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Subject:

Lectures on the control of management Lessons and case studies

Course Handout for the Management Control course Addressed to Master's and Bachelor's level, specializations in Accounting, Corporate Finance, Business Administration.

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Introduction

Introduction

Management control is one of the fundamental fields in management and accounting sciences, as it represents an effective tool for monitoring the implementation of plans and programs, and for verifying the extent to which actual performance aligns with predetermined objectives. It is not limited to the collection and analysis of financial information alone, but also includes the assessment of efficiency and effectiveness in the use of resources, and the support of the decision-making process. It is a practical tool that combines accounting analysis and strategic planning, making it an important element in supporting managerial and financial decisions.

Given the importance of this subject for third-year undergraduate students in Accounting and Finance, as well as for third-year undergraduate students in Business Administration, this pedagogical publication has been designed to provide structured lectures covering the theoretical aspects of management control, supported by real-world case studies with model solutions, in order to enable the student to bridge the gap between the academic and the practical sides. This publication also aims to equip students with the necessary knowledge and tools to understand the dynamics of management within organizations, and to enhance their analytical and practical problem-solving abilities.

Accordingly, this publication serves as an educational reference that facilitates the revision and preparation process, and enhances the student's capacity to absorb knowledge and employ it in the professional context. It also assists the student in their academic path and qualifies them to face future professional challenges in the fields of accounting and management.

This publication is structured around seven axes. Specifically, the first axis provides a general overview of various concepts and terms related to management control.

The second axis addresses the introduction to cost accounting as a tool for management control, through which we examine various accounting methods, including the variable costing method and the break-even point, the rational capacity utilization method, and the standard costing method.

The third axis is dedicated to providing an overview of budgetary control (budgeting), by highlighting its concept, importance, types, preparation stages, and success factors.

The fourth axis deals with the sales budget, in terms of its definition and importance, the determination of forecasting steps for preparing the sales budget, its relationship with other budgets, and the process of controlling it.

The fifth axis concerns the production budget, by addressing production systems and the method of preparing the budget, determining the optimal production program, as well as determining the budget for production program requirements and analyzing their variances.

The sixth axis addresses the procurement budget (materials budget), in terms of its definition, the method of calculating the cost of procurement and inventory management within the organization, and how to control it.

The seventh axis concerns the investment budget (capital budget), through which the concept and determinants of investment are defined, as well as how to prepare the investment budget. The criteria for evaluating profitability from the investor's perspective under conditions of certainty and uncertainty are also reviewed.

In the eighth and final axis, we address the cash budget, highlighting its concept, importance, and how to forecast and control cash flows.

The first chapter: Concepts about management control

I. Concepts related to Management Control

Before addressing the concept of management control, it is necessary to address concepts related to its application framework, as well as its field of use. We first refer to the concept of management, the organization, then the system, and then control.

1. Fundamental Concepts:

1.1 Concepts of Management, Organization, System, and Control:

1. Definition of Management: It is that set of coordinated and integrated operations that essentially include planning, organizing, directing, and controlling. In short, it is the setting of objectives and the coordination of people's efforts to achieve them, and this is the essence of the manager's task.

2. Concept of the Organization: "It is any economically independent organization within a specific legal and social framework, whose objective is to combine the factors of production in order to produce and/or exchange goods and/or services with other economic agents, with the aim of achieving an appropriate result, and this under economic conditions that vary according to the spatial and temporal context in which it exists, depending on the size and type of activity."[1]

3. Concept of the System and its Elements:

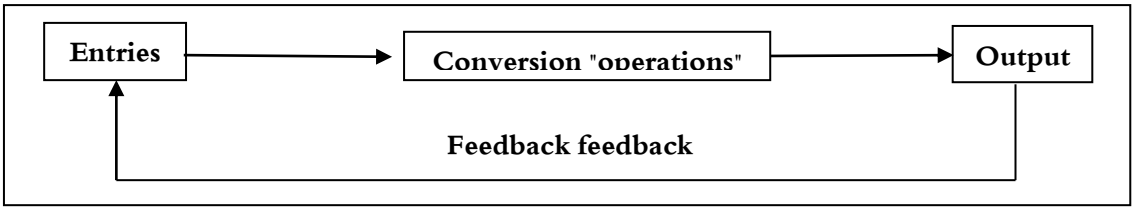
a. Concept of the System: "The system is defined as a set of dynamically interacting and organized elements aimed at achieving a specific goal."[2]

It is a set of components linked to each other and to their environment by interactive relationships that enable them to form an integrated whole.

b. Elements of the System: The system consists of the following three elements:

- **Inputs:** These are all the elements of the environment by which the system is influenced, and they are called environmental variables.
- **Transformation (Processes):** This is an internal process that results from the influencing and being influenced by environmental variables and transforming them into outputs.
- **Outputs:** These are those elements or results through which the system influences the external environment

Figure (I.1): general scheme of the system



c. The Organization as a System: According to the definition by J. Melse, the organization is:"A system composed of a set of interconnected elements that develop continuously and aim toward a specific goal under the pressure of its external environment."[3]

4. Concept of Control: Control is one of the manager's functions. Its objective is to ensure that the execution of work proceeds according to what has been planned. It is based on three stages: planning, determining rules and procedures, and evaluating results and performance.

a. Types of Control:

Several types of control can be classified according to different criteria, including: time, organization, source, comprehensiveness, and we will address the types of control according to each criterion:[4]

1. From the perspective of time: The control function requires measuring actual performance either before execution, during execution, or after execution. We find:

a. Pre-execution control (preliminary control): From the name, we deduce that this type of control relates to the future. This type of control relies on ensuring the availability of work execution requirements before starting implementation, i.e., preventive control. It reduces the intensity of deviations between expected (estimated) results and actual results. It also helps in facing future problems that hinder work. This control is predictive because it is based on forecasting expected problems that may occur in the future in order to determine procedures and preparations to face these problems.

b. Real-time control (concurrent control): This type of control is considered corrective or remedial during the execution process, meaning that errors and deviations are corrected if they occur during work execution, ensuring that it will be completed according to the required specifications. This type of control also has an effect in avoiding the occurrence of deviations.

c. Post-execution control (feedback control): This control is carried out in cycles, usually weekly, monthly, or on specified days. Thus, periodic control programs are established and implemented in advance. Its objective is more preventive than corrective with regard to deviations and their negative aspects. This type of control is carried out after the activity has been completed.

2. From the perspective of organization: According to this criterion, there are three types of control:

a. Surprise control: This control is carried out suddenly and without prior warning, in order to detect errors and deviations and to evaluate individuals. This is done through inspection tours to determine the extent of their discipline and the extent to which their work is managed according to the planned framework.

b. Periodic control: This control is carried out in cycles, usually weekly or monthly, by establishing periodic control programs that are implemented in advance. Its objective is more preventive than corrective.

c. Continuous control: This occurs throughout all the days of the year, i.e., it is permanent and not at intermittent intervals, in order to continuously monitor execution processes and carry out permanent performance evaluation. This is done using daily attendance records to monitor work discipline.

3. From the perspective of source: According to this criterion, there are two types of management control:

a. Internal control: This refers to self-control (autocontrôle), i.e., it takes place within the organization for all activities and tasks. Its purpose is to regulate ongoing operations within the organization to achieve the set objectives. It is carried out by an administrative unit specialized in management control. This type of control essentially aims to:

- Review the organization's internal plan.
- Review the leadership policy and the strategy followed in the activity.
- Evaluate the organization's environment from the social and economic aspects.
- Estimate the organization's market share.
- Estimate customer needs and classify them.

b. External control: This control is carried out by specialized bodies independent of the organization, often affiliated with the state apparatus, such as the control of financial operations on government departments by the Court of Accounts, or the control of organizational budgets by statutory auditors.

4. From the perspective of comprehensiveness: Management control is divided according to this criterion into three types:

a. Control at the individual level: This control focuses on the performance of individuals in their work and on understanding individual behavior during work. This is done using several indicators, including: competence, productivity, absenteeism rate, and lateness.

b. Control of functional activities: This includes all functions and activities of the organization, such as marketing, finance, production, and human resource management. It measures the performance of each using indicators.

c. Control of the organization's overall performance: Through this, the overall performance of the organization can be evaluated over a given period of time, using criteria and indicators used for this purpose, including the profitability rate, the organization's market share, productivity rate, and other such indicators. This is done in order to determine the extent of its efficiency in achieving the set objectives.

5. From the perspective of the control method: According to this criterion, there are two types of control:[5]

a. Closed-loop control: This is a control diagram based on direct observation of the state of the standards, then comparison between this observation and the achievement. Thus, it involves steps for the direct identification of deviations between achievements and objectives.

b. Alert-based control (contrôle par alerte): This is control based on the use of information obtained from the monitoring system, but it does not directly provide information about the standards. Below is the logical diagram of alert-based control.

Another criterion related to the organizational structure of the organization can be adopted. According to H. Bouquin, there are three levels of control:

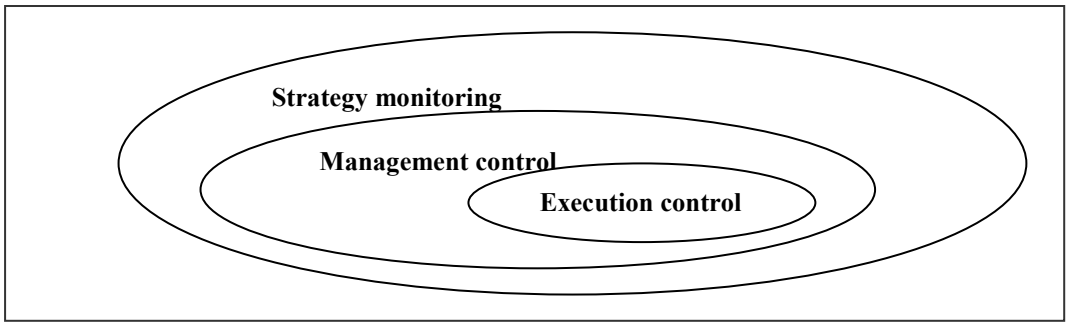
- **Strategic control:** This control corresponds to the level of strategic management. Its purpose is to ensure the suitability of long-term orientations and to assess the extent of their appropriateness.
- **Management control (operational/process control):** This control corresponds to tactical management. Its task is to allow the setting of objectives and leadership within a horizon that generally does not

exceed one year, to evaluate the effects of decisions taken, and to ensure the appropriate use of resources in implementing the strategy.

- **Task control (operational execution control):** Its task is to carry out the specified activities effectively and efficiently. Thus, it is directed at the executing individuals and is, in most of its aspects, organized and mechanical.

The levels of control can be represented in the following form:

Figure (I, 2): levels of control in the enterprise.



Source: **Henri Bouquin**; management control; PUF;5th edition; France;2001 p 65.

From the figure, we observe:

- The three levels of control are sequential and consecutive, not overlapping. In reality, it is very difficult to distinguish between them, especially between each level and the level above it.
- There is a hierarchical sequence among these three levels of control. Task control cannot exist without management control, nor strategic control without management control.
- Each type of control can carry out direction, performance measurement, and goal setting, but conversely, its goals are set and its performance is measured by the higher-ranking system.

b. Characteristics of an Effective Control System: For an effective and successful control system that enables the organization to achieve its objectives, certain important characteristics must be available. Among these, we mention:

- Clarity: A condition of the control system is that it is clear and easy to understand by all those responsible for it.

- Low costs: Meaning that the benefits obtained by the organization are greater than the costs arising from the system.
- Flexibility: For a control system to succeed, it must be highly flexible and adapt to the internal and external variables of the organization. For this purpose, the control system should be reviewed periodically, its weaknesses identified and corrected.
- Speed in reporting deviations: A good control system is one that enables us to detect deviations before they occur (speed in predicting deviations) for their urgent correction before they are used and to avoid them.
- Possibility of correcting deviations: The effectiveness and efficiency of the control system appear through the possibility of correcting deviations after identifying the causes that led to them.

2. Concept of Management Control and its Characteristics

2.1 Concept of Management Control:

Specialists' views on defining the concept of management control have differed according to the perspectives of the schools to which they belong, especially with the developments this system has witnessed. We will address some definitions that we consider to encompass all the characteristics and elements of this system by answering the following question:

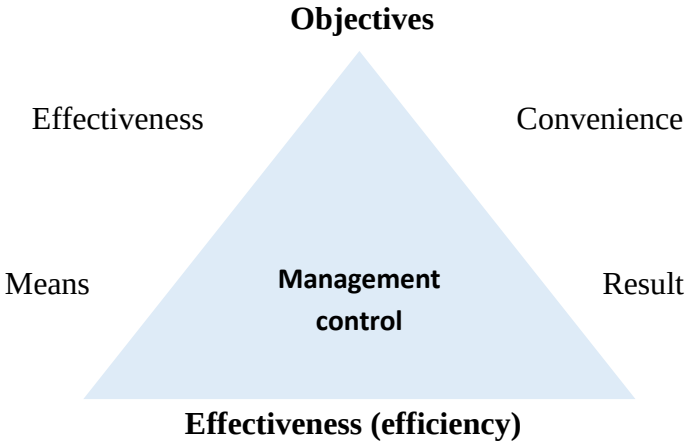
How do we define management control? And why do we control management?

- **First definition:** As defined by J.L. Ardoun, M. Michel, and L.J. Schmid: "Management control is the set of actions, procedures, and documents aimed at helping operational managers to control their management performance in order to achieve predetermined objectives."[6]

It can be said that management control is a multidimensional concept, and it is not possible to grasp all its aspects. However, it can be said that it is a set of management procedures that allow the anticipation of desired objectives, and it is also a set of tools that allow good management.

From the third definition, it can be deduced that management control is based on three fundamental concepts, which are criteria relied upon by the management controller in evaluating performance: efficiency, effectiveness, and relevance, as illustrated in the following figure :

Figure No. (I-3): The Pillars of the management control system

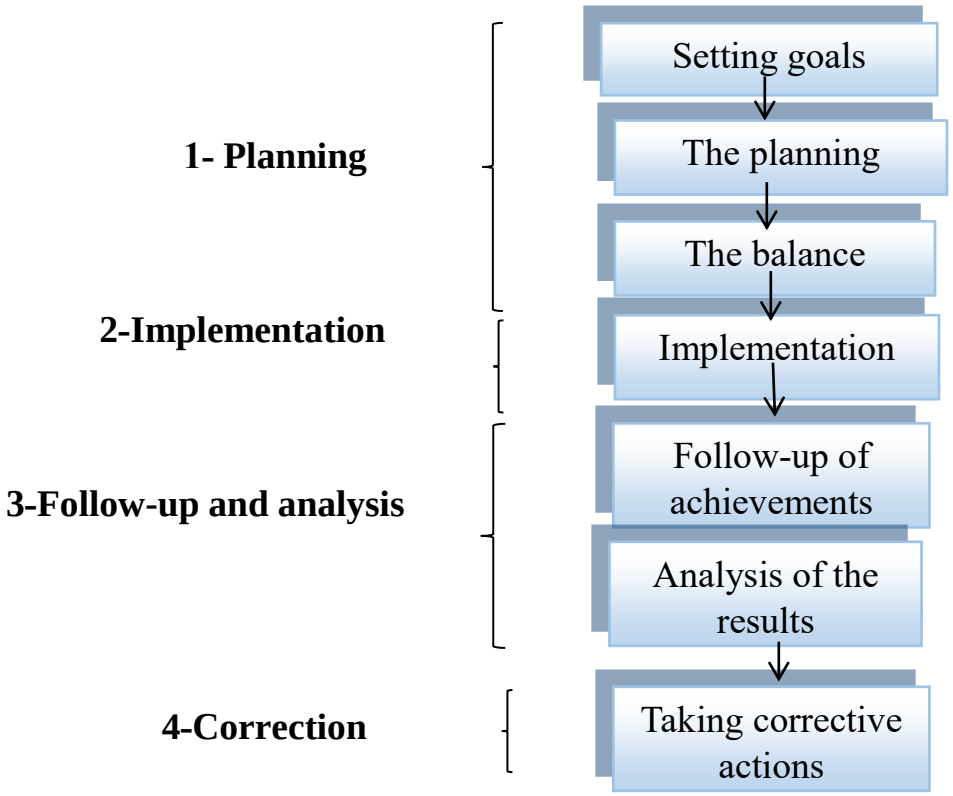


Source: Nasser Dadi adoun et al., monitoring the management of the economic institution, Dar Al-Muhammadiyah, 2004, p. 17.

I-2-2 The Management Control Process

The management control system can be viewed as a loop that assumes gradual enrichment and learning. It consists of a loop formed by four stages, as illustrated in the following figure.

Figure No. (I-2): The Management Control Process



Loning Helène, The management control organization and implementation, 2nd edition, Dunod edition, paris, 2003, p 3.

Accordingly, planning, execution, monitoring, and correction constitute the fundamental stages of the control process steps.

I -1-3-. Role, Objectives, and Importance of Management Control.

1. Role and Tasks of Management Control:

The multiplicity of concepts of management control, as we have previously presented, suggests a multiplicity of roles and functions of management control, which makes it difficult to encompass them all. However, the most important can be mentioned:[7]

- **Long-term planning:** The task of long-term planning and setting strategies for the organization is among the most important works and responsibilities of the organization's management to achieve desired objectives, such as maximizing profits and maximizing the value of the organization. Information from management control plays a prominent role in providing the organization's management with reports on various future expectations, such that it helps management evaluate the information contained in these reports and work on selecting the best alternative and incorporating it into the long-term plan.
- **Organizing, directing, and allocating resources:** Since the resources available in any organization are limited by nature, it falls upon the responsibility of managers to distribute these scarce resources and use them within the organization with maximum possible efficiency and effectiveness. This requires the cooperation of various functions and activities, as well as their organization and direction in a way that leads to their best use. The tasks of organizing, directing, and allocating resources relate to the process of implementing distributed plans to reach the organization's set objectives. Decisions related to the mentioned tasks require the most accurate management control information to reach sound decisions.
- **Performance evaluation and deviation correction:** The organization's management wishes to know how the set plans are being implemented and their adequacy. Management receives various information about the actual achievement accomplished, compares it with the set plans, and evaluates the deviations between actual achievement and expectations according to the established plans. The causes of deviations and those responsible for them are investigated and corrected. In this way, achievement is monitored and evaluated.

- **Gathering, motivating, and activating individuals:** Management control plays a role in revitalizing the various levels of authority within the organization and activating them by rewarding the diligent and punishing the negligent, as well as motivating individuals and urging them to exert their maximum efforts.
- **Gathering and disseminating appropriate information in a timely manner,** especially that related to the organization's competitive position.
- **Reconciling the data of reality with what should be in the strategy.**
- **Those in charge of management control are specialists in numbers and measurement tools.** It is assumed that they are always proactive in developing new indicators to measure the effects of various decisions on the organization's competitive position and financial efficiency, and even to know the contribution of bonuses or qualitative performance to the value creation process.
- **Management control allows for organizing and maximizing the feedback effect of information or feedback loops** that provide the organization with necessary information about the evolution of its functions and fluctuations in its environment, allowing it to adjust its objectives and means compared to achievements, and to adapt to its environment at a harmonious and consistent pace. Thus, four loops can be proposed in the organization's control procedures: planning, measurement, monitoring, and modeling (reconsidering objectives).

