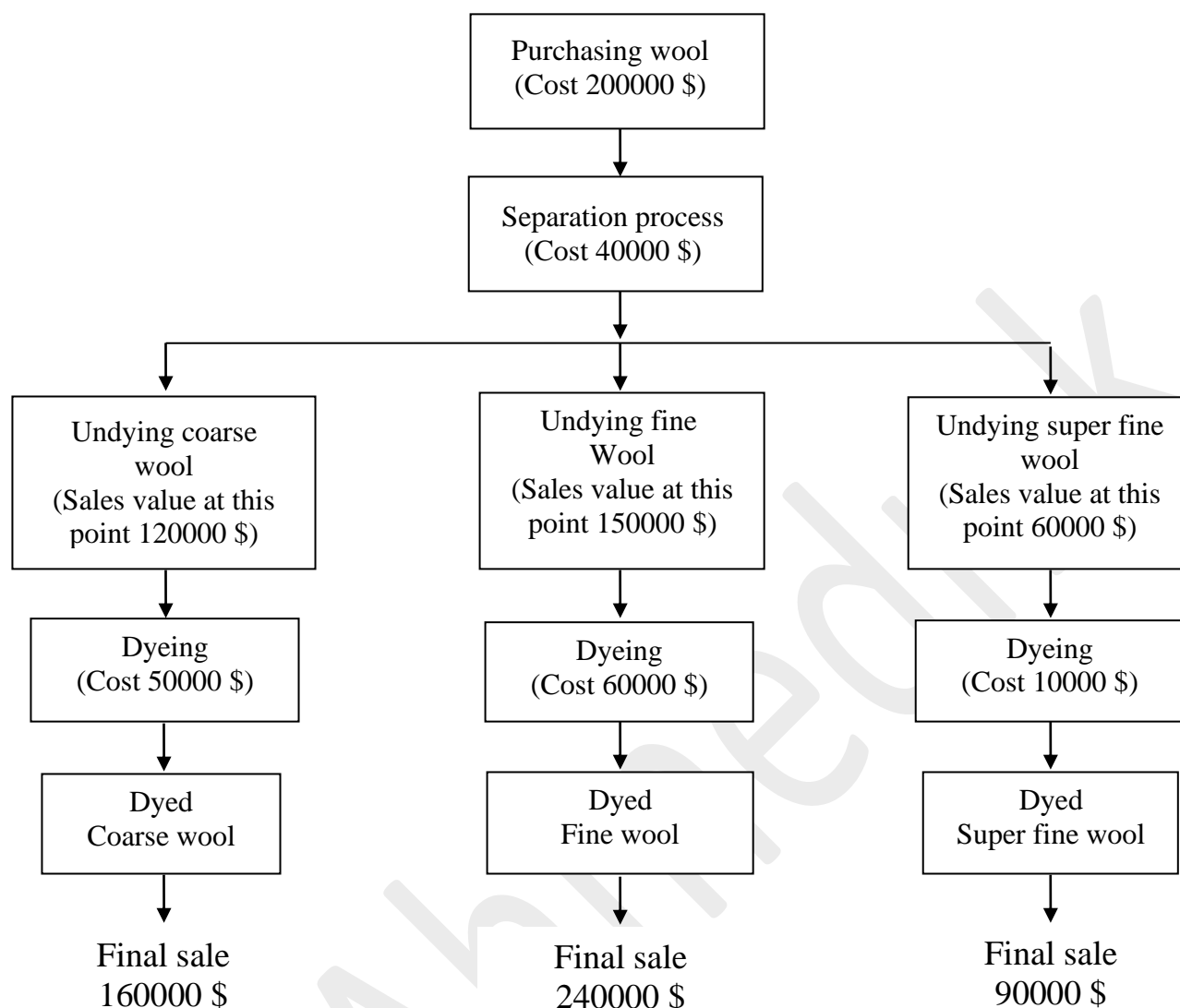
Is the point in the manufacturing process at which the joint products can be recognized as separate products.

**Note:**

Joint costs are (Irrelevant) in decisions regarding what to do with a product from the split-off point forward.

**Example (1):**

One of the manufacturing companies buys raw wool from local sheep herders, separates the wool into three grades: (Coarse, fine, and superfine), then dyes the wool. The production process, together with revenues and costs data, is diagramed in the following:



**Then:**

Analyzing of the profitability of the overall operation is shown below:

Combined final sales value: (160000 + 240000 + 90000 )		490000
- <u>Less:</u>		
Costs of producing the end products:		
Cost of wool	200000	
Cost of separating wool	40000	
Combined costs of dyeing (50000 + 60000 + 10000)	120000	
		(360000)
Overall net income (profit)		130000

The decision that must be discussed will be that the company would be better of selling one or more of the products prior to dyeing to avoid the costs of the dyeing. The appropriate way to make this choice is to compare the incremental revenues to the incremental costs from further processing as follows:

		Coarse wool	Fine wool	Superfine wool
	Final sales value after further processing	160000	240000	90000
(- Less)	Sales value at the split-off point	(120000)	(150000)	(60000)
	Incremental revenue from further processing	40000	90000	30000
(- Less)	Cost of further process (Dyeing)	(50000)	(60000)	(10000)
	Profit or (Loss) from further processing	(10000)	30000	20000

**Example (2):**

Suppose that F. T. Company has 40000 units of partially finished product (Q). It has already spent 0.75 \$ per unit to manufacture these units at a 30000 \$ total cost. F. T. Company can sell these units to another manufacturer as raw material for 50000 \$. Or. It can process them further and produce finished products X, Y, and Z at an incremental cost of (2 \$) per unit. The added processing yields the products and revenues shown in the following table:

		Price (\$)	Units	Revenues (\$)
Product	X	4	10000	40000
Product	Y	6	22000	132000
Product	Z	8	6000	48000
Spoilage	----	----	2000	0
Totals			40000	220000

**Required:** What the decision will be selling or process further?

**Example (3):**

Erbil company manufactured (Three) kinds of products from common input in a joint processing operation. Joint processing cost up to the split-off point are 150000 \$. These costs are allocated to the joint products on the base of their total sales revenues at the split-off point. The following data is about selling price, costs, and production units of each product:

Products	Production units	Selling price per unit at the split-off point	Selling price per unit after processing further	Additional processing costs
A1	30000 unit	36 \$	40 \$	126000 \$
A2	40000 unit	21 \$	26 \$	160000 \$
A3	8000 unit	57 \$	64 \$	72000 \$

**Required:**

Which product(s) should be sold at the split-off point, and which product(s) should process further? (Show computation).