2. Objectives of Management Control

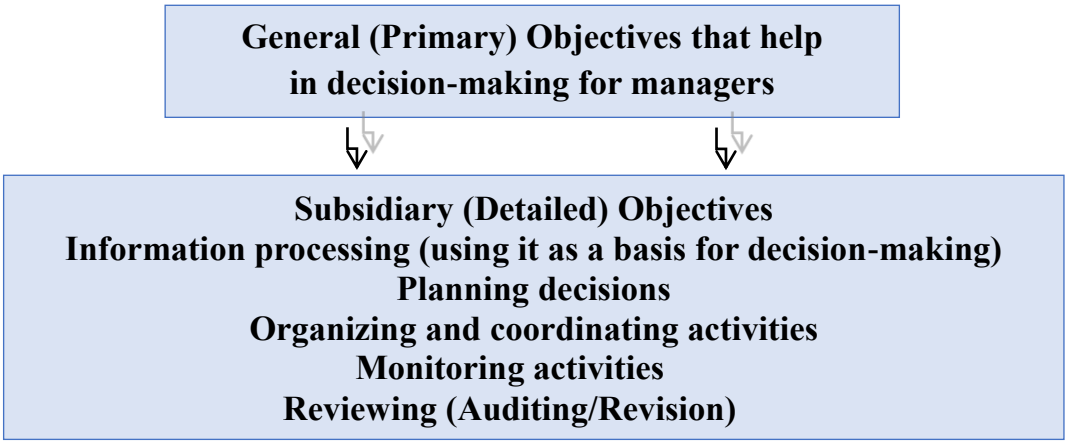
Management control seeks to achieve the following objectives:

- **Achieving effectiveness:** meaning achieving the set objectives compared to available resources, and achieving relevance, i.e., ensuring that the set objectives are consistent with available means.[8]
- **Analyzing deviations** that result between actual activity and standard activity, and highlighting the causes that led to these deviations. This is done through budgetary control (budgets).
- **Identifying weaknesses** to correct them and deducing strengths to focus on reinforcing them.
- **Achieving efficiency:** considered the basic principle in neoclassical theory, which involves the rational and wise use of the organization's resources. This is achieved by setting budgets and then comparing what was planned with what has been achieved.

- **Achieving effectiveness:** This is done by ensuring that the set objectives are achievable, now and in the future.[9]

The objectives of management control can be summarized in the following figure.

Figure No. (I-3): management control objectives



3. Importance of Management Control

The importance of management control lies in the following:

- Identifying the problems and obstacles facing executive work in order to resolve them.
- Detecting errors as soon as they occur and taking the necessary measures to address them.
- Ensuring the correct application rules within the organization, particularly with regard to financial matters.
- Ensuring the soundness of technical operations according to established procedures and correcting errors if they occur.
- Evaluating the competence of managers at all levels and safeguarding the rights of relevant stakeholders within the organization.
- Ensuring the existence of harmony between the various administrative bodies and their progress towards achieving the set objectives.
- Ensuring the application of laws and respect for decisions, and obtaining factual information about the workflow.
- Reducing work costs and expenses.[10]

I-2-4-. Responsibility Centers and Management Control:

Based on the task of management control, which is to encourage and measure performance, it is necessary to define responsibilities precisely by distributing them to specific centers or divisions. On the other hand, the elements that can

be monitored in each center, the change or occurrence of which is attributable to the head of that center, must be determined. Among the most important known responsibility centers are:

a. Cost Center: A cost center is that level of responsibility where decisions made at its level generate costs. An example is the production unit. The responsibility of the head of this department is limited to those costs resulting from decisions made by this department. The performance measurement of this center is based on comparing actual costs achieved with the standard costs set, and extracting the variances to make necessary decisions to avoid them in the future.

b. Revenue Center: "Its task is to achieve a certain volume of revenue. The head of this center does not control prices nor costs; rather, his task is to maximize revenues within the framework of the resources and means granted to him."

c. Profit Center: This is often at the higher levels of the organization, such as general management. The head of this center has the ability to combine costs on one hand and revenues on the other, and thus derive the difference between them, which represents profit in such a center. Performance measurement depends on all costs and revenues, and thus profit. In most organizations, it depends on the evaluation of the budget and the operating account.

d. Investment Center: This is a division where its head is committed to all decisions related to acquiring new fixed assets. The objective of these decisions is to maximize investment income.

Chapter Two: Management Control through Cost Control

II. Management Control through Cost Control

Accounting emerged as a means of arranging and organizing the financial, economic, and legal information affecting the financial position of an individual or an organization. It initially relied on single-entry bookkeeping in general accounting, and then developed with the emergence of double-entry bookkeeping. The reason for this development in accounting was economic and commercial prosperity, until the industrial revolution appeared, where the size of projects increased, economic activities diversified, and their operations became more complex. All of this led to the emergence of another type of accounting, known as cost accounting (analytical accounting or industrial accounting).

II-1-. Concepts related to Cost Accounting

a. Definition of Cost Accounting

Cost accounting is defined as a method for processing information derived from general accounting, in addition to other data, with the aim of analyzing it and drawing conclusions that organizational managers rely on when making decisions related to its activities. This type of accounting also enables the study and monitoring of profitability, determining the level of effectiveness and organization of the enterprise, as well as monitoring responsibilities, whether at the execution level or at the management level. Cost accounting is considered an effective management tool that contributes to the follow-up and examination of the organization's internal flows, thereby providing essential and necessary information for decision-making.[11]

From the various definitions, we can define cost accounting as the system based on a set of procedures and foundations that work to collect, classify, organize, and analyze information to determine product prices and provide reports to senior management for planning and decision-making.

b. Objectives of Cost Accounting

When the cost accounting system applied within an organization is highly efficient and effective, it ensures the continuous and timely flow of information to the various administrative levels. This information is used to achieve a set of objectives, the most prominent of which are:

1. **Measuring and determining the cost price of produced units**, which helps to:
    - Calculate the cost of goods sold.

- Provide an accurate basis for evaluating both finished goods and work-in-progress at the end of the financial period, ensuring correct preparation of income statements and financial statements.
- Determine the unit selling price, and thus determine the profit margin.

2. **Tightening control** over production cost elements and monitoring them at the supervision and responsibility level.
3. **Rationalizing administrative decisions** and supporting policy-making processes.
4. **Assisting management** in estimating future costs and preparing budgets.
5. **Evaluating performance** at the level of individuals, departments, and activities, while contributing to the improvement of incentive plans.

II-2-. The Variable Costing Method and the Break-Even Point

Unlike the previous method (full costing method), these methods rely on partial cost allocation. They are fundamentally based on allocating costs according to their relationship with the activity level. In this section, we will focus on the variable costing method and the break-even point.

II-2-1-. The Variable (Marginal) Costing Method

First: Definition

This method is fundamentally based on distinguishing between fixed costs and variable costs, calculating the cost price using only variable costs for management purposes. When total variable costs are subtracted from turnover (revenue), the contribution margin (margin on variable cost) is obtained, which is used as a tool for making periodic decisions within the organization. By subtracting fixed costs from this margin, the net result is reached. The purpose of this method is not to calculate the result itself, but rather to achieve economic and analytical objectives.

This method is considered more suitable compared to the full costing method, due to its value in the analysis and economic management of the organization, in addition to its role in providing effective indicators used in the fields of management, planning, and control. It also primarily focuses on studying the level of profitability rather than focusing on determining the cost price and its composition, by analyzing the relationship between sales volume

and profit, relying on determining the break-even point according to specific mathematical relationships, summarized in the following equations.

Second: Principles of the Variable Costing Method

The variable costing method is based on a set of principles, the most important of which are as follows:[12]

- Considering that variable costs are components of production cost, so the produced unit must bear its share of them.
- Calculating the contribution margin for each product separately.
- Considering that fixed costs are periodic charges ultimately borne by the enterprise.
- Studying the relationship between different cost elements and the level of activity.

In addition to these principles, the fundamental and main principle on which this method depends is that net turnover (revenue) must cover the period's costs.

Third: Uses of this Method in Management

Its uses are shown in the following:[13]

This method is a tool for operating analysis and not a direct means of calculating the net result, as no accounting method can ignore a part of costs, such as fixed costs. Among its most important advantages are the following:

- It enables monitoring the effectiveness of internal management and highlights the relationship between the level of activity and costs, especially concerning the need to control fixed costs.
- It is considered a means of inventory valuation and provides protection against the risk of a future decline in its value.
- It is used as a fundamental basis for making future decisions related to variable and fixed costs, as well as for determining selling prices or profit margins.
- In the case of multiple products, it allows studying the operating conditions specific to each product individually to select the most suitable among them.
- It helps determine the break-even point for each product or for each function within the organization.
- Separating costs simplifies the process of calculating the break-even turnover, which facilitates the management process.

- It allows for the calculation of the margin of safety. With its development, it has become possible to use the break-even point to derive what is known as the "activity threshold," by distributing the total costs within the organization among variable costs.

II-2-2. The Break-Even Point

The break-even point (or break-even turnover, or equilibrium point) is the level of turnover at which the organization achieves a zero result, i.e., neither profit nor loss, where:

Net Turnover = Total Costs

Contribution Margin = Fixed Costs

This indicator allows knowing the necessary level of activity at which the organization achieves a zero result. After exceeding it, the organization enters the profit zone. This indicator can be estimated mathematically and graphically as follows.

First: Calculating the Break-Even Point

Mathematically, the break-even point (BEP) is estimated in terms of value, units sold, or time. It is calculated in value as follows:

Break-even point (in value) = Turnover × Fixed Costs / Contribution Margin
BEP = (Net Turnover × FC) ÷ CM = FC ÷ CM Ratio

When: CM = [Net Turnover – VC] = FC, then [Net Turnover = BEP]

Where:

- ✓ BEP is symbolized by "BEP".
- ✓ Net Turnover is symbolized by "NT".
- ✓ Contribution Margin is symbolized by "CM".
- ✓ Fixed Costs are symbolized by "FC".
- ✓ Variable Costs are symbolized by "VC".
- ✓ Contribution Margin Rate is symbolized by "CMR".

The BEP in value represents the amount of turnover at which the organization achieves neither profit nor loss. The BEP is calculated in units sold as follows:

Break-even point quantity = Fixed Costs / Contribution Margin per unit
= FC ÷ CMu = BEP in value / Unit selling price

Where:

CMu = [CM ÷ Number of units sold].

The BEP in units represents the number of units sold at which the organization achieves neither profit nor loss.

The BEP is also calculated in time as follows:

BEP in time (zero point) = (BEP in value ÷ NT) × 360 days or 12 months.

The BEP in time represents the date upon reaching which the organization achieves neither profit nor loss.

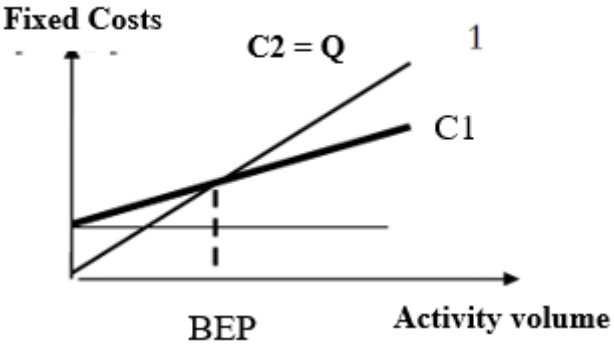
Second: Graphical Representation of the Break-Even Point

To represent the BEP graphically, there are three cases, as follows:

1. Total Cost Equation (First Case)

Total cost equation: C1 = a × Q + b (where "a" represents the variable cost rate, "b" represents total fixed costs). Turnover equation: C2 = Q (where "P" is the selling price). The BEP graphically is the intersection point of the two equations C1 and C2, as follows:

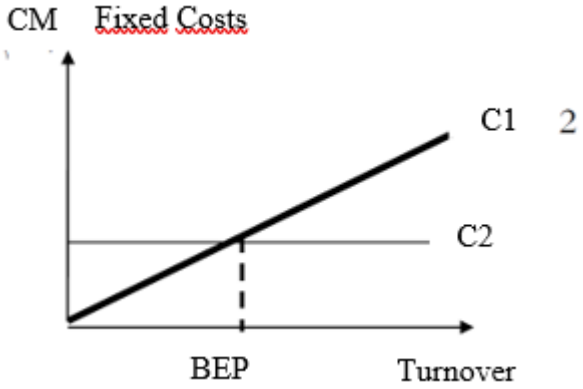
C1 = a × Q + b = Variable Costs + Fixed Costs
C2 = Q



2. Gross Profit Equation (Second Case)

Two equations need to be established. The first relates to the contribution margin equation in the form (C1 = a × S), where "a" represents the contribution margin rate, and "S" represents turnover. The second is the fixed costs equation in the form (C2 = b), where "b" represents fixed costs. The intersection point of the two equations represents the break-even point (BEP) graphically, as follows:

C1 = a × S = CM = Margin Rate × Turnover
C2 = b

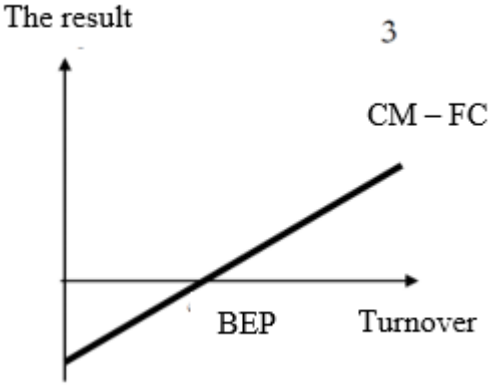


3. Net Result (Profit) Equation (Third Case)

This graphical model shows the profitability threshold through which the turnover that allows the organization to achieve a result equal to zero is determined. It is determined based on the intersection of the net result equation (C = a × S – b) and the turnover line. Where:

- a × S: Contribution margin (CM)
- a: Contribution margin rate
- b: Fixed costs (FC)

$$\begin{cases} C = a \times S - b = CM - FC = \text{Margin Rate} \times \text{Turnover} - FC \\ C2 = 0 \end{cases}$$



3-3. Determining Profitability for Each Operating Branch (for Each Product)

This analysis aims to extract the most profitable products by calculating the contribution margin for each product, then comparing the various margin ratios with one another. This allows for making various decisions regarding increasing or decreasing production, permanently deleting a specific product, or replacing one product with another, etc.

Note: Any change occurring in the number of units sold, whether increase or decrease, affects turnover on one hand and variable costs on the other.

II-3. The Rational Capacity Utilization Method for Fixed Costs

This method emerged as a result of criticisms directed at the two previous methods. Some accountants believe that production and sales must bear all variable costs in addition to a portion of fixed costs, determined in light of the organization's production capacity.

First: Definition of the Rational Capacity Utilization Method for Fixed Costs

Rational capacity utilization is a method for calculating the cost price based on distinguishing between variable expenses and fixed expenses. The latter are distributed proportionally among the units produced. Rational capacity utilization is applied when calculating a portion of the costs according to a predetermined activity level as a normal level. In each stage (whether production, distribution, or others), the value of fixed costs incorporated into the costs is calculated based on their actual value multiplied by the utilization coefficient.[14]

Second: Principle of the Rational Capacity Utilization Method

By separating the two types of costs, a portion of the fixed costs related to the normal volume of activity or production is calculated using the rational capacity utilization method. This allows obtaining a rational cost price that tends towards stability, where the unit cost becomes fixed and is not affected by production volume and its fluctuations, because the variable portion of costs per unit remains constant, and the portion of fixed costs is calculated according to the following relationship:

Loaded Fixed Costs = Actual Fixed Costs × Rational Capacity Utilization Coefficient[15]

Rational Capacity Utilization Coefficient = Actual Level of Economic Activity / Normal Level of Economic Activity

Economic activity is defined either by production level or sales volume.

Third: Determining Rational Capacity Utilization Variances

When calculating rationally loaded fixed costs, we are faced with three cases related to activity volumes and the rational capacity utilization coefficient:

- **First Case:** When the normal activity volume = the actual activity volume. This means that the rational capacity utilization coefficient equals one. In this case, there are no loading variances, and the actual fixed costs will be fully loaded onto the products.

- **Second Case:** The actual activity volume is greater than the normal activity volume, meaning the rational capacity utilization coefficient exceeds one. This means that the organization has exceeded its normal production capacity. In this case, products will be loaded with loaded fixed costs greater than the actual fixed costs. The difference between them represents an efficiency surplus gain, and the difference is added to the net result.
- **Third Case:** The actual activity volume is less than the normal activity volume, meaning the rational capacity utilization coefficient is less than one. This means that the organization has not used its production capacity normally. In this case, products will be loaded with loaded fixed costs smaller than the actual fixed costs. The difference between them represents an efficiency deficit loss, also called idle capacity cost (cost of unemployment).[16]

II-4. The Standard Costing Method

Within the framework of its continuous interest in monitoring operating activity, the organization's management seeks to employ several methods to achieve this monitoring. These methods allow for the monitoring of various costs and the cost price, such as the actual costing method and the variable costing method. However, this analysis is considered insufficient for decision-making in all cases. Therefore, this analysis must be rational by setting standards for using and measuring various cost elements. These standards are called the model (standard). The primary objective is to determine the variances resulting between actual costs and standard costs, and to attempt to interpret these variances and assign responsibilities.

II-3-1. Concept of Standard Costs

These are specific costs determined in advance on a scientific basis under specific conditions, which serve as a basis for measuring and adjusting actual costs.[17]

Standard costs are costs specific to production and rely on determining the quantitative and value standards for raw materials, labor, and indirect expenses. They do not concern distribution expenses.[18]

II-3-2. Foundations of the Standard Costing Method

This method is based on fundamental foundations and principles considered as its starting points and approach to achieving the desired objectives for the purpose of controlling and monitoring each cost element concerned, in order

to identify and analyze variances, then attempt to make necessary corrections and determine various responsibilities.

These foundations are considered general principles, regardless of the method followed or the type of standard costs adopted. We will list these foundations as follows:[19]

1. Working on setting prior standard levels for the level of activity and its constituent elements in terms of quantity, price, production capacity, and the appropriate budget. All of this should be consistent with the organization's structure, the nature of production processes, and the resources they require, according to a technical-economic-accounting study or according to specific standards from other bodies.
2. Working on continuously adjusting the objective standards according to new data related to the organization's structures, market conditions, technological developments, quality standards, etc.
    - We note that these standards must be practical and realistic, far from random estimation, and flexible, so that they take into account changes occurring related to the organization's production activity. Consequently, work must be done to change the degree of these standards, whether by increase or decrease, so that this does not negatively affect the calculation of variances and their incorrect interpretation, which in turn affects the decisions taken and the organization's budgets based on standard cost data.

II -3-3. Calculating Standard Cost and Evaluating the Method

First: Standards for Calculating Cost

1. **Theoretical Standard:** Determined based on the best possible use of production returns, i.e., it represents the ideal situation to be achieved.
2. **Historical Standard:** Based on the average costs borne by the organization in the past. It is not a well-regarded concept because it does not result from a scientific study.
3. **Normal Standard:** Determined according to forecasts related to normal production conditions within the organization, i.e., based on its reality. Experience has proven that the normal standard gives a reassuring impression and provides greater usefulness, unlike the two previous standards. The theoretical standard may lead to frustration of efforts or their inadequacy, while the historical standard gives excessive confidence in average costs.

This method does not cause complex problems as it relies on comparison between what is standard and what is actual for the period, which will reveal variances that must be interpreted.

Second: Calculating and Analyzing Variances

For the organization to be able to evaluate its capabilities, the standard costing method enables it to carry out this process based on variances between standard and actual costs when carrying out its various activities. Variances can be calculated with the following equation.

(Δ) The Variance = Standard Cost – Actual Cost

We have:

$EG=\varphi s\rho s-\varphi r\rho r$

$\Delta\varphi=\varphi s-\varphi r\Rightarrow\varphi r=\varphi s-\Delta\varphi\ldots\ldots(1)$

$\Delta\rho=\rho s-\rho r\Rightarrow\rho r=\rho s-\Delta\rho\ldots\ldots(2)$

By substituting (2) and (3) into (1), we find:

$EG=(\varphi s\rho s-\varphi s\Delta\rho-\Delta\varphi\rho s-\Delta\varphi\Delta\rho)$

$EG=\varphi s\rho s-\varphi s\rho s+\varphi s\Delta\rho+\Delta\varphi\rho s-\Delta\varphi\Delta\rho$

$$\mathbf{EG=\Delta\varphi Ps+\Delta P\varphi s-\Delta\varphi\Delta P}$$

Where:

- **EG:** Total Variance
- **PS:** Standard Price
- **QS:** Standard Quantity related to actual activity
- **PR:** Actual Price
- **QR:** Actual Quantity

$\Delta\rho=\rho s-\rho r$

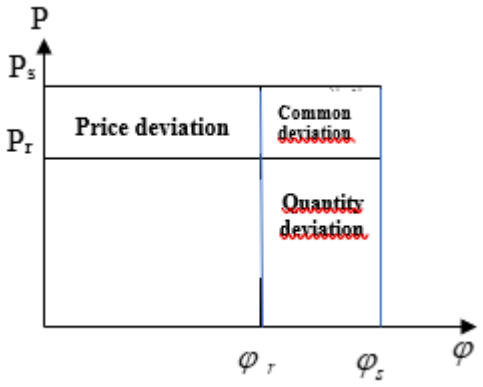
$\Delta\rho\varphi s$: Price Variance

$\Delta\varphi=\varphi s-\varphi r$

$\Delta\varphi\varphi s$: Quantity Variance

$\Delta\rho\Delta\varphi$: Combined Variance

It is represented as follows.



Variances can arise from three sources:

- **Materials Variance:** The cost is the product of quantity and unit price. Therefore, the variance can be observed between the actual cost and the standard cost. It can arise either from a price variance or a quantity variance.
- **Labor Variance:** The labor cost is the product of quantity (number of hours) and the unit price per hour. Therefore, the variance can be observed between the actual cost and the standard cost. It arises from two sources: either a change in time (efficiency) or a change in the hourly wage rate.

❖ **Analysis of Direct Overhead Variances**

1. Raw Materials Variance Analysis: By applying the total variance relationship calculated previously, the direct labor variance is analyzed. Here, **P** represents the cost of raw materials, and responsibility for it lies with the purchasing department, while **Q** represents the quantity of raw materials used in production, and responsibility for it lies with the production department.

ΔQ represents the quantity variance. Responsibility falls on the supervisors of quantity usage in the production process. The resulting variance may be due to:

- A defect in the material used.
- Spoilage during the production process.
- Modification of the production method.
- Worker negligence.
- The standard itself being unrealistic.

ΔP represents the price variance. Responsibility falls on the supervisors of production factors. This variance may result from:

- The state imposing higher customs duties.

- An increase in production costs.
- The standard price being non-objective and unrealistic.

2. Direct Labor Variance Analysis: By applying the same total variance relationship, direct labor is analyzed. Here, **P** represents the worker's wage, and responsibility for it lies with the human resources department, while **Q** represents the number of direct labor hours and allows us to assess the efficiency of the direct labor force.

$$EG=\Delta\varphi\rho z+\Delta\rho\varphi z-\Delta\varphi\Delta\rho$$

- $\Delta\varphi\Delta\rho$: Combined Variance
- $\Delta\rho\varphi z$: Price Variance
- $\Delta\varphi\rho z$: Quantity Variance

❖ Analysis of Indirect Overhead Variance

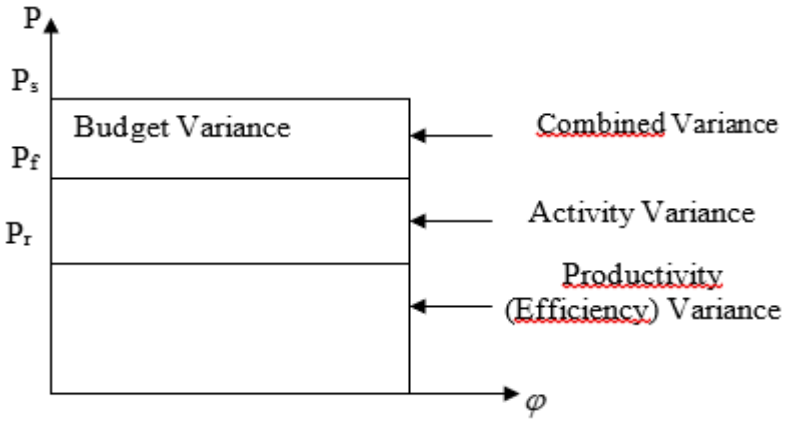
The indirect overhead variance represents the difference between the standard indirect overhead and the actual indirect overhead. It represents production overhead on a standard basis. This is done by multiplying the hours by the total indirect overhead absorption rate.

$$EG = \Delta\varphi\rho s + (\rho s - E)\varphi s + (E - \rho r)\varphi s - \Delta\varphi\Delta\rho$$

Where:

- $\Delta\varphi\rho s$: Productivity (Efficiency) Variance
- $\rho s - E$: Budget Variance
- $\Delta\varphi\Delta\rho$: Combined Variance
- $E - \rho r$: Activity (Volume) Variance

$$E = \frac{\text{Fixed costs}}{\text{Actual number of hours}} \qquad \frac{\text{All standard variable costs}}{\text{Standard number of hours}}$$



Third: Evaluation of the Standard Costing Method

Advantages

- Monitoring operating conditions within the production unit.
- It can serve as a basis for price setting.
- The possibility of achieving cost reductions.
- Evaluating the performance of responsible managers, and the possibility of taking sound actions as a result of the proper evaluation of variances.

Disadvantages

- Setting standard costs in an incorrect manner with inaccurate information can pose a risk to the organization's situation.
- Standards represent achievement levels (targets) that may be difficult to reach or may limit performance.

Chapter Three:
Estimative Budgets

III. Estimative Budgets

III-1. Nature of Budgets

III-1-1. Concept of Budgets and their Characteristics

First: Definition of Budgets

Definitions of budgets have multiplied due to differences among thinkers, their nationalities, mentalities, and political inclinations. Therefore, we will attempt to address some of them as examples, not as an exhaustive list.

- **First Definition:**[20] The French Accounting Standard (Plan Comptable Général) of 1982 defined budgets as: "An estimate expressed in numbers for all elements related to a specific system." According to this definition, budgets are a prediction of the elements needed by the organization to achieve a specific program, expressed in numerical terms.
- **Second Definition:**[21] According to Hnengror, budgets are "a quantitative expression of the business plan and an aid for achieving coordination and control." This definition adds that budgets are an estimated plan for the objectives that budgets seek to achieve, namely coordination and control. It also restricts budgets to being an expression of the organization's activities in quantitative terms.
- **Third Definition:**[22] Budgets are "a quantitative and value-based plan prepared and approved before a specified period. It usually shows the planned revenue expected to be achieved, or the expenses expected to be incurred during a specified period, and the funds used to achieve a specific goal."

Based on the above, it can be said that:

Budgets are a detailed action plan prepared in advance to realize the activities the organization intends to carry out. They are presented in the form of precise figures distributed to various responsible managers, clarifying the distribution of tasks and responsibilities and the method of work to be followed. These budgets serve as a guide directing the actions of managers and workers, thereby contributing to performance monitoring and objective evaluation.

Second: Characteristics of Budgets

Budgets are considered effective tools in the field of management control, similar to cost accounting and the dashboard. However, they are distinguished by several fundamental characteristics, the most prominent of which are:

- Their reliance on estimation. They are not mere forecasts, but an expression of the potential results of a studied future policy of the organization, built on scientific foundations and field studies of conditions, utilizing scientific, statistical, and economic methods.
- Their association with a specific future time period, which varies according to the time period of the activities.
- Being a comprehensive plan for the organization, making them a tool for coordination and connection between the various departmental programs.
- Being considered a numerical translation of the organization's policies and objectives.
- Their role as a tool for planning and control, as they embody policies, procedures, and activities in the form of detailed plans, and allow monitoring of implementation by comparing actual results with estimated ones.
- Their contribution to clearly defining responsibilities within the organization.

III-1-2. Objectives of Budgets and their Classification

First: Objectives of Budgets[23]

The importance of budgets is evident through a set of objectives they achieve for the organization, the most prominent of which are:

1. Efficient and effective use of the organization's assets.
2. Pushing the organization's management towards future thinking and anticipating potential events.
3. Promoting team spirit in work, given the cooperation required by budgets between different groups to accomplish them.
4. Determining the organization's future financing needs.
5. Establishing accurate and realistic standards for evaluating expected performance, instead of relying only on historical data which may not be valid for judging efficiency.

6. Establishing planning as a priority in the thinking of senior management.
7. Enabling the organization to prepare early to face expected events.
8. Clarifying responsibilities and determining what is expected of each individual within the organization.
9. Establishing foundations for taking corrective actions when deviations occur between actual and expected results.

Second: Classification of Budgets

Budgets can be approached from different angles according to the criterion adopted. We find the classification of budgets based on:

- The time period.
- The subject of transactions.
- The accounting unit on which the budget is prepared.
- The scope they cover.

1. Classification of Budgets by Time Period

There are no agreed-upon rules regarding determining the period for which the budget is prepared. All that can be said on this point is that the budget period should be sufficient to allow effective planning that helps achieve the organization's objectives. According to this classification, we find:

- **Short-term budget - Long-term budget**

a. Short-term budget: Implemented over a time period usually less than a year, such as monthly, quarterly, or at most annually... Examples include budgets related to the organization's operating activities, also called the annual budget, which includes the following budgets: sales, production, raw materials, purchases, labor and wages, and cash budget.[24]

b. Long-term budget: Covers a period ranging from three to five years. It concerns planning for capital investments, meaning it relates to activities the organization wishes to achieve in the long term, such as government economic programs, expansion, and the investments required for them.[25]

2. Classification of Budgets by the Activity they Cover (Nature of the Field)

According to this classification, we find:[26]

a. Operating Budget: A detailed description of the revenues and costs required for the activities the organization wishes to carry out.

b. Capital Budget: Includes financing plans related to the operating budget, in addition to planning and spending on investment projects the organization wishes to undertake (e.g., building a new factory).
It is worth noting that the sum of the operating budget and the capital budget forms what is called the **master budget**.

3. Classification of Budgets by Degree of Detail
According to this classification, we find:[27]
a. Program Budget: Through this, the organization's activities are divided into specific programs, each aiming to achieve a specific goal or reach a specific result. Then a budget is prepared for each program separately.
b. Responsibility Budget: Through this, activities are analyzed based on those responsible for implementing parts of them or achieving their objectives. Budgets are divided into parts such that the implementation of each part is the responsibility of a specific person or a specific group of people.

4. Classification of Budgets by Stability and Flexibility
According to this classification, we find:[28]
a. Fixed Budget: These are budgets prepared for a single level of production. They represent an effective tool for planning the organization's activities, in addition to their importance in control and performance evaluation to achieve the objectives set by the organization's management. This is achieved through the matching of actual activity with the planned activity specified in the fixed budget. In most cases, a difference appears between what is actually achieved and what is planned in the budget for several reasons, which necessitated the emergence of another type of budget.
The fixed budget achieves the goal of planning, but it weakens the effectiveness of the budget as a control tool when actual activity differs from the estimated activity. Therefore, it is preferable to use the flexible budget as a control tool.
b. Flexible Budget: These are budgets prepared for multiple levels of production, not just a single level as is the case with fixed budgets. This budget allows its plans to be easily modified if the actual activity level differs from the planned activity level.

III-3-1. Stages of Budget Preparation and Factors Controlling their Preparation

After learning about the most important reasons that might drive an organization to use budgets, we will move on to mentioning the stages of their preparation, although they differ from one organization to another, and then the factors that may affect the budgets.

First: Stages of Budget Preparation

The budget preparation process follows these stages:[29]

- Announcement of general policy.
- Preparation of estimates.
- Review and coordination.
- Final approval.

1. **Announcement of General Policy:**[30] In this stage, the organization announces the basic lines of its policy for the future period, through forecasting sales and expected fluctuations in price levels. Therefore, the organization works to maintain complete confidentiality of the drawn-up plans. If the organization does not introduce any amendments or corrections to its policy, this means it will retain its previous policy. This process takes place at the end of the year in preparation for the following year.
2. **Preparation of Estimates:**[31] Each responsible supervisor at the executive management levels undertakes the preparation of estimates based on the set of basic policy plans that have been established. These estimates are then discussed.
3. **Review and Coordination:**[32] The executive authority receives the estimates of the various budgets and coordinates between them. Then these budgets are reviewed to determine the feasibility of their field application. During the review process, some deficiencies may appear. Therefore, the organization makes amendments by specialists. If some problems remain, they are referred to the budget committee to make the appropriate decision regarding them.
4. **Final Approval:**[33] Undoubtedly, preparing good budgets will be of no value unless the various department managers can obtain the approval of the organization's management. While budgets take the form of financial figures representing various types of costs and outputs,

approving them effectively means accepting to work according to them for the coming year and adopting them officially, including:

- The expected results that must be achieved.
- The resources required to achieve these results.
- The required capital investments.
- The actual programs for achieving outputs, improving performance, and reducing costs.
- The support and inputs required from the remaining organizational and administrative elements.

Second: Factors Controlling the Preparation of Budgets

Before starting to prepare the budget, it is necessary to identify the factors that may affect its formulation and the strength of this effect. Among the most prominent of these factors, we mention:

1. **Sales Volume:** Represents a fundamental factor in budget preparation. If the organization has a production capacity greater than the expected demand volume, the production program will be constrained by the sales volume that can be achieved. Sales volume is in turn affected by the quality of goods and services offered by the organization compared to competitors, in addition to its competitive ability in the market.
2. **Available Production Capacity:** Directly affects the budget. If the production capacity is less than the marketable sales volume, the organization will lose marketing opportunities. If it is greater, it will result in a production surplus piling up in warehouses, leading to resource waste.
3. **Production Requirements (Materials):** These requirements may constitute a determining factor in budget preparation. The availability of qualified labor and raw materials allows the organization to implement its production and marketing programs, while their shortage represents an obstacle to achieving that.
4. **Working Capital:** Represents a pivotal factor. Any expansion in production volume requires a corresponding increase in working capital to cover the costs associated with production requirements. Its unavailability may hinder the implementation of the specified programs.

It is important to emphasize that the degree of impact of these factors varies from one organization to another, and even within the same organization from one time period to another. Here, management's task emerges in reducing the intensity of the impact of these variables to avoid them becoming obstacles to achieving desired goals. Several influencing factors may also interact simultaneously within the same organization.

III-4-1. Principles for Budget Success

The preparation of budgets should be based on a set of scientific foundations that ensure achieving their objectives. Among the most prominent of these foundations are:

1. **Principle of Comprehensiveness:** Requires that the budget include all the organization's activities, such as sales, production, purchases, investment, and financing, thereby ensuring coordination between different departments.
2. **Principle of Time Distribution:** Concerns the timing of operations and their distribution over the budget period (often a full year). This does not mean equal division of figures, but rather determining the execution dates of operations according to the probability of their actual occurrence. For example, the sales budget may take longer compared to the rest of the budgets.
3. **Principle of Realism:** The budget's objectives must be achievable according to the available human and material capabilities. Exaggerating objectives may lead to frustration, while excessive conservatism (over-reserving) makes workers lose incentive.
4. **Principle of Participation:** Requires involving all responsible managers in budget preparation to benefit from their expertise, which enhances their sense of job satisfaction and increases their loyalty and performance within the organization.
5. **Principle of Flexibility:** Aims for the budget's ability to adapt to changing surrounding conditions. This is achieved through:
    - Preparing estimates for several levels of activity to compare actual values with estimated ones.
    - Preparing short-term budgets (monthly or quarterly) to make them more realistic.
    - Adopting continuous budgeting by regularly adjusting estimates (e.g., dropping the ended month and adding a new month).

6. **Principle of Linking to Organizational Structure:** Means linking the budget to responsibility centers and tracking costs according to the responsible entity. This allows comparing actual results with planned ones, taking corrective actions when deviations or waste occur, while reinforcing strengths.
7. **Principle of Monitoring:** Based on analyzing performance by comparing actual results with the set estimates, extracting deviations, then determining their causes and proposing solutions or reducing their impact on the future course of the organization's activity.

III-2. Sales Budget

III-1-2.Definition, Importance, Responsibility, and Advantages of the Sales Budget

1. Definition of the Sales Budget

The sales budget is considered the cornerstone of preparing the operating budget. It expresses the estimated sales for the coming budget period, which are in turn the main source of its revenues. This budget is also considered the basis for preparing the production budget, and consequently the purchases, wages, and expenses budgets. As we note, the success of the budgeting system largely depends on the sales budget and the accuracy of forecasting future sales. Hence, it is called the **master budget**.[34]

It is the process of numerically expressing the organization's sales by product type, in terms of quantity and price, and planning sales and expected revenues.[35]

The sales budget represents the foundation upon which the preparation of other subsidiary budgets depends. It represents the basis for estimating production and also represents the main revenue side of ongoing operations. It is the responsibility of the sales manager. The sales budget is often issued to include:

- Quantitative and numerical determination of expected sales during the budget period, divided into monthly or quarterly periods.
- Determination of expected sales according to different departments, products, or sales regions.

2. Importance of the Sales Budget

The sales budget is considered one of the most important budgets within the organization, as it is the foundation upon which the preparation of both the production budget and the expense budget is built. To be used as an effective planning tool, detailed data should be prepared regarding monthly and quarterly sales, in addition to sales for each sales region separately.

Sales estimates should also be presented in terms of quantities and prices separately, allowing for a detailed analysis of the sales management's performance. The deviation between actual and estimated sales may be due to a difference in sales volume or in selling prices. Relying only on aggregate estimates makes it difficult to determine the causes of deviation and take corrective action in a timely manner.

Before preparing the sales budget, management must determine its basic policies related to multiple factors such as: selling prices, distribution methods, the number of sales representatives, the development of current products or the creation of new products, in addition to determining the organization's competitive position.

The sales budget is used to achieve several basic objectives, the most important of which are:

- Providing a basis for production planning and determining the required production capacity.
- Showing expected revenues and associated expenses, highlighting the difference between them, which represents the expected profit.
- Serving as a guiding tool for sales management during implementation, and at the same time as a permanent standard for evaluating its performance.

3. Responsibility for Preparing the Sales Budget

The primary responsibility for preparing the sales budget falls upon the sales manager. This budget must be comprehensive and integrated, and linked to the organization's long-term strategic plan. It should also take into account market conditions, production capacity, and promotional plans, as they have a direct impact on estimating the quantities and values of sales.

The responsibilities of the sales manager when preparing the sales budget include:

- Setting detailed sales objectives.