**Example (4):**

Al-Mustafa Co. is now produce one kind of product and sold it (as non-finished product) to another manufacturing company.

And if you know that:

1. Al-Mustafa Co. produce 15000 unit each year and sold it by 20 \$ per unit.
2. Costs data are as follow:
  - V.C. per unit 11 \$.
  - T.F.C. 60000 \$.
3. The company's manager is studying a proposal about the ability to complete manufacturing this product and there are the estimation data about revenues and costs of this proposal:
  - Selling price per unit 28 \$.
  - Additional V.C. per unit 4 \$.
  - Additional F.C. 43000 \$.

**Required:**

1. What the decision will be? Selling or process further?
2. What the decision will be if the further process leads to (Decrease) the unit's sales from 15000 units to 13000 units?

**Qualitative decision factors:**

Managers must consider qualitative factors in making managerial decisions, for example:

- The quality of the products.
- Delivery date.
- Reputation of the supplier.
- The effects of a low price on the company's image.

**Sixth: Pricing products and services decision:**

Setting a price for the company's products or services is one of the important and complex managerial decisions have to make. If the price is set too high, customers will avoid purchasing the company's products. If the price is set too low, the company's costs may not be covered (That mean it may achieve losses).

Cost information from both absorption costing and variable costing can help the managers in pricing decision.

The important fact to understand in pricing decision that the price must be enough to cover all costs, including variable costs and fixed costs and still provide an acceptable return to owners.

**V. I. N.:**

Over the long run absorption costing approach is useful, but over the short run variable costing approach is more useful.

There are several methods to help managers in setting price. The (Cost-plus) methods are probably the most common, where managers add a (Markup) to cost to reach a target price.

**Pricing approaches:**

In general, and up to cost-plus pricing we can use the following formulas:

**Selling price per unit = Cost of product + Markup per unit.**

**Markup per unit = Cost of product × Markup percentage.**

There are (Four) approaches to setting selling price by using cost-plus basic and these methods (or approaches) are:

1. Full costing approach.
2. Total variable costing approach.

**1. Full costing approach:**

Up to this approach the costs that used as a basic for determining the selling price will be:

**Cost of product = Manufacturing costs + Nonmanufacturing costs.**

**2. Total variable costing approach:**

Up to this approach the costs that used as a basic for determining the selling price will be:

**Cost of product = D.M. + D.L. + V.M.O.H. + V.S. expenses.**

**V. I. N.:**

1. The markup percentage will be changed up to the approach that we used and we can determine the markup percentage by using the following formula:

$$\text{Markup percentage} = \frac{\text{Target profit} + \text{Total excluded costs}}{\text{Units sold} \times \text{Cost of product per unit}} = ? \%$$

2. Selling price per unit must be (Equal) in all approaches.



**Example:**

Manufacturing company produces and sold a product. There are the data about it:

- D.M. per unit	4 \$
- D.L. per unit	2.5 \$
- V.M.O.H. per unit	3.5 \$
- F.M.O.H.	5000 \$
- V.S. expenses per unit	1.7 \$
- F.S. and A. expenses	11500 \$

And if you know that:

- The manager expected to produce and selling 5000 unit in the next year.
- The manager is planning to achieve target profit (Before tax) worth 25000 \$.

**Required:**

1. Compute (Markup percentage) up to each approach.
2. Setting selling price per unit up to (Full costing and, Variable costing) approaches.

**Setting selling price by using (Return on investments) approach:**

**R. O. I.:**

Is the return that the companies want to make on their investment's capital (Assets).

And up to this approach we can use the following formula to determine the selling price per unit:

$$\text{Selling price per unit} = \frac{\text{Total costs} + \text{Target or required R. O. I.}}{\text{Units produced and sold}} =$$

$$\text{Target R. O. I.} = \text{Target R. O. I. ratio} \times \text{Total investment (Total assets)}.$$

$$\text{R. O. I. ratio} = \frac{\text{Target net operating income}}{\text{Total investments (Total assets)}} = ? \%$$

**Example:**

Manufacturing company produces and sold the product (A) and there are the data about the costs of this product:

- D. M. per unit	4 \$
- D. L. per unit	2 \$
- V. M. O. H. per unit	1 \$
- F. M. O. H.	15000 \$
- S. and A. expenses	10000 \$

And if you have this additional information:

- Expected units produce and sold 5000 unit.
- Target R. O. I. ratio 20 %.
- Total investments in assets 200000 \$.

**Required:**

Setting selling price per unit by using R. O. I. approach.

## **CHAPTER (2)** **(Master budget and profit planning)**

In this chapter we will focus on steps taken by business to achieve their desired levels of profits through a process that can be called (Profit planning). We shall see that profit planning is accomplished through the preparation of numbers of budgets, which, when brought together, from an integrated business plan known as the (Master budget). The master budget is an essential management tool that communication management's plans throughout the organization, allocates resources, and coordinates activities.

### **First: Theory introduction to budgeting:**

#### **Definition of budget:**

A (Budget) is a detailed plan for acquiring and using financial and other resources over a specified time period. It represents a plan for the future expressed in monetary terms. All managerial levels in the company should be involved in budgeting process.

#### **The budgeting objectives or goals:**

The act of preparing budgets is called (Budgeting). The budgeting process serves several purposes as follow:

1. Motivating employees and communication with them.
2. Helps coordinate a company's activities toward common goals.
3. Is useful in evaluating results and management performance.
4. It helps in starting and operating company.
5. Such planning gives managers glimpse into the future.
6. It can force managers to (Think about) and then translate the ideas of these managers into actions.
7. It provides a means of (Allocating resources) to those parts of the organization where they can be used most effectively.