- Determining the number and types of products, their configurations, and classifications.
- Drawing up the pricing strategy, including discounts and special offers.
- Developing other detailed marketing policies and programs.
- Preparing the sales budget, both in terms of quantities and values.
- Providing the information needed by the budget manager.

Other managers also bear indirect responsibilities in preparing these budgets, as shown in the following table.

Table No. 01: Responsibilities for Preparing the Sales Budget

Responsible Function	Related Responsibilities
Senior Management	– Determining general marketing objectives. – Developing general product strategies and policies. – Developing general pricing strategies and policies. – Developing other general marketing strategies and policies.
Budget Manager	– Achieving coordination and linkage between the sales budget and other budgets.
Production Manager	– Providing information about available production capacity.
Sales Regional Managers	– Estimating sales quantities of each product in the regions (departments) where they supervise sales.
	– Assisting the sales manager in preparing the sales budget.
Financial Manager	– Providing accounting information related to data and its classification according to the needs of the sales manager for previous years before budget preparation.
	– Conducting analysis using financial indicators to determine the estimated profit resulting from applying the sales budget.
	– Conducting financial studies and analyses acceptable to the sales manager.

Source: Mohamed Sami Rady, the modern introduction to the preparation and use of budgets, University Publishing House, 2006, Egypt, pp. 78-79.

3. Advantages of the Sales Budget

- It pushes management to take actions to collect necessary figures, statistics, and information related to future sales.
- It contributes to the development and promotion of sales, and also motivates salespeople and encourages them to achieve the objectives set in the budget.
- It provides a means to identify positive and negative aspects of performance.
- It helps achieve effective coordination between the various elements of the sales program.
- It contributes to organizing and distributing sales efforts, advertising, personal selling, and product promotion.
- It is used as a control tool to monitor sales volume and ensure the achievement of set objectives.
- It supports production management in planning and scheduling production operations.
- It provides management with data on expected income and estimated expenses.
- It is a means of evaluating sales activities at various levels.
- It helps departments and individuals define their tasks in the areas of sales and products, and sets standards for the desired performance according to management.
- The enterprise seeks to maintain the relationship between revenues and expenses, control this relationship, and prevent it from getting out of control. The sales budget will determine those costs.[36]

III-1-2. Steps of Forecasting and Preparing the Sales Budget

1. Steps of Sales Forecasting

Sales forecasting methods, whether based on estimates or statistical methods, rely on using past experience and previous information to determine what is expected in the future. These steps for preparing sales forecasts are summarized as follows:[37]

a. Data Collection: This step is considered one of the most important stages of preparing forecasts. It aims to collect a sufficient and appropriate quantity of data while ensuring its accuracy, often using sampling methods.

b. Data Summarization: After collecting the data, it is reviewed and refined. A large amount of data does not necessarily lead to higher forecast accuracy,

as it may contain inappropriate information or information inconsistent with the forecasting process. Therefore, it is preferable to select the sample randomly to avoid any potential bias during the selection process.

c. Building the Forecasting Model: In this stage, available data is used to build an appropriate model that reduces forecasting errors to the lowest possible level, through the following steps:

- Selecting a preliminary model for testing.
- Dividing the data into a core part used for forecasting.
- Building the model based on the core data.
- Applying the extracted model to forecast sales.
- Making decisions based on the analysis results using the model.

d. Preparing Forecasts: After selecting the most appropriate model, it is used to prepare final forecasts more accurately and reliably.

The Most Important Sales Forecasting Methods:

Sales forecasting methods are divided into two main categories:

1. Qualitative Methods:

These methods rely on experience and personal estimates. The most prominent are:

- **Study of Economic Indicators:** By analyzing the situation of investment, consumption, and savings at the national level, and understanding their impact on the organization's sales, whether in the short or long term.
- **Estimates of Sales Agents and Representatives:** Where salespeople in different regions estimate the expected sales volume for each product based on their experience and customer contacts. These estimates are then collected and compared with actual data of past sales, taking into account future expectations.
- Other qualitative methods also exist, such as the advisory committee method and the Delphi method.

2. Quantitative Methods:

These are considered among the most accurate forecasting methods. They rely on mathematical and statistical models to estimate future sales. The most important of these methods will be presented later.

1. Time Series Analysis: By determining the general trend line equation using the least squares method as well as regression analysis, because there is a relationship linking sales to time. From this, we obtain a time series showing estimates of sales changes over time. The least squares method is one of the most famous methods for determining the straight-line equation where the squared deviations are less than possible, or the sum of squared deviations is less than the sum of squared deviations in any other straight line. The line determined by this method approximates the general trend of the sales function, assumed to be:

Y = aXi + b

Where:

- **Y**: Estimated sales.
- **X**: The time period for which sales are to be estimated.

As for the values of **a** and **b**, they are represented as follows:

$$X = \sum Xi / n \qquad Y = \sum Yi / n$$

$$b = \bar{y} + a\bar{X}$$

$$a = \frac{\sum X_i Y_i - n\bar{X}\bar{Y}}{\sum X_i^2 - n\bar{X}^2}$$

Correlation Coefficient: The correlation coefficient determines for us the strength of the relationship between sales and other changes specific to the forecast of sales volume.

$$r = \frac{n\varepsilon xy - (nx)(ny)}{\sqrt{[(n\varepsilon x^2 - (n\varepsilon x^2)(n\varepsilon y - \varepsilon y)^2]}}$$

The correlation coefficient is contained between -1 and 1, which indicates the strength of the relationship between two variables, except in the case where the correlation coefficient is 0, which means there is no relationship.

2. Moving Averages Method: This method is used to eliminate fluctuations and irregularities contained in time series data. It is also used for cyclical fluctuations as well as seasonal fluctuations. This method is used when the actual sales data are profitable in a single time series. The estimation process is carried out according to the following procedure:

- Determine the objective of the estimation.
- The products to be sold must be divided into homogeneous groups.
- Identify the factors affecting the sales of each group and arrange them according to the strength of their impact.
- Select the forecasting method suitable for each homogeneous group.

- Collect and analyze data and information scientifically, and draw conclusions.

Preparing the Sales Budget

Developing a sales program must be followed by sales budgets. The sales budget is prepared either on a seasonal basis, or on the basis of products, departments, customers, salespeople, sales regions, or on the basis of some of these aforementioned foundations combined. Below, we address some of the distribution bases:

1. Seasonal Distribution: Sales are not made once during the year but occur over different periods. Customs and traditions influence consumer behavior, such that the quantity sold of a particular product varies from one season to another. This variation and difference in the degree of sales of a product from one period to another is due to seasonal changes. Therefore, sales from previous periods are analyzed to determine the seasonal variations for the sales of each product individually. The average of seasonal variations is extracted in the form of a percentage, where each season represents a percentage of the annual sales.

Example:

An organization extracted the average of its sales during the previous five years, and the results were as follows:

January	February	March
8%	9.2%	11%
Second Quarter	Third Quarter	Fourth Quarter
30%	17.2%	24.6%

Monthly average: 8.33% Quarterly average: 25%

The program for the sixth year is estimated at 5 million DZD.[38]

The organization will undertake an advertising and promotion campaign which will lead to an increase in the sales percentage in the fourth quarter of the coming year and a decrease in the sales percentage in the second and third quarters, as follows:[39]

- An increase of three percentage points in the sales percentage in the fourth quarter.
- A decrease of two percentage points in the second quarter.
- A decrease of one percentage point in the third quarter.

In light of this data, the program for the sixth year is distributed as follows:

The Annual Program According to the Previous Example.

Time Period	Percentage	Estimated Sales (DZD)
January	8%	400,000
February	9.2%	460,000
March	11%	550,000
Second Quarter	28%	1,400,000
Third Quarter	16.2%	810,000
Fourth Quarter	27.6%	1,380,000
Total	**100%**	**5,000,000**

Source: Ferkous Mohamed, OpCit, p. 35.

2. Regional Distribution of Sales: Sales must be distributed regionally or by area because consumption differs from one region to another due to different population distribution and the economic and social level of each region. To know what can be sold in each region, the distribution of sales of that product in past years must be studied, but taking into account the following factors:

- The distribution ratio of the population across regions and demographic growth.
- Study of population movement from one region to another.
- The economic and social level of the populations of the different regions.
- For industrial products, the number of companies, their size, and the number of employees are taken into account.

Example: The expected sales for one of the companies in the coming year are estimated at 6 million DZD, to be distributed across four regions. From its study of the four regions, it appears that sales will be distributed as follows:

- Region One: 18%
- Region Two: 28%
- Region Three: 24%
- Region Four: 30%

Distribution of Sales by Region

Region	Percentage	Expected Sales (DZD)
Region One	18%	1,080,000
Region Two	28%	1,680,000
Region Three	24%	1,440,000
Region Four	30%	1,800,000

Total	**100%**	**6,000,000**

3. Distribution by Product: The objective of this distribution is to enable the organization to monitor and evaluate the development of sales of each product. The method used for distribution is either distribution based on previous years or distribution based on the importance of the profit margin. Thus, the organization will work to sell products that have a large profit margin and promote them, while reducing the sale of products that have a small profit margin and are difficult to market. Distribution by product also helps to know the extent of the impact of new products on the sales of old products.

Example: The sales of one of the organizations in the past year were 12,000,000 DZD, distributed across three products A, B, and C as follows:

Distribution of Sales by Product

Product	Sales (DZD)	Percentage
A	3,000,000	25%
B	4,800,000	40%
C	4,200,000	35%
Total	**12,000,000**	**100%**

Source: Mohamed Ferkous, Op.Cit, p. 40.

The organization wishes to sell a new product (D) in the coming year in addition to the other products. The estimated sales of the new product (D) are estimated at 3 million DZD, which will lead to an increase in total sales of 20%, assuming that the sales quantity of the old products will remain constant without change in the coming year. The distribution will be as follows:

The New Distribution

Product	Percentage 1	Percentage 2	Estimated Sales (DZD)
A	25%	20%	3,000,000
B	40%	32%	4,800,000
C	35%	28%	4,200,000
D	-	20%	3,000,000
Total	**100%**	**100%**	**15,000,000**

Source: Mohamed Ferkous, Op.Cit, p. 38.

4. Master Budget (Summary Budget): We can say that there is no single design that is valid for all organizations. Therefore, each organization can

design the budget as it sees fit. Generally, the master budget contains the following main points:

- Distribution of sales by product.
- Estimation of sales in quantities, value, and selling price.
- Seasonal and regional distribution of sales of each product.

Example: An organization wishes to market two products (A and B). The estimated sales for each are as follows: A=7,200,000 DZD, B = 4,000,000DZD. From its study of regions and seasons, it reached the following results:

Distribution of Sales by Region

Region	**Product A**	**Product B**
Region One	25%	20%
Region Two	40%	35%
Region Three	25%	30%
Region Four	10%	15%

Distribution of Sales Percentage by Season

Season	**A**	**B**
First Quarter	40%	25%
Second Quarter	25%	20%
Third Quarter	10%	30%
Fourth Quarter	25%	25%

Source: Mohamed Ferkous, Op.Cit, p. 38.

From this, the total sales budget can be prepared as follows:

Total Sales Budget (Amounts in thousands of DZD)

	Region 1	Region 2	Region 3	Region 4	Total
Product A					
Q1 (40%)	720	1152	720	288	2880
Q2 (25%)	450	720	450	180	1800
Q3 (10%)	180	288	180	72	720
Q4 (25%)	450	720	450	180	1800
Total A	**1800**	**2880**	**1800**	**720**	**7200**
Product B					
Q1 (25%)	200	350	300	150	1000
Q2 (20%)	160	280	240	120	800
Q3 (30%)	240	420	360	180	1200
Q4 (25%)	200	350	300	150	1000

Total B	**800**	**1400**	**1200**	**600**	**4000**
Total Sales	**2600**	**4280**	**3000**	**7800**	**11200**

Source: Mohamed Ferkous, Op.Cit, p. 40.

III-1-3. Responsibility for Preparing the Sales Budget and its Relationship with Other Budgets[40]

First: Responsibility for Preparing the Sales Budget

The primary and direct responsibility for preparing the sales budget falls on the sales manager. The sales budget must be comprehensive, integrated, and based on the long-term strategic plan of the business enterprise. The sales budget must also take into account market conditions, production capacity, and promotional plans, which directly affect the estimation of sales quantities and values.

It can be said that the sales manager's responsibility when preparing the sales budget includes the following:

- Setting detailed sales objectives.
- Determining the number and type of products, their composition, and classification.
- Determining pricing strategies, discounts, and special offers.
- Developing other detailed marketing strategies, policies, and programs (promotion, sales and distribution, marketing research and studies).
- Preparing the sales budget in terms of quantities and values.
- Providing the information needed by the production manager to prepare the production budget.
- Providing the information needed by the budget manager.

Other managers also bear indirect responsibilities in preparing this budget, as shown in the following table:

Table (1.1): Responsibility of Other Departments in Preparing the Sales Budget

Functional Level of Responsible	Responsibilities Assigned
Senior Management	- Determining general marketing objectives.
	- Developing general product strategies and policies.
	- Developing general pricing strategies and policies.
	- Developing other general marketing strategies and policies.
Budget Manager	- Achieving coordination and linkage between the sales budget and other budgets.
Production Manager	- Providing information on available production capacity.
Sales Regional Managers (Sales Departments)	- Estimating the quantity of sales of each product in the regions (departments) where they supervise sales.
	- Assisting the sales manager in preparing the sales budget.
Financial Manager	- Providing accounting information related to sales and its classification according to the needs of the sales manager for the five years preceding the budget preparation.
	- Conducting analysis using financial indicators to determine the estimated profit resulting from applying the sales budget.
	- Conducting financial studies and analyses requested by the sales manager.

Second: Relationship of the Sales Budget with Other Budgets

The sales budget is considered the governing or influencing factor, or the cornerstone, upon which other budgets in the business enterprise are built, because it is the foundation upon which the production manager relies. The relationship between the sales budget and other budgets can be clarified through the following table:

Table (2.1): The Sales Budget and its Relationship with Other Budgets

Budget	Budget Inputs	Budget Outputs
Sales Budget • Objective: To estimate the quantity and value of sales during the budget period, by product, geographic region, and customer category. • Responsible: Sales Manager	•Long-term strategic plan •General marketing objectives. •Market trends and the organization's share thereof. • Product and pricing policies. • Promotional strategies. • Capital expenditure.	• **Production Budget:** Quantity of products estimated to be sold. • **Selling and Distribution Expense Budget:** Sales quantity and volume of sales and distribution activity. • **Income Statement Budget:** Revenues or estimated sales value. • **Cash Flow Budget:** Timing and collection of sales value. • **Statement of Financial Position Budget:** Debit movement of customers.

III-3. Control of the Sales Budget[41]

III -3-1. Seasonal and Regional Control

To achieve control over the implementation of the sales budget, a set of reports showing actual sales for each region should be prepared.

1. **Seasonal Control:** If it appears that during a certain period the sales volume was weak in a particular region or in all sales regions, this could be attributed to a recession in that region or in all regions. If the sales volume is weak during a certain period, management must monitor the sales representatives by controlling the distances traveled.
2. **Regional Control:** If the general trend of sales in a particular region differs from the general trend in other regions, it is necessary to investigate the causes of this difference to correct them and avoid their occurrence in the future. The control process focuses on sales agents. The causes may be external, such as labor strikes in a particular region or local recession, or internal causes, such as a lack of financing for a

particular region, the inefficiency of salespeople and representatives, or them not performing their work as required.

III-3-2-Control of Products and Revenue Responsibility Centers

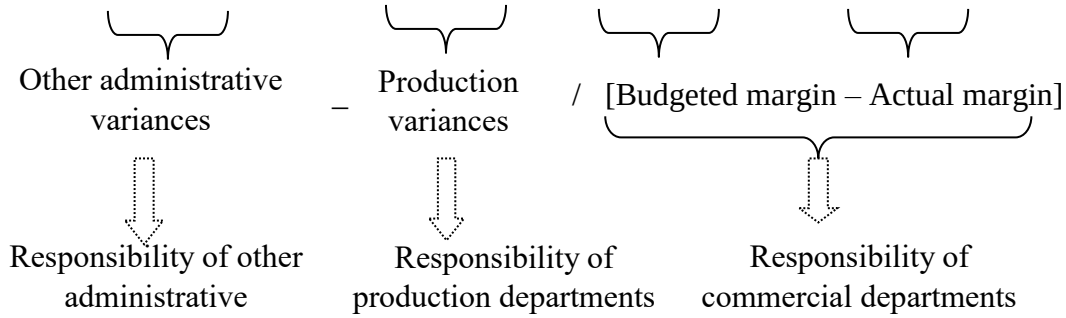
To achieve control over the implementation of the sales budget, a set of reports showing actual sales for each type of product should be prepared. The best indicator that can be relied upon as a control tool is the net result (profit) criterion, which is calculated according to the following relationship:

$$R=CA–CP–AC$$

$$E/R=Rr – Rb$$

$$E/R= (CAr –CPr – ACr) – (CAb – CPb– ACb) +CPp – CPp$$

$$E/R=[(CAr – CPp) – (CAb – CPb)] – (CPr – CPp) – (ACr – ACb)$$



- **R:** Net result (Profit)
- **CAr:** Actual turnover (revenue)
- **CAb:** Budgeted turnover
- **CPr:** Actual production cost
- **CPb:** Budgeted production cost
- **CPp:** Budgeted (estimated) production cost related to actual production
- **ACr:** Actual other costs
- **ACb:** Budgeted other costs

Index:

- **p (préétablie):** Standard / Estimated
- **b (budgétaire):** Budgeted
- **r (réel):** Actual

Variance Analysis:

In addition to the net result indicator, the manager should also analyze the margin indicator and the turnover indicator. These variances are analyzed as follows.

Variance Analysis on Margin:

It is advisable that the objective set for the sales department is to achieve a certain margin target, rather than the objective being to achieve a certain turnover target. Variance analysis helps answer the following questions:

1. Is the margin higher or lower than expected?
2. Is the sales quantity greater or less than the estimated quantity?
3. Was the actual sales mix better or worse than the estimated sales mix?

a. Case where the organization sells a single product:

In this case, the organization is often affected by only two variables: price and quantity.

1. Price Variance:

$$E/P = (pr - pb)\,QR = Mr - Mp$$

- **Pr:** Actual selling price
- **Pb:** Budgeted selling price
- **QR:** Actual sales quantity

3. Quantity Variance:

$$E/Q = (Q_R - Q_b)\,M_b$$

$$E/Q = (Q_R - Q_b).(P_b - C_b)$$

- **QR:** Actual sales quantity
- **Qb:** Budgeted sales quantity
- **Mb:** Budgeted unit margin (marge budgétaire)
- **Pb:** Budgeted selling price
- **Cb:** Budgeted production cost

a. Margin Variance in the Case of Multiple Products:

1. Price Variance:

$$E/P = Mr - Mp \qquad E/P = (Pr - Pb).QR$$

- **Pr:** Actual selling price
- **Pb:** Budgeted selling price
- **QR:** Actual sales quantity

2.Total Volume Variance:

E/VG = Volume Variance

$$E/VG = (CAp - CAb).tb$$

- **CAp:** Estimated turnover (revenue)
- **CAb:** Budgeted turnover

$$\sum Q_R \cdot P_b$$

- **tb:** Budgeted margin rate
- **CAb:** Budgeted turnover
- **CPb:** Budgeted costs

$$t_b = \frac{M_b}{Ca_b} = \frac{CA_b - CP_b}{CA_b}$$

3. Sales Mix Variance:

E/CV = Mix Variance

$$E/CV = (tp - tb) \cdot CAp$$

$$M_p = CA_p - CP_p$$

- **tp:** Estimated margin rate

$$tp = \frac{M_p}{CA_p}$$

III-3. The Production Budget

The production budget aims to estimate the quantities that the organization wishes to produce during the budget period in order to meet the needs of the sales budget in a timely manner.