#### **Choosing a budget period:**

Operating budgets ordinarily cover a one – year period corresponding to the company's fiscal year. Many companies and to provide specific guidance divide their budget year into four quarters. The quarter budget then can be subdivided into months.

#### **Evaluation involves comparing actual results against one of two usual alternatives:**

1. Past performance.
2. Expected performance.

An evaluation assists management in identifying problems and taking correct actions if necessary.

#### **Budget reporting:**

Managers can compare actual results to budgeted amounts in a report. This report shows actual amounts, budgeted amounts, and their differences. Such differences are called a (Variances).

- The master budget:

Is a summary of a company's plans that sets specific targets for sales, production, and financing activities. It generally culminates in a cash budget, a budgeted income statement, and a budgeted balance sheet.

A master budget consists of a number of separate but interdependent budgets that are linked with each other to form a coordinated plan.

- Master budget components:

The usual number and types of budgets included in a master budget depend on the company's size and complexity. A master budget should include, at a minimum, the budgets listed below:

▪ **Operating budgets:**

- *Sales budget.*
- For merchandiser add: *Merchandise purchases budget (units to be purchased).*
- For manufacturing add: *Production budget (units to be produced).*  
*Manufacturing budget (manufacturing costs).*
- *Selling, General and administrative expense budget.*

▪ **Financial budgets:**

- *Cash budget (Cash receipts and payments).*
- *Budgeted income statement.*
- *Budgeted balance sheet.*

- Preparing the master budget:

The first step in preparing the master budget is planning the sales budget. The sales budget is the starting point in the budgeting process because plans for most departments are linked to sales. All of the other parts of the master budget are dependent on the sales budgets in same way.

The sales budget will help determine how many units will have to be produced (or to be purchased in merchandiser companies). Thus, the production budget is prepared after the sales budget.

The production budget in turn is used to determine the budgets for manufacturing costs including the direct material budget, the direct labor budget, and the manufacturing overhead budget. These budgets are then combined with data from the sales budget, the selling, general and administrative expenses budget to determine the financial budgets (Cash budget, budgeted income statement, budgeted balance sheet).

The selling, general and administrative expense budgets are both dependent on a determinant of the sales budget.

**Second: Operating budgets:**

**1. Sales budget:**

The sales budget is the starting point in preparing master budget. Is a detailed schedule showing the expected sales for the budget period, it is expressed in both units and dollars.

The sales budget can be prepared for many different products, regions, departments, and sales representatives.

The sales budget is constructed by multiplying the budget sales in units by the selling price.

**Example:**

(H. F. Co.) is going to prepare its own sales budget for the year 2023. The following data can be help in this:

❖ Budget sales units:

Q1 10000 unit – Q2 30000 unit – Q3 40000 unit – Q4 20000 unit.

❖ Selling price per unit 20 \$.

❖ Cash collection:

70 % of sales are collected in the quarter in which the sales made.

30 % of sales are collected in the following quarter.

❖ Balance of A / R account at 31 / 12 / 2022 are 90000 \$.

**Required:**

1. Prepare sales budget for the year 2023.
2. Prepare the schedule of expected cash collection for the year 2023.

**2. Production budget:**

This budget is prepared after sales budget, this budget shows the number of units that must produce during each budget period (month or quarter) to meet sales needs and to provide for the desired ending inventory. A production budget does not show costs, it is always expressed in (units of product).

Production needs can be determined as follows:

Budgeted sales in units	xxxx
+ Desired ending finished inventory in units	xxxx
Total needs	xxxx
- Beginning finished inventory in units	(xxxx)
Required production (in units)	xxx

**V. I. N.:**

Merchandiser companies prepare (Purchases budget) instead of production budget. The purchases budget depends on budgeted sales volume. The general layout for purchases budget can be show in the following equation:

$$\text{Inventory to be purchased} = \text{Budgeted ending inventory} + \text{Budgeted sales for the period} - \text{Budgeted beginning inventory}$$

**Example:**

(H. F. Co.) Management believes that ending finished goods must be equal to 20 % of the next quarter sales.

If you know that the budgeted sales units for the first quarter of the year 2024 are 15000 units.

**Required:**

Prepare the production budget for the year 2023.

3. Direct materials budget:

After the production requirements have been computed in units, a direct materials budget can be prepared. This budget shows the direct material that should be used in production through the budget period (In units and costs). This budget can be prepared as follow:

Production budget (Units)	xxx
× Materials requirements per unit	<u>xx</u>
Materials needed for production (units)	xxx
× Materials price per unit	<u>xx</u>
Total cost of D. M. used in production	xxx

The direct material budget (That used in production) must follow by preparing the budgeted direct material that should be purchased. This budget details the raw materials that must be purchased to fulfill the production budget and to provide for adequate inventories.

The required purchases of raw materials are computed as follows:

Production budget (units)	xxx
× Materials requirements per unit	<u>xxx</u>
Materials needed for production (units)	xxx
+ Budgeted ending inventory (units)	<u>xxx</u>
Total materials requirements (units)	xxx
- Beginning inventory (units)	<u>(xxx)</u>
Materials to be purchased (units)	xxx
× Materials price per unit	<u>xx</u>
Total cost of direct materials to be purchased	xxx

The direct material budget (That to be purchased) is usually companied with a schedule of expected cash paid for raw materials. This schedule is consisting of payments for purchased on account in the beginning of the period plus any payments for purchases in the current budget period.

**Example:**

(H. F. Co.) Managers would like to keep ending inventories equal to (10 %) of the following quarters production needs. Each unit of production requires 15 kg, per kg is cost 0.2 \$. (A / P) balance at 31 / 12 / 2022 are 25800 \$. The company's policy is to pay 50 % of the

payment by cash and the remaining must be pay at the next quarter. Desired ending inventory for the last quarter are 22500 units.

**Required:**

1. Prepare direct material budget used in production for the year 2023.
2. Prepare budgeted raw materials that to be purchased for the year 2023.
3. Prepare the schedule of expected cash payment for the year 2023.

4. Direct labor budget:

This budget is also depending on production budget. In this budget the company determine the time available to meet production needs.

The direct labor budget can be computed as following:

Budgeted production (units)	xxx
× Labor requirements per units (Hours)	xxx
Total labor hours needed	xxx
× Labor rate (per hour)	xxx
Cost of direct labor (dollars)	xxx

**Example:**

(H. F. Co.) Manager's believes that the requirement time for each unit is 0:40 direct labor-hours, the direct labor rate per hour 15 \$.

**Required:**

Prepare direct labor budget for the year 2023.

5. Manufacturing overhead costs budget:

This budget provides a schedule of costs of production other than direct materials and direct labor. All costs in this budget can be separated into (Variable and fixed costs).

The variable costs in this budget can be determined by the following formula:

$$\text{V. M. O. H.} = \text{Variable rate} \times \text{The base used (Number of units production, direct labor-hours, machine hours ...)}$$

**Example:**

(H. F. Co.) Manager's wanted to prepare its M. O. H. budget. The following data are about it:

- The variable component is 4 \$ per direct labor-hour.
- The fixed component is 60600 \$ per quarter.
- Depreciation expenses is 15000 \$ per quarter.

**Required:**

1. Prepare M. O. H. budget for the year 2023.
2. Show details about budgeted cash payment for M. O. H. costs.



6. Ending finished goods inventory budget:

In this budget the company computes unit product costs. This computation was needed for two reasons:

1. To determine cost of goods sold on the budgeted income statement.
2. To know what amount to put on the budgeted balance sheet inventory account for unsold units.

To compute production cost per unit we can use the following formula:

$$\text{Unit production cost} = \frac{\text{A. M.} + \text{D. L.} + \text{M. O. H.}}{\text{Budgeted production units}} = \$/\text{unit}$$

$$\begin{array}{ccccc} \text{Cost of ending finished goods} & & \text{Ending finished goods} & & \text{Unit production} \\ \text{inventory} & = & \text{inventory (units)} & \times & \text{cost} \end{array}$$

Example:

By using all data that provided from the previous budgets:

Required:

Prepare ending finished goods inventory budget.

7. Selling, general and administrative budget:

This budget lists the types and amounts of selling, general and administrative expected expenses during budget period.

The (Selling) costs in this budget can be divided into variable and fixed costs, and it depends on the sales budget (by units or by amounts).

This budget can be prepared as following:

Budgeted sales (Units) or (Amount)	xxx
× Variable selling expenses (per unit) or (per \$)	xxx
Total variable selling expenses	xxx
+ Total fixed selling, general and administrative expenses	xxx
Total budgeted selling, general and administrative expenses	xxx

Then we can compute the cash part of these expenses to use it in the cash budget as following:

Total budgeted selling, general and administrative expenses	xxxx
- Non-cash expenses (Depreciation for example)	(xxx)
Budgeted cash payment for selling, general and administrative expenses	xxx

**Example:**

If you have this information about (H. F. Co.):

- The variable selling expenses is 1.8 \$ per unit.
- The annual fixed selling, general and administrative expenses are as follow:

Advertising	80000 \$
Manager's salaries	220000 \$
Depreciation	40000 \$
- Insurance expenses for the second quarter 1900 \$, and for the third quarter 37750 \$.
- Property tax in the fourth quarter 18150 \$.

**Required:**

1. Prepare selling, general and administrative expenses budget for the year 2023.
2. Prepare a schedule showing the cash part of the selling, general and administrative expenses.

**Third: Financial budgets:**

After preparing the operating budgets, the managers can use the information that includes in these budgets to prepare the financial budgets they are:

**First: Cash budget:**

This budget shows expected cash inflows and outflows during the budget period. The cash budget is composed of four major sections:

**1. The receipts section:**

This section consists of a listing of all of the cash inflows (except for financing) during the budget period. (Sales revenues).

**2. The disbursements (payments) section:**

This section consists of all cash payments that are planned for the budget period. (Raw materials, direct labor, M. O. H. costs, equipment purchases, dividends and so on)

**3. The cash excess or deficiency section:**

Which computed as follows:

Cash balance (beginning)	xxxx
+ Expected cash receipts	xxxx
Total cash available	xxxx
- Expected cash payments	(xxx)
Excess or deficiency of cash available over payments	xxx

**V. I. N.:**

1. If the expected ending cash balance is deficiency during any budget period, the company will need to borrow funds (short-term loans).
2. If the expected ending cash balance is excess the desired balance during any budget period, funds that borrowed in previous period can be repaid or can be invested.

**4. The financing section:**

This section details the borrowing and repayments project to take place during the budget period. It also includes interest payment that will be due on money borrowed.

**V. I. N.:**

1. Monthly cash budget is most common.
2. Depreciation expenses are not included in cash budget.

**Example:**

By using all the information, you have about the previous budgets of (H. F. Co.) , and by using these additional data:

- The beginning cash balance is 42500 \$.
- Management plans to spend 130000 \$ during the year on equipment purchases: (50000 \$ in the first quarter, 40000 \$ in the second quarter, 20000 \$ in the third quarter, and 20000 \$ in the fourth quarter).
- The board of directors has approved cash dividend of 8000 \$ per quarter.
- Management would like to have a cash balance of at least 40000 \$ at the beginning of each quarter for contingencies.
- Assume (H. F. Co.) will be able to get agreement from a bank for an open line of credit. This would enable the company to borrow at an interest rate of 10 % per year. All repayments would be at maximum 100000 \$ amounts. All borrowing would occur at the beginning of quarters and all repayments would be made at the end of quarters. Interest would be due when repayments are made and only on the amount of principal that is repaid.

**Required:**

Prepare cash budget for the year 2023.

**Second: Budgeted income statement:**

This budget is one of the final steps in preparing the master budget. It shows the company's planned profit for the upcoming period. This budget is a managerial accounting report showing predicted amounts of sales and expenses for the budget period. After prepare this statement for company performance can be measured.