The process of estimating and monitoring the production program is carried out by the following departments: studies office, methods office, industrial engineering department, scheduling department, human resources department, management control department, etc.

To prepare the production budget, it is first necessary to understand the production systems and then the budget preparation method.

III -3-1. Production Systems and Budget Preparation Method[42]

First: Production Based on Specific Orders (Job Order Production).

We note that in this case, the organization manufactures specific types of products to fulfill customer orders. In this case, the organization does not produce finished products for storage. Therefore, it is its duty to establish the system that enables it to produce and deliver products as quickly as possible. Given that sales forecasting is not easy in this production model, it is difficult to produce products in advance before receiving orders. Despite this, the organization can start producing some parts in advance to meet customer orders within specified times.

Second: Batch Production or Continuous Production.

This type includes:

- Equipment produced in batches (trucks, machinery, some office equipment, etc.).
- Industrial products (cement, glass, etc.).

Characteristics of Continuous Production: Sales can be forecast through:

- **Production cycle:** Generally short (a few weeks at most).
- The organization must store significant and permanent quantities of finished products corresponding to demand.

III-3-2-. Determining the Production Program for Continuous Production.

To know the sales program, we derive the production program as follows:[43]

Production = Sales + Targeted Ending Inventory – Beginning

We must determine the level of ending inventory that the organization wishes to achieve. The ending inventory level is determined by taking into account several factors, including:

- ✓ The level that should not be exceeded regarding working capital needs.
- ✓ The current beginning inventory level, which may have become very low or vice versa.

After determining the inventory level, we can prepare the production program. Then comes the subsequent stage of determining whether the currently available and expected production capacity is sufficient to execute the production program or not. If there are production constraints, we must search for the optimal solution, or the solution that allows taking them into account while maintaining estimated sales, by identifying production constraints represented by:

- **Constraints related to production equipment:** This involves determining the production time allowed by the capacity of existing or expected machinery and identifying bottleneck points in the workshops. By knowing the machine's normal activity time (the time the machine is operating), we estimate the non-productive time (equipment setup and adjustment time, maintenance time, worker break times, technical stoppage times, workshop raw material supply stoppage times, etc.). Productive time is obtained by subtracting non-productive time from activity time.

- **Constraints related to direct labor:** The productive time for direct labor is obtained by subtracting non-productive time from the total number of attendance hours.
- **Other production constraints:** Other production constraints may relate to available storage space, supply, or available skilled labor time. Some workshops require specific skills. The non-marketable production rate due to not meeting required quality specifications must also be considered.

III-3-3. Budget for Production Program Requirements[44]

For a manufacturing organization, determining the production budget comes after determining the sales budget. The production plan aims to plan production operations and coordinate them in a way that ensures production flow at a rate consistent with the rate of customer orders for the product. Therefore, the production budget is also affected by the organization's inventory policy, whether regarding raw materials or finished products, because inventory will directly affect the production volume needed to meet sales. The production volume budget is given as follows:

Production Volume Budget for the Period = Planned Sales + Desired Ending Inventory – Desired Beginning Inventory for the Budget Period.

After determining the production volume, the process of determining the direct and indirect costs of the production process follows, by identifying the programs and activities necessary for the production process and the various direct and indirect costs to achieve the required production level. At this level, two main types of budgets are prepared: the budget for direct production program requirements (mainly raw material consumption and labor) and the budget for indirect manufacturing expenses.

First: Budget for Direct Production Program Requirements: This budget determines the production requirements for direct costs, often expressed in raw materials and direct labor. Accordingly, the two main budgets branching from this are the raw materials procurement budget and the direct labor requirements budget.

- **Raw Materials Procurement Budget:** Just as the production budget is determined relative to sales and inventory policy, the procurement budget is determined relative to the production volume and the required quantities of raw materials, taking into account the inventory policy for

raw materials. The raw materials purchases budget is determined as follows:[45]

Raw Material Purchases = Production Requirements of Raw Materials + Ending Raw Materials Inventory – Beginning Raw Materials Inventory

By determining the necessary purchase quantity, the organization estimates the value of these purchases based on their market prices. This same value is used in calculating the direct production cost, in addition to the value of materials in stock and the method of managing material issues adopted by the organization. Value determination is more accurate when the organization deals with fixed supply lines, which also helps in the precise distribution of the budget throughout the production cycle.

- **Direct Labor Budget:** The direct labor budget shows the requirements needed to fulfill the production program for each type of direct labor across all production centers. The required labor is determined relative to the planned production quantity and the technical/engineering study of labor utilization rates in the production process.[46]

Second: Budget for Indirect Manufacturing Expenses: In addition to the direct production program requirements budget, the organization must prepare a budget for indirect manufacturing expenses. This budget aims to show cost elements that do not enter directly into the product composition but are necessary for the production process. In some industries, these are more necessary than direct costs due to changing industrial data. New requirements and data have emerged, including managing another type of process oriented more towards supporting customer-oriented processes and ensuring product quality through support activities and R&D activities, in addition to technological developments that have changed some concepts of direct cost, particularly concerning labor.

III-3-4. Variances at the Level of Production Program Requirements.

Cost variances are divided into direct cost variances and indirect cost variances.

First: Direct Cost Variances.[47]

1. Raw Materials Variances: The materials concerned by this variance are those that enter directly into the production process. Supplies and materials that do not enter directly into production fall within the scope of indirect manufacturing expense analysis.

Total Variance = Actual Cost – Standard (Estimated) Cost.

The total variance is divided into:

a. Price Variance: Arising from the change in actual price compared to the standard price of raw materials.

Price Variance = (Actual Price – Standard Price) × Actual Quantity.

b. Quantity (Usage) Variance: Attributed to losses, spoilage, and material deterioration.

Quantity Variance = (Actual Quantity – Standard Quantity) × Standard Price.

The material quantity variance can be further analyzed into two variances: material mix variance and material yield variance.

- **Material Mix Variance:** This type of variance appears as a result of a change caused by an imbalance in the mix used. In this case, the mix represents the mix of raw materials used in the production process. For example, the production department might use smaller quantities of one material and compensate by increasing the quantities used of another material, due to unavailability of the material in suitable quantities or its high market price. This variance is calculated as follows: **Material Mix Variance = (Standard Mix Ratio – Actual Mix Ratio) × Total Actual Quantity × (Standard Average Price – Standard Price).**

The material mix variance is favorable in the following two cases:

- ✓ If the usage ratio increased for the raw material whose price is lower than the standard average price.
- ✓ If the usage ratio decreased for the raw material whose price is higher than the standard average price.

The material mix variance is unfavorable in the following two cases:

- ✓ If the usage ratio increased for the raw material whose price is higher than the standard average price.
- ✓ If the usage ratio decreased for the raw material whose price is lower than the standard average price.

- **Material Yield Variance:** Before starting production operations, a standard for the expected normal yield is often determined, representing the quantity of finished products (outputs) resulting from using a standard quantity of raw materials (inputs). The difference between the standard yield and the actual yield is referred to as the yield variance. **Material Yield Variance = (Actual Quantity – Standard Quantity of Materials for Actual Output) × Standard Average Price.**

2. Direct Labor Variances[48]**:** The total labor variance appears as the result of the difference between actual cost and standard cost.

Total Variance = Actual Cost – Standard Cost.

This variance is analyzed into labor rate variance and labor efficiency variance. The first corresponds to the price variance for raw materials, and the second corresponds to the quantity variance.

Labor Rate Variance = (Actual Rate – Standard Rate) × Actual Time.
Labor Efficiency Variance = Time Quantity Variance = (Actual Time – Standard Time) × Standard Rate.

Labor efficiency variance can be further analyzed into labor mix variance and labor yield variance, similar to the material quantity variance.

- **Labor Mix Variance:** The labor mix variance is analyzed using the same logic as the material mix variance, substituting the production element from raw material to direct labor. The labor mix variance is calculated as follows:
  Labor Mix Variance = (Standard Labor Mix Ratio – Actual Labor Mix Ratio) × Actual Total Hours × (Standard Average Rate – Standard Rate).
- **Labor Yield Variance:** This variance resembles the material yield variance. It arises when the actual yield differs from the standard or expected yield. It is calculated as follows:
  Labor Yield Variance = (Actual Hours – Standard Hours Allowed for Actual Output) × Standard Average Rate.

Second: Indirect Manufacturing Expense Variances.

The budgetary analysis process for indirect manufacturing expenses is based on two types of budgets: the static budget and the flexible budget.

1. Static Budget:[49] A budget prepared based on a fixed level of activity, which is not changed later during the analysis process regardless of the actual activity level (actual production, actual sales, actual number of work units).

2. Flexible Budget: A type of budget that is adjustable according to subsequent variables of actual activity (actual production volume, actual sales, actual number of work units). The flexible budget allows expanding the scope of analysis by adapting estimated data based on current activity data, through which other dimensions of variances are given, detailing aspects of hidden responsibility that cannot be shown using the static budget.

Indirect costs are divided into variable indirect costs and fixed indirect costs:

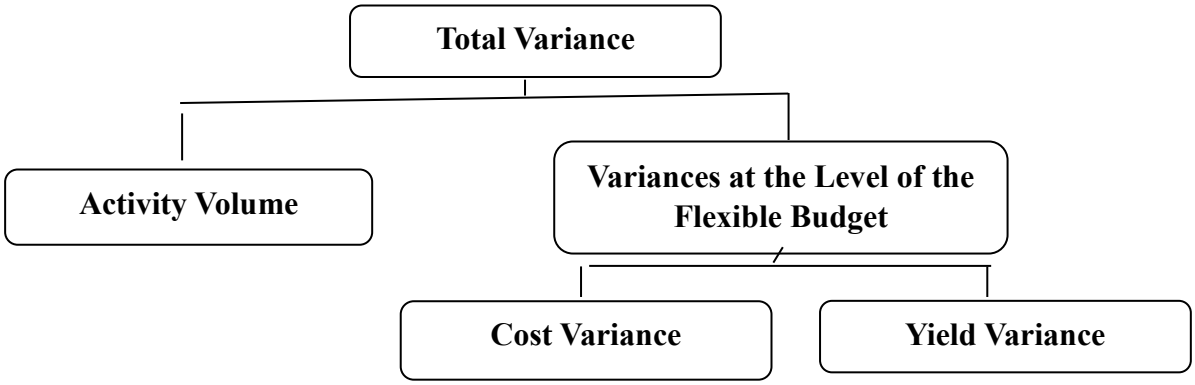
- **Variable Indirect Costs:** Costs that carry added value without directly entering the production process and are not characterized by stability (e.g., indirect supplies, indirect labor, energy).
- **Fixed Indirect Costs**[50]**:** Costs that also carry added value without directly entering the production process but are characterized by stability (e.g., depreciation, some administrative costs, etc.).

1. Variable Indirect Cost Variances: The reference framework for analyzing variable indirect costs is based on flexible budgets according to the following steps:

- Identify the variable indirect costs included in the analysis center.

- Determine the appropriate activity unit (relying on statistical methods such as the correlation coefficient to study the degree of correlation of some proposed variables as a cost driver for variable indirect costs).
- Estimate the estimated unit cost of variable costs.

Figure No. (II -1): Basic Variances at the Level of Variable Indirect Costs.



a. Total Variance: This is the variance that appears at the level of the static budget, resulting from the imbalance between estimates and reality. It takes the difference in its entirety without considering the difference between the actual and estimated activity volume.

Static Budget Variance = Actual share of variable indirect costs – Estimated share of variable indirect costs.

The total variance at the static budget level is divided into flexible budget variance and activity volume variance:

b. Activity Volume Variance: This variance appears in the difference of the total estimate of variable indirect costs between the flexible budget and the static budget. This variance tends to explain the difference between what was estimated based on a specific volume of expected activity, and what the estimates would have been at the actual activity volume. Referring to the previous table, the difference at the total cost level is the result of the difference in the activity volume taken as the background for the study across the two budgets. Therefore, this variance is called the activity volume variance. Consequently, it equals zero if the expected activity volume is the same as the actual activity volume.

Activity Volume Variance = Flexible budget share of variable indirect costs – Static budget share of variable indirect costs

c. Flexible Budget Variance: Unlike the static budget variance, which studies the effect of changes in activity volume on total cost estimates, the

flexible budget studies the effect of changes resulting from deviations in the estimates of variable indirect cost elements (expressed in the table above) for the same given activity volume (actual activity volume). Referring back to the table, the constant variable between the flexible budget and actual achievement data is the activity volume. Therefore, the variances explain the imbalance in the estimates of the variable indirect cost variables prepared according to the steps indicated previously.

Static Budget Variance = Actual share of variable indirect costs – Estimated share

The flexible budget variance is divided into yield variance and cost variance.

d. Yield Variance for Variable Indirect Costs: This variance focuses on the change in the estimated activity unit and thus the productivity of the relevant center and its efficiency in utilizing production elements. For example, in the area of machine hours, an unfavorable variance is explained by using a greater number of machine hours than was estimated for the same production volume. This may be due to several reasons, including:

- ✓ A flaw in the programming of production stages by the production scheduler.
- ✓ Machines needing repair.
- ✓ A flaw in the study, meaning that machine production standards were not based on good studies according to working conditions.
- ✓ The organization filled urgent orders by putting pressure on production processes.

Yield Variance for Variable Indirect Costs = (Actual number of work units – Estimated number of work units for actual production) × Estimated variable cost per work unit.

e. Variable Indirect Cost Variance: This variance reflects the difference between actual variable costs and the estimated variable cost per work unit, also referred to as the variable cost budget variance.

Variable Indirect Cost Variance = (Actual variable cost per work unit – Estimated variable cost per work unit) × Actual number of work units.

The variance is favorable for two main reasons:

1. The actual cost of the element (indirect labor, supplies, energy) is lower than the estimated cost.
2. The actual total consumption of these elements is lower than the estimated consumption.

2. Fixed Indirect Cost Variances: The flexible budget for fixed indirect costs is prepared according to the following steps:

- ✓ Identify fixed indirect costs, taking the sum of these costs as a basis for calculating the standard cost per work unit.
- ✓ Determine the estimated number of work units.
- ✓ Calculate the standard cost per work unit for fixed costs. **Standard Fixed Cost per Work Unit = Total Fixed Costs / Estimated number of work units**
- ✓ Calculate the standard fixed cost per production unit. **Standard Fixed Cost per Production Unit = Estimated Fixed Costs / Estimated Production Standard Fixed Cost = Number of work units per production unit × Standard fixed cost per work unit = (Standard fixed cost per production unit) × Production volume**

The analysis of fixed indirect cost variances differs between the American approach and the Francophone approach. According to the American approach, this variance is viewed from two main angles:

Cost Variance = Actual fixed indirect costs share – Estimated fixed indirect costs share

Activity Variance = Estimated fixed indirect costs – (Standard number of work units for actual production × Standard fixed cost per work unit)

This is with respect to the actual activity volume. Thus, it equals zero if the estimated activity volume equals the actual volume.

Regarding the analysis of the French (Francophone) chart of accounts, it agrees with the American view regarding the cost variance or capacity variance according to some references. However, it adds another level of analysis regarding the apparent variance at the activity level in the American approach. It distinguishes at this level between activity variance and yield variance. Therefore, it does not differentiate much in the analysis levels between variable indirect costs and fixed indirect costs.

Cost Variance = Actual fixed indirect costs share – Estimated fixed indirect costs share.

Activity Variance = Estimated fixed costs – (Standard fixed cost per work unit × Actual number of work units).

Yield Variance = (Actual number of work units – Standard number of work units attributable to actual production) × Standard fixed cost per work unit.

III-4. The Procurement Budget (Materials Budget)

The procurement budget is considered one of the most important tools that management relies on for decision-making, as it is used as a tool for both planning and control simultaneously. However, this budget does not represent a comprehensive solution to all management problems; it must be used within certain limits, given its dependence on estimates and forecasts related to estimated production volume, market conditions, and the organization's environment (such as demand changes and shifting consumer tastes). Therefore, the results of budgets should be handled with caution, recognizing the surrounding limitations and possibilities of inaccuracy.

After preparing the sales budget and the production budget, the procurement budget must be prepared to determine the necessary quantity of materials and supplies needed to ensure the execution of the production program, focusing on the necessity of purchasing them in appropriate quantities, at suitable prices, with appropriate quality, and taking into account controlling inventory management costs.

III-4-1. Definition of the Procurement Budget

The procurement budget is defined as a quantitative or value-based plan containing estimates of the materials and supplies necessary to execute the production program. It aims to determine the quantities to be purchased at the right times, at the lowest possible cost, while ensuring the required quality.

The procurement budget is used in various economic organizations, whether industrial or commercial, to ensure that production needs for raw materials are met in appropriate quantities and quality, taking into account storage capacity, activity level, and market conditions.

When preparing the procurement budget, the first stage involves estimating the organization's inputs of various goods and materials. The second stage involves determining the optimal order quantity and determining procurement costs as low as possible. The Wilson model will be addressed as it is the most common for calculating optimal order levels, number of orders, and related costs.

The procurement policy in economic organizations always seeks to control costs and the quality of incoming and outgoing material and financial flows. To accomplish this task, the procurement department is usually specialized in two functions:

- **Purchasing function:** Concerned with preparing and submitting purchase orders, receiving purchases, and monitoring market developments.
- **Inventory management function:** Concerned with providing all the physical, accounting, and administrative conditions for managing inventories, allowing for the reduction of storage costs by avoiding excessive stock levels and ensuring no stockouts.

III-4-2. Determining and Calculating Procurement Costs

Procurement cost includes the sum of costs associated with purchasing and storage operations. Through it, the organization seeks to achieve the lowest possible total cost. It is calculated according to the following relationship:

Estimated Procurement Cost = Purchasing Costs + Ordering Cost + Holding and Storage Costs + Stockout Costs + Stock Accumulation

Procurement costs can be divided as follows:

a. Purchasing Costs

These are the total costs borne by the organization for acquiring materials from suppliers. They are calculated using the following relationship:

Purchasing Cost = Purchase price per unit × Number of units purchased

b. Ordering Cost

Represents all the costs borne by the purchasing department from the moment a need for a material is felt until it is received, such as communication, transportation, insurance, and order compliance control costs. It is calculated as follows:

Ordering Cost = Number of orders × Cost per order

c. Holding and Storage Costs

Includes all expenses related to storing materials from the time they enter the warehouse until their use, such as:

- Financing charges (interest on funds invested in inventory).
- Warehouse workers' wages.
- Rental, maintenance, and insurance costs.
- Costs of spoilage, obsolescence, and internal transport.

These costs are often calculated as a percentage of the average annual inventory value.