The budgeted income statement can be prepared as following:

Details	Partial	Partial	Total
Budgeted sales revenues			xxx
- <u>Cost of goods sold:</u>			
D.M.	xxx		
D.L.	xxx		
M. O. H.	xxx		-
Total production costs		xxx	
+ Beginning finished goods inventory		xxx	
- Ending finished goods inventory		(xxx)	
Cost of goods sold			(xxx)
Gross profit			xxx
- S., G., and A. expenses			(xxx)
Net operating income			xxx

**Example:**

By using all the information that available from the previous budgets for (H. F. Co.):

**Required:**

Prepare budgeted income statement for the year 2023.

**Third: Budgeted balance sheet:**

The final step in preparing the master budget is summarizing the company's financial position. The budgeted balance sheet shows predicted amounts for the company's assets, liabilities, and owners' equity as of the end of the budget period.

**Example:**

By using the following balance sheet of (H. F. Co.) for the year ended December 31, 2022 and by using the information from the previous budgets:

H.F. Co.	
Balance sheet	
At December 31, 2022	
<i>Assets</i>	
<u>Current assets:</u>	
Cash	42,500
Account receivable	90,000
Raw materials inventory	4,200
Finished goods	<u>26,000</u>
Total current assets	162,700
<u>Plant and equipment:</u>	
Lands	80,000
Buildings and equipment	700,000
Accumulated depreciation	<u>(292,000)</u>
Net plant and equipment	488,000
Total assets	<u>650,700</u>
<i>Liabilities and stockholders' equity</i>	
<u>Current liabilities:</u>	
Accounts payable	25,800
<u>Stockholders' equity:</u>	
Common stock	175,000
Retained earnings	<u>449,900</u>
Total stockholders' equity	624,900
Total liabilities and stockholders' equity	<u>650,700</u>

**Required:** Prepare budgeted balance sheet at 31 / 21 / 2023.

**Chapter (3)**  
**(Capital budgeting decisions)**  
**(Invest less, make more)**

**First: Capital budgeting:**

This term is used to describe how managers plan significant outlays on projects that have long-term implications such as the purchase of new equipment and the introduction of new products. Managers must carefully select those projects that promise the greatest future return. How well managers make these capital budgeting decisions is a critical factor in the long-run profitability of the company.

**Capital budgeting** involves (Investment) a company must commit funds now in order to receive a return in the future. Investments are not limited to stocks and bonds. Purchase of inventory or equipment is also an investment.

**Capital budgeting:**

Includes any decision that involves an outlay now in order to obtain some return (Increase in revenues or reduction in costs) in the future. Capital budgeting requires predictions and estimates. This kind of decision (Which is long-term decisions) impacts the company for years.

**Second: Typical capital budgeting decisions:**

Typical capital budgeting decisions include:

1. Cost reduction decisions. Should new equipment be purchased to reduce costs?
2. Expansion decisions. Should a new plant, warehouse, or other facility be acquired to increase and sales?
3. Equipment selection decisions. Which of several available machines would be the most cost effective to purchase?
4. Lease or buy decisions. Should new equipment be leased or purchased?
5. Equipment replacement decisions. Should old equipment be replaced now or later?

An objective for these decisions is to earn a satisfactory return on investment.

*A capital budgeting decision is risky because:*

1. The outcome is uncertain.
2. Large amounts of money are usually involved.
3. The investment involves a long-term commitment.
4. The decision could be difficult or impossible to reverse.

Managers use several methods to evaluate capital budgeting decisions. Nearly all of these methods involve predicting cash inflows and cash outflows of proposed investment, assessing the risk of and returns on those flows, and then choosing the investments to make.

**Third: The time value of money:**

In approaching capital budgeting decisions, it is necessary to employ techniques that recognize (The time value of money). A dollar today is worth more than a dollar a year from now.

The same concept applies in choosing between investment projects. Those projects that promise earlier returns are more favorite than that promise later returns.

**V. I. N.:**

A dollar received today is more valuable than a dollar received a year from now for the simple reason that if you have a dollar today, you can put it in the bank and have more than dollars in a year from now.

Since dollars today are worth more than dollars in the future, we need some means of weighting cash flows that are received at different times so that they can be compared. Mathematics provides us with the means of making such comparisons. With a few simple calculations, we can adjust the value of a dollar received any number of years from now so that it can be compared with the value of a dollar in hand today.

***The amount invested now = Present value Or Discounted value.***

The time value of money is important when evaluating capital investments, but managers sometimes apply evaluation methods that ignore present value. In this chapter we will explained each method after divided the methods into two kinds:

***(Evaluation methods for investment projects)***

**First: Methods not using time value of money:**

**1. Payback period method (PBP):**

Is the expected time period to recover the initial investment amount. (The time that it takes for an investment to pay for itself)

**Note:**

The payback period is expressed in years.

**❖ Computing payback period with even cash flow:**

Even cash flow is cash flows that are the same each and every year. In this case we can use the following formula to compute (PBP):

$$\text{Payback period} = \frac{\text{Cost of investment required}}{\text{Net annual cash flows}} = ? \text{ year}$$

**Note:**

**Net cash flows = Cash inflows – Cash outflows**

**Example (1):**

F. B. Co. needs a new milling machine. The company is considering two machines:

Machine A: Costs (15000 \$) and will reduce operating costs by (5000 \$) per year. Life of the machine is (6 years).

Machine B: Costs (12000 \$) and will reduce operating costs by (5000 \$) per year. Life of the machine is (5 years).

**Required:**

Which machine should be purchased according to the payback period method?

**V. I. N.:**

When we compute the net cash flows we must excludes all noncash revenues and expenses (Depreciation for example).

**Example (2):**

M. T. Co. is considering several different capital investments, one of them is to purchase a machine to use in manufacturing a new product. There are the data about that:

- Machine cost (16000 \$).
- Expected (8 year) life with no salvage value.
- Expected producing (1000 units) each year.
- Expected selling price for the new product (30 \$) per unit.
- Expected annual costs and expenses are (25900 \$).

**Required:**

Find the (PBP) for this machine.

**Example (3):**

One of the manufacturing companies are conceder to invested in machine that cost (50000 \$) with estimated working life (10 years) without scrap value. Using this machine will yield even annual revenues (Before depreciation and tax) worth (10000 \$). The company will use (Straight-line method) for depreciation, and the tax rate (40 %).

**Required:**

Find the (PBP) for this machine.