Holding and Storage Costs = Average Inventory Value × Holding and Storage Cost Rate

Inventory value is calculated according to the following relationship:

Average Inventory Value = Estimated Annual Consumption Value / (2 × Number of Orders)

As for the average holding and storage cost, it is given by the following relationship:

Average Inventory Holding Cost = (Estimated Annual Consumption Volume / (2 × Number of Orders)) × Unit Purchase Price × Holding Cost Rate

d. Stockout Costs

The organization incurs these costs in the event of inventory depletion (stockout). They may include purchasing materials at high prices, loss of customers, or deterioration of the organization's reputation.

e. Stock Accumulation Costs

These result from storing materials that are no longer usable after a certain period. They are measured by the difference between their acquisition cost, their storage cost, and the value that can be obtained from selling or disposing of them.

III-4-3. The Wilson Model for Inventory Management

The Wilson model aims to determine the Economic Order Quantity (EOQ) that achieves the lowest total procurement cost, by balancing ordering costs and holding costs.

The model assumes the following:

- Demand is constant and known.
- Lead time is constant.
- Purchase price is constant.
- No stockouts occur.
- No safety stock exists.

According to the Wilson model, the economic order quantity and the optimal number of orders are those that minimize the total procurement cost. The economic order quantity (Q) is calculated by the following relationship:

$$Q = \sqrt{\frac{2Ya}{PT}}$$

Where:

- **Y:** Annual consumption volume.
- **a:** Ordering cost per order.
- **P:** Unit purchase price.
- **T:** Holding and storage cost rate.

The optimal number of orders (N) is given by the following relationship:

$$N = \sqrt{\frac{CT}{2 \times ca}}$$

Where **C** is the annual consumption value.

III -4-4. Inventory Formation within the Organization

Organizations rely on establishing different levels of inventory to ensure activity continuity. The most important of these are:

a. Minimum Inventory (Critical Stock): The quantity that covers consumption during the lead time. It is calculated as follows:

Minimum Inventory = Daily Consumption × Lead Time

b. Safety Stock: A reserve inventory to face emergencies and irregular supply. It is calculated as:

Safety Stock = Daily Consumption × Safety Period

Procurement Methods in Economic Organizations

Procurement methods vary according to the nature of consumption. The most important are:

- Procurement with equal-sized orders at equal intervals.
- Procurement with equal-sized orders at unequal intervals.
- Procurement with unequal-sized orders at equal intervals.
- The probabilistic method in the case of random consumption.

III-4-5. Procurement Budget Control

The procurement budget is controlled by comparing actual purchases with estimated purchases, calculating variances as follows:

Total Variance = Actual Purchases – Estimated Purchases

Procurement can also be monitored by calculating the inventory turnover ratio, which measures the number of times inventory is converted into sales during a single accounting year. It is calculated by the following relationship:

Inventory Turnover Ratio = Cost of Sales / Average Inventory

This ratio helps evaluate the efficiency of inventory management.

Example:

An organization is supplied with a raw material of Q = 360 units per year. The holding cost per unit is estimated at T = 4, and the ordering cost is estimated at ca = 45.

Required: Determine the optimal order quantity.

Solution: We calculate the total procurement cost for different order quantities:

Item	1	2	3	4	5	6
Order Quantity	360	180	120	90	72	60
Average Inventory	180	90	60	45	36	30
Number of Orders	1	2	3	4	5	6
Holding Cost	720	360	240	180	144	120
Ordering Cost	45	90	135	180	225	270
Total Cost (C)	**765**	**450**	**375**	**360**	**369**	**390**

- Average inventory in quantity = Consumption or purchase quantity / 2N
- Total holding cost = Average inventory × Holding cost per unit

From the table, the optimal number of orders is 4, and the optimal order quantity is 90 units, i.e., when holding cost equals ordering cost.

Optimal number of orders N:

$$N = \sqrt{\frac{CT}{2 \times ca}} \qquad N = \sqrt{\frac{4 \times 360}{2 \times 45}} = 4$$

Optimal order quantity Q:

$$Q = \sqrt{\frac{2Ya}{T}} \qquad Q = \sqrt{\frac{2(360 \times 45)}{4}} = 90$$

Where:

- **Y:** Annual consumption volume.
- **a:** Ordering cost per order.
- **P:** Unit purchase price.
- **T:** Holding and storage cost rate.

III-5. The Investment Budget (Capital Budgeting):

All countries, without distinction, have come to view investment as an imperative and a tool for economic growth, a sensitive element, and an effective tool for economic advancement, through the increased productive capacity and utilization of human resources it achieves, and the realization of economic development. Therefore, we will attempt to provide an overview of

the concept of investment, its most important determinants, and its characteristics as follows:

III-5-1. Concept of Investment

"Investment in general is a series of expenditures followed by a series of revenues over successive time periods. This investment may be tangible (land, buildings, machinery) or intangible (demand money such as bonds and stocks)."[51]

Or: "It is the replacement of a certain, available present financial value, in exchange for the expectation of obtaining future financial income. In other words, it is the preference for future consumption over immediate or present consumption that is forgone."

Investment can also be defined financially and accounting-wise.

1. The Financial Concept of Investment:

Financially, "investment is the acquisition of financial assets, i.e., dealing with money to obtain profits. Dealing with money means forgoing it for a certain period of time in order to obtain future financial flows that compensate for the present value of the invested funds and the risk factor always accompanying the future."

2. The Accounting Concept of Investment:

From an accounting perspective, "investment is the set of properties and permanent assets, whether tangible or intangible, acquired or created by the organization, in order to use them as a permanent means of operation, not for the purpose of selling and disposing of them."[52]

III-5-2. Determinants of Investment

The most important factors determining investment can be summarized as follows:[53]

1. The Most Important Factors Affecting Investment:

1. **Interest Rate:** Represents the cost of using invested capital, with an inverse relationship linking it to the volume of invested funds.
    - An increase in the interest rate leads to increased borrowing costs, thus reducing the volume of loans and investments.
    - A decrease in the interest rate lowers borrowing costs, thus increasing borrowing and investment volume.
    - In the case of inflation, raising the interest rate is preferable; in the case of economic recession, lowering it is advisable.

2. **Marginal Efficiency of Capital:** Refers to the productivity or expected return from investing a specific amount.
    - The relationship between the marginal efficiency of capital and investment is direct; a higher expected return encourages increased investments.
    - Conversely, a lower expected return means declining expected incomes and thus a lower investment volume.
3. **Scientific and Technological Progress:** Leads to the emergence of modern, highly productive machinery and equipment, pushing organizations to replace old ones with new ones to keep up with competition. It also includes advances in research and development fields, which contribute to discovering new energy sources that enhance investment.
4. **Degree of Risk:** The relationship between risk and investment is inverse; the higher the degree of risk, the lower the investment, and vice versa.

   However, the relationship between risk and return is direct, meaning higher risk is usually associated with higher returns. This is why it is necessary to provide guarantees and legislation that encourage investment, especially in developing countries. Political and economic stability also contributes to reducing the degree of risk and encouraging investors.

Additional Factors:

- Existence of an active and efficient financial market.
- Spread of savings and investment awareness among individuals in society.

III-5-3. The Investment Budget and its Preparation Process

Given that investment expenditure decisions are among the most difficult and riskiest decisions, the importance of relying on the investment budget emerges. This budget represents a tool that starts from evaluating investment expenditure proposals, monitoring the pace of completion of the various projects undertaken by the organization, ensuring it follows the optimal path towards achieving the expected objectives of this orientation.

1. Concept of the Investment Budget

The investment budget is nothing more than a quantitative and financial plan for investment activities in the coming period. As such, it is considered a planning and control program for financial management.[54]

From this definition, it becomes clear that the investment budget includes a set of quantitative and financial expressions for a specific program the organization seeks to implement, related to the investment activities and projects it undertakes, by incorporating them within the framework of the investment budget plan that allows for planning and controlling these activities.

It has also been defined as determining what must be spent on investment expenditures, represented by long-term commitments or obligations of significant and large amounts of resources made within the framework of long-term strategic policy.[55]

This definition links the process of preparing the investment budget to the long-term expenditures made by the organization within the framework of its strategic plans related to establishing various investment projects, which have effects extending for many years and can significantly determine its future.

The investment budget has also been defined as the plan for investment spending on fixed and intangible assets, an integrated process undertaken by financial management to analyze investment projects and make necessary decisions to include some of them in the said budget.[56]

This definition shows that the investment budget preparation process starts from the process that allows evaluating investment expenditure proposals and selecting the appropriate project that allows the organization to rationalize this expenditure and achieve the maximum return from it. As such, it is considered a reliable tool for analyzing and evaluating different investment projects.

2. Importance of the Investment Budget

The importance of the investment budget lies in the following:

a. Long-term effects: The fact that the results of these decisions last for a long period means the organization loses a lot of flexibility. For example, if it decides to buy a specific asset with a ten-year economic life, this requires a long waiting period before knowing the final results of this action. In this case, the organization freezes financial amounts during this period and becomes bound by future events[57]. Hence, the importance of making sound estimates of investment needs and corresponding revenues the organization

can achieve from this expenditure emerges, in order to determine the appropriate investment volume sufficient to achieve these revenues.

Incorrect estimation of investment requirements in assets leads to serious consequences. An increase in investment results in unnecessarily high expenses. Insufficient investment results in the organization losing part of its market share if production capacity is inadequate, and attempting to recover it requires significant expenses. Furthermore, if the equipment is not suitably modern, the organization will not be able to compete with other organizations in production.[58]

b. Timing of asset acquisition and their quality: Timing is of great importance. The organization must provide fixed assets at the right time for its needs so that it can meet customer needs for products in the required quantities and at the appropriate time. In this context, an effective investment budget plays a major role in determining the appropriate timing for asset acquisition and improving their quality. If the organization decides to make estimates of its long-term capital asset needs in advance, it is better to purchase and install these assets a suitable period before needing them[59]. However, usually the organization does not send purchase orders for these assets until it finds that the increase in its sales is starting to pressure the available production capacity, which may happen to a large number of organizations simultaneously. Consequently, the simultaneous increase in demand for these assets may render the organizations producing them unable to meet it.

c. Obtaining funds[60]: Another reason for the importance of preparing the investment budget is that the expansion in the volume of capital assets usually requires significant expenditures. Therefore, the organization must plan appropriately before spending a large amount of funds to obtain the necessary financing to cover these expenditures, because the large amounts of money required are not automatically available. The organization also needs to think about a major capital spending program and make necessary arrangements to obtain the required financing early to ensure its availability when needed.

Hence, investment budget decisions are among the most difficult decisions made by financial management in the organization and affect all its departments. Therefore, executive managements must be aware of these various decisions. This process represents a system of interconnected lines with long-term investment decisions. This process is also influenced by the

organization's strategy, which hopes to achieve objectives in a changing environment characterized by many developments. As long as achieving these objectives requires investment expenditures, the organization's strategy is often necessarily the investment budgeting process.

3.Preparation of the Investment Budget

Preparing the investment budget means preparing the project timeline on one hand and the financing schedule on the other[61]. After selecting the appropriate project and determining its various needs, the time distribution of the various related activities and the required expenditures is determined. Then, the corresponding financing sources to cover the related expenses are determined. Investment expenditures can be recorded at three different points in time[62]: the commitment date, the payment date, and the date of receiving the required sales.

The importance of determining the different times at which investment expenditures can be recorded is due to:

1. Commitment Date:

The importance of knowing and determining this date is due to:

- The commitment may turn into a payment of funds in the short term (e.g., paying advances on an order for manufacturing large equipment).
- If the committed party wants to back out of its commitments, it is forced to bear the damages incurred by the other party, which represents a cost to the committed party. Therefore, these dates must be taken into account when preparing the investment budget.
- The committed party must fulfill its commitments regularly.
- Any delay in implementing one stage of the project leads to delays in the commitment dates for other stages.

2. Payment Date:

The importance of knowing these dates is due to the following considerations:

- Due to the significant amounts that must be paid and the impact of these amounts on the organization's treasury.
- Actual amounts often differ from estimated amounts. On the payment date, the organization resorts to taking certain decisions, such as reducing or postponing the project.

3. Receipt Date:

The importance of determining receipt dates allows knowing the extent to which the operations associated with the project (production, sales, etc.) can begin.

III-5-4. Commercial Profitability Evaluation Criteria from the Investor's Perspective

Commercial profitability evaluation criteria are defined as the criteria that concern the individual investor, without considering the project's implications for the national economy. They essentially aim to make the appropriate decision regarding accepting or rejecting a project or choosing between several projects, by comparing expected returns with implementation and operating costs. Several criteria are used for project evaluation and selection, differing in accuracy and complexity. The commercial evaluation is conducted according to prevailing investment conditions. These conditions may be based on complete certainty or be characterized by a degree of risk and uncertainty. Accordingly, the evaluation criteria applied under certainty differ from those used under uncertainty and risk. Given the multiplicity and disparity of these criteria, focus will be placed on the most common and applied in feasibility studies, as they combine theoretical accuracy and practical ease of application. Therefore, we will discuss below the most important commercial profitability evaluation criteria under conditions of certainty, uncertainty, and risk.

1. Commercial Profitability Evaluation Criteria under Certainty Conditions

By certainty conditions, we mean those conditions that allow results to be specific, precise, complete in information, and comprehensive. Each alternative or action has one result and one probability[63]. These methods are divided into two categories: methods that ignore the time value of money, and methods that rely on the time value of money. These are as follows:

First: Methods that do not rely on the time value of money

These methods are used to choose between different investment proposals. Officials in organizations resort to them to solve certain problems. They do not rely on the time value of money. Two methods will be addressed:

- The Payback Period (PP).
- The Accounting Rate of Return (ARR).

1. Payback Period Criterion:

1-1. Concept of Payback Period: This method is considered one of the traditional methods for evaluating investments. Some definitions can be given as follows:

- The payback period is defined as the number of years required to recover the original investment value. The payback period is the number of years within which the enterprise can cover its original investment from annual net cash flows.[64]
- The payback period represents the length of time required for the project to recover its initial investment (i.e., its initial cost). According to this criterion, the project is considered feasible if the estimated payback period is equal to or less than the required period. In the case of several alternative projects, the project with the shortest payback period is considered the best and most feasible.[65]

According to this method, the investor determines a maximum time period for each available investment opportunity to recover the value of his invested funds, and the results of the available investment opportunities are arranged according to the length of the payback period.

1-2. Payback Period Calculation Method:[66]

- **In the case of equal annual net cash flows for the project:** The payback period is calculated as follows:

Payback Period=Initial Investment (Investment Cost) / Annual Net Cash Flow

To illustrate the above relationship, we propose the following applied example: We have two projects (1) and (2). The initial investment amount is estimated at 55,000 DZD and 90,000 DZD, respectively. The annual net cash flow for the two projects is estimated at 10,000 DZD and 20,000 DZD, respectively.

Required: Choose the better project based on the payback period?

Solution:

Payback period for project (1) = 55,000 / 10,000 = 5.5 years (i.e., five and a half years)

Payback period for project (2) = 90,000 / 20,000 = 4.5 years (i.e., four and a half years)

Therefore, we choose project (2) because its payback period is shorter than that of project (1).

- **In the case of unequal annual net cash flows:** The payback period is calculated as follows:

$Dr = I_0 / CFm$

CFm (average annual cash flow) = $\sum CF / n$

To illustrate this, we propose the following example:

In an organization, the investment is estimated at 50,000 DZD with a useful life of 5 years. The net cash flows are shown as follows:

Year	1	2	3	4	5
Cash Flows	10,000	15,000	21,000	24,000	5,000

$\sum$ **CF / n =** (10,000 + 15,000 + 21,000 + 24,000 + 5,000) / 5 = 15,000 = CFm

Dr = I0 / CFm = 50,000 / 15,000 = 3.3333 years + (0.333 × 360 days) = 3 years and 4 months

Method 2: We calculate the ascending cumulative total of cash flows as follows:

Year	Cash Flow	Cumulative Cash Flows
1	10,000	10,000
2	15,000	25,000
3	21,000	46,000
4	24,000	70,000
5	5,000	75,000

Thus, the capital recovery period is between period 3 and period 4. Therefore:

(50,000 - 46,000) = 4,000 → X

(70,000 - 46,000) = 24,000 → 12 months

X = (4,000 × 12) / 24,000 = 3 years and 2 months

1-3. Evaluation of the Payback Period Criterion:[67]

a. Advantages: The advantages of using the payback period are summarized as follows:

- The payback period criterion is characterized by simplicity and ease of calculation, and it is one of the most common and widely used methods.
- This criterion is very important and provides a degree of security for projects whose operations are affected by rapid economic, technological, and technical fluctuations, and which require rapid replacement. Therefore, they are interested in the payback period, preferring it to be short.
- This criterion gives an initial and quick indication of whether the project deserves further research and study.
- This criterion is very important for enterprises suffering from liquidity problems, which are very interested in recovering invested funds in order to reinvest them in other areas.

b. Disadvantages: These can be summarized as follows:

- The payback period criterion ignores the time value of money, because the value of money changes from one year to another due to several influences, the most important of which is inflation.
- This criterion ignores the salvage value of the investment project at the end of its useful life, which has a sales value and constitutes revenue and cash flow for the project.
- The payback period criterion is used to measure the time needed to recover the invested amount or funds, not to calculate profitability. This is completely contrary to the objectives of projects, which are to achieve profitability from investment. In other words, it is concerned with liquidity at the expense of profitability. Therefore, investment decision-makers are required to use this criterion along with one or more other evaluation criteria.

2. Accounting Rate of Return (ARR):

2-1. Concept of Accounting Rate of Return:

It is defined as the percentage ratio between the average annual return and the initial investment cost[68]. Or it is the interest rate that equates the present value of the cash flows generated by the project with the costs required by the proposed project. In other words, it is the ratio of the net profit obtained to the initial investment cost.[69]

2-2. Method of Calculating the Accounting Rate of Return:

The accounting rate of return is calculated according to the following relationship:[70]

ARR = (Average Annual Net Profit / Initial Investment Value) × 100

The net accounting result is calculated after deducting taxes and depreciation. Projects that have an accounting rate of return exceeding the rate set by the organization's managers are accepted. When choosing between several alternatives, the alternative that achieves the highest rate is selected, provided it is greater than the rate set by the organization. The accounting rate of return expresses the accounting method that measures the economic return on invested funds.[71]

To illustrate this, we propose the following example: An investment project, with an estimated investment cost (initial investment) of 240,000 DZD, had the following cash flows over 5 years, according to the following table:

Years	1	2	3	4	5
Cash Flows	60,000	95,000	135,000	150,000	100,000

Required:

1. What is the accounting rate of return?
2. If the optimal rate of return is 30%, what is the investment decision (accept or reject)?

Solution:

1. Calculation of the accounting rate of return:

$$\text{Accounting Rate of Return} = (\text{Average Annual Net Profit} / \text{Initial Investment Value}) \times 100$$

$$\text{Average annual net profit} = (100{,}000 + 150{,}000 + 135{,}000 + 95{,}000 + 60{,}000) / 5 = 108{,}000 \text{ DZD}$$

$$\text{ARR} = (108{,}000 / 240{,}000) \times 100 = 45\%$$

2. The optimal rate of return is 30%, and the calculated ARR is 45%. Since the ARR is greater than the optimal rate of return, the project is accepted.

Generally, there are three cases:

- If ARR = Optimal rate of return: the project is considered acceptable.
- If ARR < Optimal rate of return: the project is considered rejected.
- If ARR > Optimal rate of return: the project is considered acceptable.