**Example (4):**

One of the manufacturing companies are considering to buy a machine that cost (121000 \$). The estimated working life for this machine are (11 years) without scrap value. The company will use the (Straight-line method) for depreciation, and the tax rate (20 %).

**Required:**

Find the (PBP) for this machine.

**V. I. N.:**

The cash inflows may be (Even) but the company may use depreciation methods that yield (Uneven) cash inflows such as (Decline depreciation method).



**Example (5):**

One of the manufacturing companies are conceder to invest (125000 \$) in purchasing a machine. The estimated working life for this machine are (3 years) with estimated scrap value (27000 \$). The estimated annual revenues (Before depreciation and tax) are (60000 \$) with tax rate (30 %). The company will use (Decline depreciation method) (Fixed rate from decline book value).

**Required:**

Find the (PBP) for this machine.

**❖ Computing payback period with uneven cash flows:**

In this case, the payback period is computed using the (Cumulative total of net cash flows).

**Example (1):**

(F. B. Co.) is considering to invest in a new machine that cost (16000 \$), estimation working life for this machine are (8) years without scrap value. The net cash flows through the (8) years are as following:

Year 1	3000 \$
Year 2	4000 \$
Year 3	4000 \$
Year 4	4000 \$
Year 5	5000 \$
Year 6	3000 \$
Year 7	2000 \$
Year 8	2000 \$

**Required:**

If you know that all cash inflows and outflows occur uniformly during the year, compute the (PBP) for this investment.

**Example (2):**

Consider the following data for the one of the companies:

Year	Investment	Cash inflows
0	20000 \$	-----
1	-----	7000 \$
2	-----	5500 \$
3	-----	4500 \$
4	-----	6000 \$
5	-----	4000 \$

**Required:**

What is the (PBP) for this investment?

**Example (3):**

A company is considering to invest in fixed asset, it have (Three) alternatives which are (A, B, and C). The initial investment for each one of the asset is (150000 \$). The following are the cash inflows for each asset:

Year	Cash inflows for the project (A) (\$)	Cash inflows for the project (B) (\$)	Cash inflows for the project (C) (\$)
1	37500	40000	80000
2	37500	50000	40000
3	37500	20000	15000
4	37500	25000	10000
5	37500	30000	5000
6	37500	40000	0

**Required:**

By using (PBP) method which of the projects is acceptable?

**Example (4):**

One of the manufacturing companies are conceder to invest in a project. The estimated life of this project is (4 years). The initial cost of this project is (70000 \$) and the estimated annual net cash inflows from this project are as following:

Years	1 <sup>st</sup> year	2 <sup>nd</sup> year	3 <sup>rd</sup> year	4 <sup>th</sup> year
Net annual cash inflows	40000 \$	20000 \$	30000 \$	10000 \$

**Required:**

Compute (PBP) for this project.

**Example (5):**

Al-Mohand Co. are conceder to invest (25000 \$) in one of three projects. The following data are about them:

Details	Project (1)	Project (2)	Project (3)
Cost of investment	25000 \$	25000 \$	25000 \$
<u>Annual net cash inflows:</u>			
1 <sup>st</sup> year	5000 \$	15000 \$	0
2 <sup>nd</sup> year	5000 \$	8000 \$	0
3 <sup>rd</sup> year	5000 \$	6000 \$	0
4 <sup>th</sup> year	5000 \$	3000 \$	0
5 <sup>th</sup> year	5000 \$	2000 \$	40000 \$
6 <sup>th</sup> year	5000 \$	0	0
7 <sup>th</sup> year	5000 \$	0	0

**Required:**

If you know that the company use (Straight-line method), and by using (PBP) method which project do you recommended?

2. Accounting rate of return (Simple rate of return) method (ARR) or (SRR):

This method also called (Rate on average investment, the unadjusted rate of return, and the financial statement method).

This method does not involve discounted cash flows. Rather, it focused on accounting net operating income.

This method computed by dividing a project's after-tax net income by average amount invested in it, and it depends on estimating the revenues that will be generated by a proposed investment and then to deduct from these revenues all of the project operating expenses associated with the project. The net operating income is then related to the initial investment in the project, as shown in the following formulas:

$$\text{Simple rate of return} = \frac{\text{Incremental net operating income after tax}^{(*)}}{\text{Initial investment}^{(**)}} =$$

(\*) Incremental revenues – (Incremental expenses, including depreciation + Income tax expenses)

(\*\*) The investment should be reduced by any salvage from the sale of old equipment.

Or:

If a cost reduction project is involved, previous formula become:

$$\text{Simple rate of return} = \frac{\text{Cost saving} - \text{Depreciation on new equipment}}{\text{Initial investment}^{(*)}}$$

(\*) the investment should be reduced by any salvage from the sale of old equipment.

V. I. N.:

In case of (Uneven) cash inflows, we can use the following formulas:

$$\text{Annual average investment} = \frac{\text{beginning book value} + \text{Ending book value (Scrap value)}}{2}$$

$$\text{Accounting rate of return} = \frac{\text{Annual average after-tax net income}}{\text{Annual average investment}} =$$

Note:

We can make a decision that the investment's return is satisfactory or not only when it is related to returns from other investment with similar lives and risk. The highest return is the best.

Example (1):

Brigham Tea Co. is a processor of a low-acid tea. The company is considering purchasing equipment for an additional processing line. The additional processing line would increase revenues by (90000 \$) per year. Incremental cash operating expenses would be (40000 \$) per year. The equipment would cost (180000 \$) and have a (9) year life. No salvage value is projected.

**Required:** Find the (SRR) or (ARR) for this project.

**Example (2):**

Midwest Farms Co. hires people on a part-time basis to sort eggs. The cost of this hand sorting process is (30000 \$) per year. The company is investigating the purchase of an egg sorting machine that would cost (90000 \$) and have a (15) useful life. The machine would have no scrap value, and it would cost (10000 \$) per year to operate and maintain. The egg-sorting equipment currently being used could be sold now for a scrap value of (2500 \$).

**Required:**

Find the (SRR) or (ARR) for this project.

**Example (3):**

A company considering purchasing equipment for an additional processing line. The additional processing line would increase revenues by (180000 \$) per year. Incremental cash operating expenses would be (100000 \$) per year. The equipment would cost (300000 \$) and have a (10) year life. No salvage value is projected.

**Required:**

1. Compute (SRR) if you know that the company use straight- line method to compute depreciation expenses, and the income tax rate is 10 %.
2. Find (PBP) for this project.

**Example (4):**

A company is considering the purchase of new machine. The cost of the new machine (400000 \$), the estimation working life for this machine are (5) years with no scrap value. The company uses the (Straight-line method) for depreciation. The annual net after-tax income is (5000 \$).

**Required:**

Compute (ARR) for this project.

**Example (5):**

A proposed investment on a machine cost (400000 \$). The estimated working life of the machine is (5) years, and the estimated scrap value of this machine is (25000 \$). The following is the expected income (Before depreciation expenses and income tax) for (5) years:

Year	Net after-tax income (Before depreciation and income tax) (\$)
1 <sup>st</sup> year	150000
2 <sup>nd</sup> year	180000
3 <sup>rd</sup> year	120000
4 <sup>th</sup> year	150000
5 <sup>th</sup> year	100000

And if you know that:

- Income tax rate is 40 %.
- The company use (Straight-line method) for depreciation.

**Required:**

Find (ARR) for the proposal investment.

**Second: Methods using time value of money:**

The following are the methods that help managers with capital budgeting decisions that used the time value of money:

**1. Net present value (NPV) method:**

Under this method, the present value of project's cash inflows is compared to the present value of the project's cash outflows. The difference between the present values of these cash flows, called the (Net present value), and determines whether or not the project is an acceptable investment.

$$\text{Net present value} = \text{The present value of the cash inflows} - \text{The present value of cash outflows}$$

**V. I. N.:**

An investment can be viewed in two ways:

**First:** It can be viewed as in terms of its future value.

**Or:**

**Second:** In terms of its present value.

**V. I. N.:**

To find (Present value), and (Future value) we must use the tables attached in the end of this chapter.

**❖ Computing (NPV) in case of (Even cash flows):**

**Example (1):**

(H. F. Co.) is considering the purchasing of a machine. This machine will cost (5000 \$), and it will last for (5) years, with no scrap value. Using this machine will reduce labor costs by (1800 \$) per year. (H. F. Co.) requires a minimum pretax return of (20 %) on all investment projects.

**Required:**

Should the machine be purchased?

**Example (2):**

(F. T. Co.) is considering to purchase a machine to use in manufacturing a new product. This machine costs (16000 \$), and is expected to have (8) year life with no scrap value. The manager predicts that the use of this machine will yield (4100 \$) as a pretax income per year, with requires a (12 %) annual return.

**Required:**

Should the company purchase that machine?

**Example (3):**

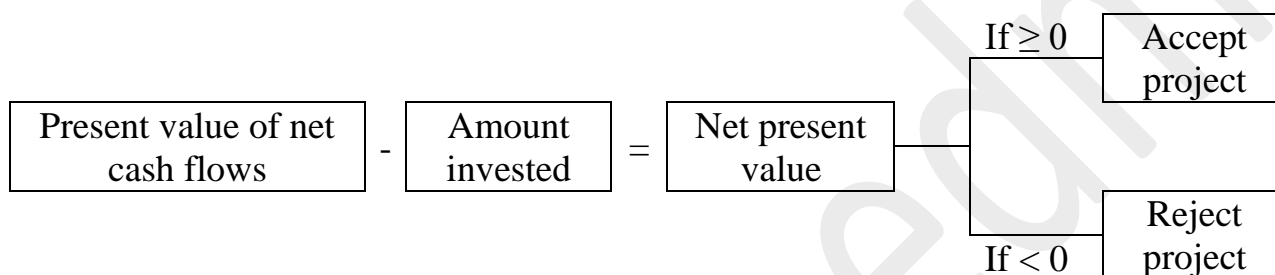
Kurdistan Co. is considering the purchase of a machine by cost (8000 \$), it needs to incremental working capital by (2000 \$), and will last for (10) years with (Zero) scrap value. Using the machine will reduce labor costs by (3600 \$) annually. The company required (10 %) as a rate return on all investment projects.

**Required:**

Compute (NPV) for the project.

**V. I. N.:**

- If the result is (Positive or Zero) = Acceptable
- If the result is (Negative) = Not acceptable
- Working capital = Current assets – Current liabilities.



**V. I. N.:**

- When a company takes an a new project, the balance in the current assets account will often increase, such as (Additional cash, increased account receivable, increase inventory,...)
- The following types of cash flows are common in business investment projects:

*A. Cash outflows:*

- Initial investment (Including installation costs).
- Increased working capital needs.
- Repairs and maintenance.
- Incremental operating costs.

*B. Cash inflows:*

- Incremental revenues.
- Reduction in costs.
- Salvage value.
- Release of working capital.

$$\text{Investment required} = \text{Cost of equipment} + \text{Repairs and maintenance} + \text{Increased working capital needs} - \text{Salvage value of old equipment}$$

- These are some of the important terms that we must use in this chapter:

Annuity: A series, or stream, of identical cash flows.

Compound interest: The process of paying interest on interest in an investment.

Discount rate: The rate of return that is used to find the present value of a future cash flow.

Discounting: The process of finding the present value of a future cash flow.

Present value: The value now of an amount that will be received in some future period.

- Recovery of the original investment:

When computing the present value of a project, depreciation is not deducted for two reasons:

First: Depreciation is not a current cash outflows

Second: Discounted cash flow methods (Automatically) provide for return of the original investment.

The different between operating profit (Income) and cash inflows is depreciation, which:

**Cash inflows = Operating income after tax + Depreciation**

Or:  
**Operating income after tax = Cash inflows - Depreciation**

**Example:**

Carver Hospital is considering the purchase of an attachment for X-ray machine that will cost (3170 \$). The attachment will be usable for (4) years, after which time it will have no salvage value. It will increase net cash inflows by (1000 \$) per year in the X-ray department. The hospital's board of directors has instructed that no investment is to be made unless they have an annual return of at least (10 %).