2-3. Evaluation of the Accounting Rate of Return Method:

a. Advantages: The most important advantages of using this criterion are summarized as follows:

- This criterion is characterized by ease of calculation and understanding.
- It takes into account the expected profitability factor of the investment, which was neglected by the payback period criterion.
- It is considered a means of self-control over project implementation when compared to the required rate of return.

b. Disadvantages: These are as follows:

- It ignores the time value of money and the cost of invested funds.
- This method only cares about the financial income of the early years and neglects other periods of the project's life.
- It relies on accounting profit rather than cash flows.

Second: Methods that rely on the time value of money

These methods allow taking into account the time value of money for all projects. However, the problem is choosing the discount rate. Usually, the interest rate of the financial market or the internal rate of return is used. We note that in developing countries, determining the discount rate is very difficult due to the absence of a financial market. We will attempt to address some methods that take the time value of money into consideration: Net Present Value (NPV), Profitability Index (PI), and Internal Rate of Return (IRR).

1. Net Present Value (NPV) Criterion:

This criterion was developed to address the most important shortcomings of the previous evaluation criteria.

1-1. Concept of Net Present Value:

It is defined as the difference between the present value of the project's cash flows and the value of the initial investment.[72]

Present value means how much a specific amount of money received in the future (after one year or more) is worth today.[73]

That is, the present value of the project is the value obtained by discounting the difference between incoming and outgoing cash flows each year throughout the project's useful life at a fixed interest rate[74]. From this definition, it becomes clear that the net present value is the difference resulting from the net cash flows expected to be obtained during the project's useful life, evaluated in present terms, and the original investment amount.

According to this criterion, if the NPV is positive, the project is accepted. If the NPV is negative, the project is rejected. When choosing between several projects, the project with the highest NPV is selected.

1-2. Method of Calculating Net Present Value:[75]

- **In the case of equal cash flows,** NPV is calculated according to the following relationship:

$$VAN = CF\left[\frac{1-(1+i)^{-n}}{i} - I_0\right]$$

Where:

- NPV: Net Present Value
- I_0: Initial investment amount of the project
- CF: Annual cash flow
- i: Interest rate or discount rate
- n: Economic or productive life of the project

Generally, there are three cases when calculating the present value:

- **When NPV > 0:** This reflects that the present value of incoming cash flows is greater than the present value of outgoing cash flows, meaning the project is acceptable.
- **When NPV < 0:** This reflects that the present value of outgoing cash flows is greater than the present value of incoming cash flows, thus the project is rejected.
- **When NPV = 0:** This reflects that the present value of outgoing cash flows equals the present value of incoming cash flows. This is the most difficult situation facing the project. In this case, the project owner resorts to calculating the internal rate of return or the profitability index.

To illustrate this, we propose the following example: A company wants to make an investment of 100,000 DZD. The estimated annual net cash flow is 32,000 DZD. The life of the investment is estimated at 5 years. The discount rate is 15%.

Required: Calculate the net present value. Will the company accept or reject the project?

Solution:

1. Calculation of NPV:

$NPV=-100{,}000+32{,}000\times(1-(1.15)^{-5}/0.15)$

$NPV=-100{,}000+32{,}000\times3.35216\approx7{,}286.96$ DZD

Since the NPV of the project is positive (NPV > 0), the project is considered acceptable.

- **In the case of unequal cash flows,** NPV is calculated according to the following relationship:

$$NPV=-I_0+CF_1(1+i)^{-1}+CF2(1+i)^{-2}+...+CFn(1+i)^{-n}$$

Where:

- CF_i: Annual cash flows
- $(1+i)^{-n}$: Present value factor
- i: Cost of financing (interest rate)
- n: Time (years)
- I_0: Initial value of the investment

To illustrate this, we propose the following example:

We have 3 investment projects, with an economic life of 5 years, financing cost for each project is 12%. Their investments and annual net cash flows are shown in the table:

	Project 1	**Project 2**	**Project 3**
Initial Investment (I_0)	90	100	80
Annual Net Cash Flows			
Year 1	25	70	40
Year 2	35	55	40
Year 3	42	42	40
Year 4	55	35	40
Year 5	70	25	40

Required: Find the NPV for each project and select the appropriate project.
Solution: Calculation of NPV for each project:

$$VAN= \sum_{i-1}^{5} \frac{CF_i}{(1+12)^i} - I_0$$

Project 1:

$NPV= [25/(1.12)+35/(1.12)^2+42/(1.12)^3+55/(1.12)^4+70/(1.12)^5]-90$
$=154.79-90=$**64.79**

Project 2:

$NPV=[70/(1.12)+55/(1.12)^2+42/(1.12)^3+35/(1.12)^4+25/(1.12)^5]-100$
$=172.67-100=$**72.67**

Project 3:

$NPV=[40(1.12)+40(1.12)^2+40(1.12)^3+40(1.12)^4+40(1.12)^5]-80$
$=144.19-80=$**64.19**

Thus, the appropriate and most profitable project is Project 2.

Note: In Projects 1 and 2, we note that the annual net cash flows are the same in both projects but in reverse order, yet their total present values (NPV) are not equal. The reason is that the present value decreases the farther the collection period of the flows is from the start date of the investment, due to the decreasing value of money resulting from increasing financing costs.

1-3. Evaluation of the Net Present Value Criterion:

a. Advantages: These are as follows:

- It is considered one of the best methods used in project evaluation because it takes the time factor (time value of money) into account.
- This method helps measure the effectiveness of each investment project.

- It takes into account the cost of invested funds and all cash flows throughout the project's life.

b. Disadvantages:

- This method does not address the problem of uncertainty.
- Difficulty in choosing an appropriate discount rate, because it represents the price or cost of funds, and it is subject to varying expectations, with no common or unified agreement on how to calculate it.
- This criterion expresses the economic return and neglects the expected social return from these projects.
- NPV does not allow comparison of projects with different lifespans.

These criticisms and disadvantages do not diminish the importance of this criterion, but they indicate that relying on it alone is not sufficient.

2. Profitability Index (PI) Criterion:

2-1. Definition of Profitability Index:

It is defined as the criterion that determines the ability of the investment project to generate profit. The PI is calculated when the productive lives of the projects differ, where applying the NPV criterion is difficult. This criterion highlights the profitability of the monetary unit invested.

2-2. Method of Calculation:

This index is calculated by dividing the net present value of cash flows by the initial investment, according to the following relationship:

PI=Net Present Value of Cash Flows / Investment Cost (Initial Investment)

$$IP = \frac{VAN}{Io}$$

Using this criterion, for a single project, the project is profitable if PI > 1. When considering multiple projects, the project with the highest PI is chosen.

From the previous example:

- **Project 1:** PI = NPV / I_0 = 64.79 / 90 = 0.72.
  Each Dinar invested gives an additional NPV of 0.72, or generates a value of 1.72.
- **Project 2:** PI = 72.67 / 100 = 0.73.
  Each Dinar invested gives an NPV of 0.73, or 1.73 DZD in net cash flows.
- **Project 3:** PI = 64.19 / 80 = 0.80.
  Each Dinar invested gives 0.80 DZD NPV, or 1.80 DZD in net cash flows.

Therefore, one Dinar has the highest profitability when invested in Project 3 because it achieves the highest return.

This method is used as a complementary method to the NPV method, for the purpose of ranking projects that achieve a positive NPV with unequal invested funds, where the project with the highest PI is selected.

3. Internal Rate of Return (IRR) Criterion:

3-1. Definition of Internal Rate of Return:

The IRR is defined as the discount rate at which the net present value equals zero[76], i.e., the rate at which the present value of incoming cash flows equals the present value of outgoing cash flows. It is also defined as the discount rate at which the initial investment value equals the present value of the annual cash flows throughout the project's useful life.[77]

The IRR is considered one of the most important criteria used in choosing between different investment projects. The World Bank currently uses it in all types of financial and economic analysis of projects, and it is also used by most international financing institutions when accepting or rejecting projects submitted to them for financing. The IRR represents the highest value of the interest rate that an investor can pay. It takes the following three cases:

- IRR < prevailing market interest rate: the project is profitable (accepted).
- IRR > prevailing market interest rate: the project is losing (rejected).
- IRR = prevailing market interest rate: the project achieves neither profit nor loss.

It is expressed by the following relationship:

$$VAN=0 \longrightarrow \sum \frac{CF}{(1+t)^n} - I_0 = 0 \longrightarrow \sum \frac{CF}{(1+t)^n} = I_0$$

3-2. Method of Calculation:[78]

The common method for calculating the IRR is the trial and error method. Applying this method requires determining the outgoing cash flows (the initial investment required to implement the project). The IRR is found by trial and error, following these steps:

1. Assume an approximate discount rate (guided by the prevailing market interest rate) and use it to estimate the NPV of the project's annual cash flows.

2. If the calculated NPV is positive (NPV > 0), this means the IRR is greater than the selected rate. Then, try a higher discount rate and recalculate the NPV at this new rate.
3. If the calculated NPV is negative (NPV < 0), this means the selected discount rate is higher than the required IRR. Then, try a lower discount rate and recalculate the NPV at this new rate.
4. Continue repeating the previous steps until reaching the IRR that makes the total NPV of the project's cash flows over its useful life equal to zero or very close to it.

In most cases, this method results in one discount rate giving a positive NPV and another giving a negative NPV. To reach the IRR more accurately, the following relationship can be used to determine the discount rate that makes NPV equal to zero:

$$TRI = K1 + \frac{(K2 - K1) \times VAN1}{|VAN2| + |VAN1|}$$

Where:

- K_1: Lower rate
- K_2: Higher rate
- NPV_1: Net present value at the lower rate ($NPV_1 > 0$)
- NPV_2: Net present value at the higher rate ($NPV_2 < 0$)

To illustrate this, we propose the following example:

An organization intends to establish a project with an initial investment value estimated at 10,000 DZD. The project's cash flows for five years are shown in the following table:

Years	**1**	**2**	**3**	**4**	**5**
Annual Flow	3,000	3,500	3,400	2,500	2,500

Required: Find the internal rate of return, given that the prevailing market interest rate is 10%.

Solution:

Assume $K_1 = 10\%$.

Calculate NPV_1:

$NPV1 = -10{,}000 + 3{,}000(1.1)^{-1} + 3{,}500(1.1)^{-2} + 3{,}400(1.1)^{-3} + 2{,}500(1.1)^{-4} + 2{,}500\ (1.1)^{-5} = 1{,}434.14$

Assume $K_2 = 20\%$.

Calculate NPV_2:

$NPV2=-10{,}000+3{,}000(1.2)^{-1}+3{,}500(1.2)^{-2}+3{,}400(1.2)^{-3}+2{,}500(1.2)^{-4}+2{,}500(1.2)^{-5}=-981.52$

Calculate IRR:

$$TRI = 10 + \frac{(20-10)\ 1434{,}14}{|1434{,}14| + |-981{,}52|}$$

TRI= %16

Therefore, the project is considered acceptable because its IRR (≈16%) is greater than the prevailing market rate (10%).

Note: In the case of multiple projects, choose the project with the highest IRR.

3-3. Evaluation of the Internal Rate of Return Criterion:

a. Advantages:

- It takes the time value of money into consideration.
- This criterion is characterized by extreme objectivity, thus it is considered an accurate measure of profitability and clearly expresses the revenues achieved by the investment project.
- It expresses the profitability of the investment project as a percentage, allowing for monitoring and comparison of actual implementation with calculated estimates.
- It can be used with a high degree of confidence to rank projects according to their profitability and feasibility.
- It reflects the degree of risk the project faces by calculating the difference between the IRR and the cost of capital.
- It avoids the problem of choosing the appropriate discount rate to discount the annual net cash flows to arrive at the NPV, a problem from which the NPV criterion suffers.

b. Disadvantages:

- This method is considered somewhat complex and lengthy compared to other criteria.
- It is difficult to apply under conditions of uncertainty.
- Sometimes there are multiple rates (non-conventional cash flows), presenting the problem of which rate to use for evaluation.
- When there are mutually exclusive projects (choosing one prevents choosing another), the NPV criterion is more effective for choosing between them.

2. Commercial Profitability Evaluation Criteria under Uncertainty Conditions:

These criteria differ from the previous ones because the probabilities of profit situations are different and unknown. Sometimes, investment organizations lack information related to the proposed alternatives, which makes investment in those alternatives characterized by uncertainty. Hence, the need for other methods to evaluate projects under uncertainty conditions arose.

Uncertainty conditions can be defined as "the natural situations that occur in the future and affect decision-making, in which it is impossible to predict the probability distributions of those situations. However, the personal judgment of the decision-maker is used, and his judgment depends on the extent of his tendencies and expectations for the future (optimism or pessimism)." Or it is a situation that describes a situation where investment decision-makers lack sufficient historical data and information to give probability estimates, making forecasting difficult or impossible due to the decision-maker's lack of sufficient information[79]. The most important criteria used for evaluation under these conditions are as follows:

First: Mathematical Expectation Criterion: E(X)

1-1. Definition:

Mathematical expectation can be defined as the sum of the products of each variable multiplied by its probability of occurrence. The mathematical expectation is symbolized by E(X)[80], and the following formula can be given:[81]

$$\mathbf{E(X)=\sum Xi \cdot Pi}$$

Where:

- X_i: Cash flows
- P_i: Probability of these variables occurring

To illustrate this, we propose the following example:

A study office is presented with two projects for study. The initial value of project (1) is 12,000 DZD, and for project (2) is 14,000 DZD. The productive life of both projects is 10 years. These two projects may face five different economic conditions:

- Severe depression
- Moderate depression
- Normal conditions
- Moderate boom

- Severe boom

The cash flows for the two projects and their probabilities of occurrence are shown in the following table:

Table of expected cash flows for the two projects and their probabilities:

Economic Condition	Project (1)		Project (2)	
	Expected CF	Probability	Expected CF	Probability
Severe Depression	4,000	0.20	2,500	0.15
Moderate Depression	3,000	0.15	3,200	0.20
Normal Conditions	4,500	0.30	4,050	0.30
Moderate Boom	4,800	0.20	5,100	0.25
Severe Boom	5,000	0.15	6,000	0.10

We multiply the potential flow for each condition by the probability of that condition occurring, as shown in the following table:

Table showing the expected value for two projects based on probabilities:

Economic Condition	Project (1)	Project (2)		
	CF × Probability	Expected Value	CF × Probability	Expected Value
Severe Depression	0.20 × 4000	800	0.15 × 2500	375
Moderate Depression	0.15 × 3000	450	0.20 × 3200	640
Normal Conditions	0.30 × 4500	1350	0.30 × 4050	1215
Moderate Boom	0.20 × 4800	960	0.25 × 5100	1275
Severe Boom	0.15 × 5000	750	0.10 × 6000	600

Total	**E(X) for Project 1**	**4310**	**E(X) for Project 2**	**4105**

Therefore, we choose Project (1) because $E(X)_1 > E(X)_2$.

Second: Decision Tree Criterion:

It can be said that the decision tree criterion is considered one of the most widely used criteria in decision-making under uncertainty using probabilities.[82] A decision tree can be defined as a graphical form showing the sequence of expected decisions under possible situations. This tree consists of branches, each branch representing one of the presented alternatives. The number of alternatives represented by the branches of the decision tree depends on several variables that the analysis may include.[83]

To be able to rely on the decision tree method, we must put the problem in the form of a tree (set) of decisions. The following steps must be followed to have a valid decision tree:[84]

- Start by drawing the main decision point in the form of a square or rectangle.
- From the decision point, several branches branch out according to the number of available alternatives for study; each branch represents an alternative.
- From each alternative point, several other sub-branches branch out according to the expected events.
- We place the expected financial data for each alternative: we put the investment cost or the capital amount related to each alternative on its branch, then we put the monetary value related to each event on the branch representing the event.

To illustrate this, we propose the following illustrative example:

Organization "E" is considering the possibility of launching a new product. If it does so, demand can take 3 cases:

First year:

- Case 1: Weak demand, result = 20 units (monetary units, e.g., thousands)
- Case 2: Medium demand, result = 70 units
- Case 3: Strong demand, result = 100 units

Second year: The organization tries to apply a new pricing policy in the case of weak and medium demand, and to make an additional investment in the case of strong demand.

- Changing the pricing policy costs 10 monetary units.
- Additional investment costs 50 monetary units.

Expected results for the second year are as follows:

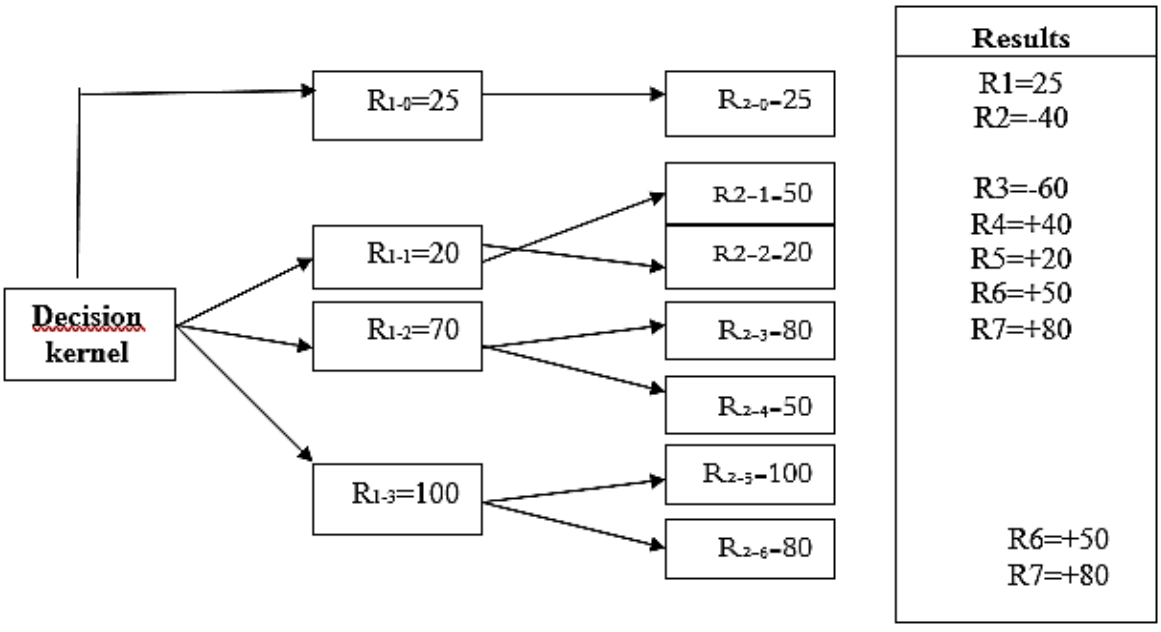
1. In case of weak demand:
    - With price change: result = 50 units
    - Without price change: result = 20 units
2. In case of medium demand:
    - With price change: result = 80 units
    - Without price change: result = 50 units
3. In case of strong demand:
    - With additional investment: result = 100 units
    - Without additional investment: result = 80 units

The cost of launching the product in the market is 100 units. If the organization does not do this, it maintains an annual result estimated at 25 units.

Required: Construct the decision tree. What decision does the organization make?

Solution:

a. Constructing the decision tree



Based on the results shown in the decision tree, the organization should launch the new product but without making an additional investment, as this will achieve the highest result (80 units).