**Required:**

Make (NPV) analysis for this project.

**V. I. N.:**

- Simplifying assumptions:

Two simplifying assumptions are usually made in net present value analysis:

First: All cash flows other than initial investment occur at the end of periods.

Second: All cash flows generated by an investment project are immediately reinvested at a rate of return equal to the discount rate.

- The company's (Cost of capital) is usually regarded as the minimum required rate of return. The (Cost of capital) is the average rate of return the company must pay to its long-term creditors and to shareholders for the use of their funds.

The cost of capital is the minimum required rate of return because if a project's rate of return is less than the cost of capital. Therefore, any project with a rate of return less than the cost of capital should not be accepted.



- Salvage value and accelerated depreciation:

In many cases, assets are expected to have salvage value. If so, this amount is an additional net cash inflow received at the end of the final year of the assets life. All other computations remain the same.

❖ **Computing (NPV) in case of (Uneven cash flows):**

Net present value analysis can also be applied when net cash flows are uneven (Unequal)

**Example (1):**

Assume that (F. T. Co.) can choose only one capital investment from a many projects. A, B, and C. Each project requires the same (12000 \$) initial investment. Future net cash flows for each project are shown in the following table:

	Net cash flows		
	A	B	C
Year 1	5000 \$	8000 \$	1000 \$
Year 2	5000 \$	5000 \$	5000 \$
Year 3	5000 \$	2000 \$	9000 \$
Total	15000 \$	15000 \$	15000 \$

**Required:**

If you know that the required rate is 10 %, which project can the company accept?

**Example (2):**

Sharp Co. has (20000 \$) to invest. The company is trying to decide among three alternatives. The following data is about these alternatives:

Data	Project (1)	Project (2)	Project (3)
Investment required	20000 \$	20000 \$	20000 \$
Cash inflows in 1 <sup>st</sup> year	11000 \$	.....	15000 \$
Cash inflows in 2 <sup>nd</sup> year	12000 \$	.....	.....
Cash inflows in 3 <sup>rd</sup> year	10000 \$	35000 \$	18000 \$

**Required:**

If you know that the company determines (10 %) as rate return. By using (NPV) method which investment would you recommended?

2. **Internal rate of return (IRR) method:**

Which equals the rate that yields an (NPV) of (Zero) for in investment. This means that if we compute the total present value of a project's net cash flows using the (IRR) as the discount rate and then subtract the initial investment from this total present value, we get a (Zero NPV).

**Case 1:**

If the net cash flows are the same (Even) every year there are two-steps processes to computing (IRR) which are:

**Step 1:** Computing the present value factor for the investment project:

$$\text{Factor of the internal rate of return} = \frac{\text{Amount invested}}{\text{Net annual cash flows}}$$

**Step 2:** Identify the discount rate (IRR) yielding the present value factor:

The factor derived from formula (1) is then located in the present value table to see what rate of return it represents.

**Example (1):**

(G. S. D. Co.) is considering the purchase of a new machine. At present, the company is using a small hand machine. The new large machine will cost (16950 \$) and will have a useful life of (10) years. It will have no scrap value. The new machine would do the job much more quickly than the old one and would result in a labor savings of (3000 \$) per year.

**Required:**

Find the (IRR).

**Example (2):**

(F. T. Co.) is considering a new capital investment. The project requires (12000 \$) initial investment. This project yield (5000 \$) net cash flows for (3) years.

**Required:**

Find (IRR) for this project.

**Case 2:**

If net cash flows are uneven (unequal), we must then use (Trial and error) to compute the (IRR).

**Using the (Internal rate of return):**

The internal rate of return is compared to the company's (required rate of return). The (required rate of return) is the minimum rate of return that an investment project must yield to be acceptable.

If the internal rate of return is (Equal) to or (Greater) than the required rate of return, then the project is acceptable.

**Example:**

Harper Ferry Co. provides a ferry service across the Mississippi river. One of its small ferryboats is in poor condition. This ferry can be renovated at an immediate cost of (200000 \$). Further repairs and an overhaul of the motor will be needed (5) years from now at a cost of (80000 \$). In all, the ferry will be usable for (10) years if this work is done. At the end of (10) years, the ferry will have to be scrapped at a salvage value of (60000 \$). The scrap value of the

ferry right now is (70000 \$). It will cost (300000 \$) each year to operate the ferry, and revenues will total (400000 \$) annually.

As an alternative, the company can purchase a new ferryboat at a cost of (360000 \$). The new ferry will have a life of (10) years, but it will require some repairs at the end of (5) years. It is estimated that these repairs will amount to (30000 \$). At the end of (10) years, it is estimated that the ferry will have a scrap value of (60000 \$). It will cost (210000 \$) each year to operate the ferry, and revenues will total (400000 \$) annually.

If you know that the company requires a return of at least 14 % before taxes on all investment projects.

**Required:**

Should the company purchase the new ferry or renovate the old ferry?

3. Profitability index (PI) method:

Where no revenues are involved, the most desirable alternative will be the one that promise the (least total cost) from the present value perspective, which can be computed by the following formula:

$$\text{Profitability index} = \frac{\text{Present value of cash inflows}}{\text{Investment required}}$$

**Or:**

$$\text{Profitability index} = \frac{\text{Present value of cash inflows}}{\text{Present value of cash outflows}}$$

**Note:**

We use this rule in case of comparing between two projects or more, if the investment required between them are differed.

The project which provides (Greater) (PI) is the acceptable project.

**Example (1):**

Assume that a company is considering two investments, as below:

Data	Investment (A)	Investment (B)
Investment required	80000 \$	5000 \$
PV of cash inflows	82000 \$	6000 \$
NPV	2000 \$	1000 \$

**Required:**

Compute the (PI) for each investment proposal to determine which project is acceptable?

**Example (2):**

Assume that a company is considering two investments, and you have the following data about it:

<u>Data</u>	<u>Investment (A)</u>	<u>Investment (B)</u>
PV of cash inflows	553802 \$	581640 \$
PV of cash outflows	300000 \$	300000 \$

**Required:**

Compute the (PI) for each investment proposal to determine which project is acceptable?