4. Commercial Profitability Evaluation Criteria under Risk Conditions

Risk conditions express situations where various alternatives have several possible states, and the occurrence of any one of them cannot be determined specifically and with certainty. Thus, risk can be defined as "the relative standard deviation of expected investment returns, meaning the degree of fluctuation in expected investment returns. This degree of risk increases as the degree of fluctuation in expected revenues and returns increases."[85]

Risk can be measured using one of the following criteria:

First: Standard Deviation and Coefficient of Variation

1-1. Standard Deviation:[86]

Mathematically, it is defined as the square root of the sum of the squared deviations of values from their arithmetic mean. The standard deviation is used to measure risk. It helps measure the degree of dispersion of the expected return around its expected value. The standard deviation is reached using the following steps:

- Calculate the mathematical expectation as seen in the previous section.
- Subtract the expected value from each possible outcome or each potential cash flow to obtain the sum of deviations from this value.
- Square each deviation, then multiply the squared deviation by the probability of occurrence of the cash flow corresponding to the outcome, then sum all of that to obtain the variance of the probability distribution. This is done using the following equation:

$$\delta^2 = \Sigma(Xi - X)^2.Pi$$

- The standard deviation is obtained by calculating the square root of the variance as follows:

$$\delta = \sqrt{\Sigma(xi - x)^2.pi}$$

To illustrate this, we propose the following illustrative example: An organization has two projects to choose between. The cash flows for the two projects and their probabilities of occurrence are shown in the following table, noting that the project faces 5 different economic conditions.

Required: Calculate the standard deviation for the two projects and choose the better project.

Table of cash flows for the two projects and their probabilities of occurrence:

Economic	Project (1)		Project (2)	
Condition	Expected CF	Probability	Expected CF	Probability
Severe Depression	3000	0.15	2000	0.10
Moderate Depression	3500	0.20	3000	0.20
Normal Conditions	4000	0.30	4000	0.35
Moderate Boom	4500	0.20	5000	0.25
Severe Boom	5000	0.15	6000	0.10

1. Calculation of Standard Deviation:

- **For Project 1:**

$\bar{X}1 = \Sigma Xi/n = (3000+3500+4000+4500+5000)/5 = 4000$ $\quad \bar{X}(1) = 40000.$

$\delta 2 = (3000-4000)^2.0,15+(3500-4000)^2.0,20+(4000-4000)^2.0,3+(4500-4000)^2.0,20+ (5000-4000)^2.0,15$ $\quad \delta^2 = 400000$

Thus, the standard deviation for project (1) is: $\sqrt{\delta^2} = \sqrt{400000} = 632\ ,\ 455$

- **For Project 2:**

$\bar{X}2 = \Sigma Xi/n = (2000+3000+4000+5000+6000)/5 = 4000$ $\quad \bar{X}(2) = 4000$

$\delta 2 = (2000-4000)^2.0,10+(3000-4000)^2.0,20+(4000-4000)^2.0,35+(5000-4000)^2.0,25+(6000-4000)^2.0,10$ $\quad \delta^2 = 1250000$

Thus, the standard deviation for project (2) is: $\sqrt{\delta^2} = \sqrt{1250000} = 1118,03$

Therefore, we choose Project (1) because it is better than Project (2), as Project (1) has a lower degree of risk compared to Project (2).

1-2. Coefficient of Variation:

Some problems may appear when using the standard deviation as a measure of risk, especially in the case where the standard deviations of the projects under consideration are equal. It is calculated according to the following relationship:

$$\text{Coefficient of Variation} = \frac{Standard\ Deviation}{Expected\ Value\ (Expected\ Return)}$$

To illustrate this, we propose the following example: We have two projects, "X" and "Y". The expected return for the two projects is estimated at 800 DZD and 3000 DZD, respectively, while the standard deviation for both projects is estimated at 400.

Required: Calculate the coefficient of variation for the two projects. Which one is riskier?

Solution:

1. Calculation of the coefficient of variation:

- For project "X": Coefficient of Variation (CV)=400/800=0.5
- For project "Y": Coefficient of Variation (CV)=400/3000=0.13

Thus, according to the coefficient of variation, project "X" is riskier than project "Y".

Second: Maximin Criterion (Wald's Criterion):

The perspective of this criterion is pessimistic because it favors the project that achieves the highest possible profit under the worst conditions. This criterion selects the worst conditions and then chooses the alternative that achieves the highest profit. This criterion allows identifying projects that maximize the minimum possible profit (Maximin).

To illustrate this, we propose the following example:

Company (A) produces widely consumed goods, holding 28% of the market share, compared to 40% and 20% for the main competitors in the market, with the remainder for new and small companies. Organization A wants to increase its market share and has 4 strategies for that:

- Alternative 1: Launch a new product in the market.
- Alternative 2: Carry out an advertising campaign to promote its products.
- Alternative 3: Adopt a discount policy on sales of its current products.
- Alternative 4: Apply a price reduction policy.

Choosing any alternative also entails certain reactions from competitors. The organization has anticipated that the reactions could take 3 forms:

- Fast and strong reaction
- Moderate reaction
- Weak reaction

The organization has expressed each expected event from each policy or investment alternative in the form of numerical estimates of expected gains, as follows:

Table showing investment policies and expected gains according to reactions:

Expected Gains	Reactions		
Data	**Fast & Strong Reaction**	**Moderate Reaction**	**Weak Reaction**
1. New Product	-850	960	1890
2. Advertising Campaign	-50	220	950
3. Discount on Sales	-600	700	1200
4. Price Reduction	-230	480	1000

Source: Abdel Ghaffar Hanafi, Rasmia Gharigas, Fundamentals of Investment and Finance, University Publishing House, Alexandria, 2000, p. 368.

Required: How to choose between these alternatives and policies by applying the Wald criterion (Maximin)?

Solution: We choose the minimum expected gains from each alternative:

- Alternative 1: -850
- Alternative 2: -50
- Alternative 3: -600
- Alternative 4: -230

According to this criterion, the second investment alternative (advertising campaign) is chosen. This means that, under the worst conditions, conducting an advertising campaign is preferable to achieve the highest profit.

Third: Laplace Criterion:

This criterion allows identifying projects that maximize the mathematical expectation of profits. This criterion assumes equal probabilities for the expected states (principle of insufficient reason).[87]

According to this criterion, the comparison between investment policies is made by selecting the alternative that achieves, on average, the maximum expected cash gains, using the following formula:

$$\mathbf{X=\sum Xin}$$

Where:

- n: Number of possible states
- X_i: Expected events

According to this criterion, the first alternative (new product) is chosen because it has the highest average.

Fourth: Hurwicz Criterion:

The perspective of this criterion is optimistic. Hurwicz believed that "it is illogical to neglect or ignore high results in favor of low ones." So, his criterion combines the worst and best results.[88]

Hurwicz expressed his idea in the following formula:

$H=(1-\alpha)m+\alpha M$

Where:

- m: Represents the worst (minimum) result
- M: Represents the best (maximum) result
- α: Represents the coefficient (index of optimism), ranging between 0 and 1, reflecting the decision-maker's degree of optimism (0 = pessimism, 1 = optimism).

Applying this criterion to the previous example, assuming $\alpha = 0.7$:

- $H_1 = (1-0.7)\times(-850) + 0.7\times1890 = -255 + 1323 = 1068$
- $H_2 = (1-0.7)\times(-50) + 0.7\times950 = -15 + 665 = 650$
- $H_3 = (1-0.7)\times(-600) + 0.7\times1200 = -180 + 840 = 660$
- $H_4 = (1-0.7)\times(-230) + 0.7\times1000 = -69 + 700 = 631$

According to this criterion, the appropriate alternative is the first alternative (launch a new product in the market).

Fifth: Savage Criterion (Minimax Regret):

This criterion allows identifying projects that achieve the minimum possible regret (opportunity loss). Since the available financial resources of any enterprise are limited, it is impossible for it to accept all proposed projects. One is chosen, and the other alternatives presented to management are rejected, thus depriving the enterprise of the opportunity to achieve the estimated profits from these alternatives.

"If the enterprise finds, after implementing the chosen project, that the profits achieved from it are less than the profits of the other alternative projects that were available to it, management feels sorry and regret for losing these profits. To avoid this, this criterion allows identifying projects that minimize the state of loss and regret as much as possible."[89]

The amount of regret (opportunity loss) is determined by subtracting the highest gain (or the highest value) from the other gains specific to each investment alternative for each expected event.

To illustrate this, we return to the data of the previous example and take the highest gain for competitor reactions (fast & strong, moderate, weak). We find that the highest gains are -50 DZD, 960 DZD, and 1890 DZD,

respectively. Then, we subtract this value from itself and from the other values in the same column, obtaining the following results (the amount of regret the organization might bear compared to the highest possible return):

Table showing the amount of regret (opportunity loss):

Expected Events	Fast & Strong Reaction	Moderate Reaction	Weak Reaction	The least possible loss *
Investment Policies (Alternatives)				
New Product	800	0	0	800
Advertising Campaign	0	740	940	940
Discount on Sales	550	260	690	690
Price Reduction	180	480	890	890

(*) We choose the highest value (maximum regret) for each alternative (in each row).

Based on the data in the previous table, the third alternative (adopting a discount policy on sales) is considered the optimal alternative because it results in the minimum possible regret (690) under the worst expected conditions (minimax regret).

III-6. The Cash Budget

III -6-1. Concept of Cash Management, its Importance, and Types

1. Concept of Cash Management:[90]

It is an estimate of the organization's payments and receipts during a specific period. Thus, it is not a cost budget. Therefore, the cash budget is generally not prepared on an annual basis but on a monthly basis, and sometimes distributed weekly. It is considered a cash planning tool and aims to study the organization's financing situation and cash liquidity.

The cash budget shows us the amount of cash liquidity remaining in the treasury or bank at the end of each period (week, month, quarter), taking into account only receipts and payments.

If we want to maintain a minimum cash balance, and if the amount falls below this minimum, the budget shows the amount that must be arranged, i.e., the amount to be borrowed to cover the cash deficit. It also aims to determine the organization's cash surplus and the timings when this surplus will be achieved, for short-term investment.

Finally, this budget shows when we can invest (in case of surplus) and when we must borrow (in case of deficit).

In other words, the cash budget shows the plan of cash receipts and payments for the project.[91]

III-5-2. Importance and Objectives of the Cash Flow Budget

1. Importance of Preparing the Cash Budget:[92]

The importance of the treasury budget (cash budget) lies in the fact that it works to achieve several purposes, including showing the expected cash liquidity position before implementation begins, and showing the need for additional financing. Undoubtedly, this reason may be what drives banks to request the cash budget from any organization seeking a loan, so that the bank has a clear view of the liquidity choke points and when the organization will be able to repay the loan in the future. This budget also helps establish foundations for controlling cash flow sources and their uses.

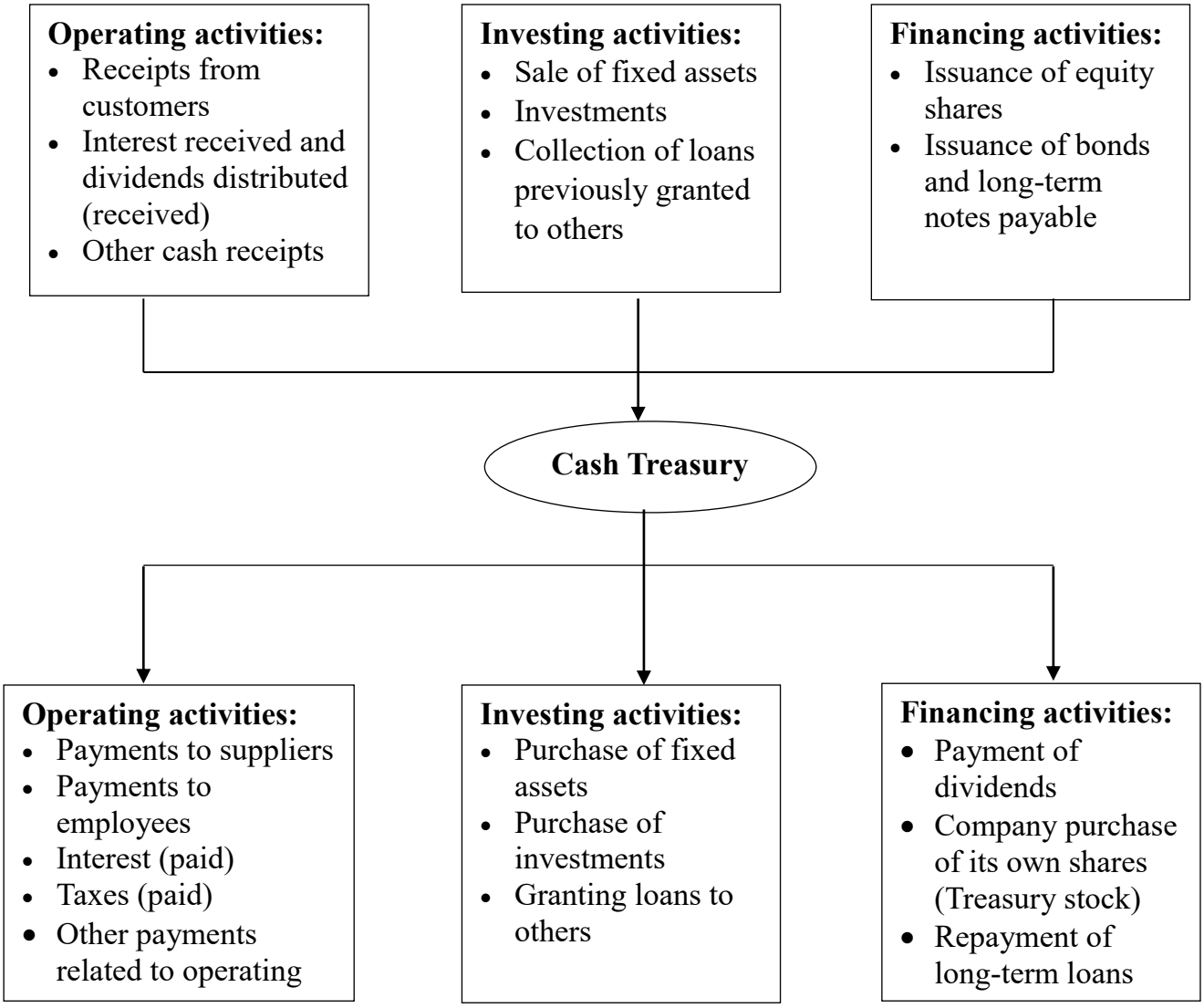
2. Objectives of the Cash Budget:

This budget aims to determine the organization's cash surplus and the timings when this surplus will be achieved, which helps it renew the uses of this cash surplus.

The cash budget aims to plan cash receipts and payments during a specific period with a sufficient degree of accuracy and detail to ensure activity continuity, meet obligations, and manage cash resources precisely, correctly, and appropriately to achieve the organization's objectives and goals.

The components of cash flow can be illustrated through the following figure:

Figure (II-2): Components of the Cash Budget.



Source: Mohamed Sami Radhi, Modern Approach to Budget Preparation and Use, University Publishing House, Printing, Publishing and Distribution, Alexandria, 2001, p. 24.

III-5-3. Cash Flow Forecasting and Control

1. Cash Flow Forecasting in the Organization:

Cash flow means the movement of cash resources owned by the organization, starting from obtaining them, then using them in several areas, and then their return as cash resources. The direct estimation method of cash receipts and payments is used for cash flow forecasting. It is the most common method in practical application because it relies on detailed forecasting of each item of cash receipts and payments, allowing estimation of the extent of change in

receipts and payments. This method is particularly suitable for organizations whose activity is subject to wide fluctuation.

1. Estimating Cash Receipts:

Receipts received by the organization can be divided into receipts from cash sales, receipts from receivables, and receipts from other revenues.

a. Cash Sales Receipts: Sales are the most important source of cash receipts and the most complex element to estimate. Cash receipts or part of them may be collected directly with sales orders, while a long period may elapse between the sale and collection. Some companies operate on a cash-on-delivery basis, others require advance payment, and some combine both principles.

In the case of credit sales, relying on the sales budget to estimate cash receipts from sales is more complex and requires more detail. Usually, some customers pay before the discount period ends, while others delay payment. This affects the cash flow of receipts in terms of timing and amount. Therefore, intensive studies must be conducted to understand the characteristics of the collection system in each organization, as it also varies according to the type of activity.

b. Receipts from Receivables:

At the beginning of the budget period, the company has amounts due in accounts receivable representing goods sold during the previous period but whose value has not yet been collected. These must be included in the months in which they are expected to be collected.

c. Other Receipts: These include receipts resulting from:

- Disposal of investments
- Issuance of new shares
- Long and medium-term loans
- Investment interest

The important thing about sources is knowing the dates of obtaining them.

2. Estimating Cash Payments:

Cash payments are determined according to the nature of the activity the organization undertakes. For production organizations, their cash payments consist of raw material purchases, wage costs, and various other expenses (selling and distribution expenses, administrative and financial expenses, rent, taxes, distributed dividends, etc.). To arrive at cash payment values, we refer to the various operating budgets (sales, labor, etc.).

Estimating the Cash Balance: After preparing the estimates of receipts and payments, and taking into account the cash balance at the beginning of the period:

Ending Cash Balance=Beginning Cash Balance+Total Receipts−Total Payments

The beginning balance is used to determine the increase or decrease in cash liquidity. Generally, a minimum cash balance (safety buffer) must be maintained. By comparing the cash surplus or deficit with the minimum required balance, the amount to be borrowed and the borrowing date, or the amount that can be invested in the short term and the investment date, can be determined.

We conclude that an organization that forecasts its cash balance benefits by determining the amount of cash deficit that must be covered through short-term borrowing or overdraft. Cash balance planning also helps the organization know the timing of its cash needs.

Preparing the Cash Budget:

The cash budget is prepared for a period estimated at one year or six months, and this period is divided monthly or weekly. The preparation of this budget takes the form of three tables:

- Table of cash receipts
- Table of cash payments
- Table of the cash budget

2. Control of the Cash Budget:

The organization needs an effective control system over its cash flows, as the liquidity position of the organization is of utmost importance for the smooth running of its operations. This requires two levels of control:

1. **Continuous daily control** over cash movements and available balances, to ensure the organization's ability to meet its current obligations on time, maximize the benefit from surplus cash, and/or reduce the cost of financing. This level of control is achieved through daily and weekly movement registers and statements of the cash box and banks, in addition to inventorying expected receipts and anticipated payments over the coming days and weeks and monitoring them closely.
2. **Monthly and periodic control:** Over cash movements and available balances, comparing them to those estimated in the cash budget,

identifying variances, and analyzing their causes in preparation for making appropriate decisions to address negative variances and maximize the benefit from the causes of positive variances. These decisions can include:

1- Modifying the organization's policies regarding credit, discounts, and collection.
2- Increasing efforts to collect accounts receivable.
3- Reducing costs.
4- Deferring investment projects.
5- Reducing inventory balances.
6- Deferring debt payments to suppliers or agreeing with them on other payment terms.
7- Modifying the cash budget for the coming months to reflect changes in the organization's activities that affected the results of previous periods, in addition to incorporating the impact of decisions made to address future variances.

III-6-4. Case Study on the Cash Budget

The monthly sales estimates for Al-Manar Organization, prepared by the marketing department, are shown in the following table:

Month Product	Jan	Feb	Mar	Apr	May	Jun
S (Quantity)	9,000	9,000	10,000	8,000	7,000	7,000
A (Quantity)	235,000	230,000	235,000	170,000	150,000	170,000

Selling price excluding tax (HT) for product S = 26 monetary units/unit
Selling price excluding tax (HT) for product A = 12 monetary units/unit
The general terms of sales settlement by customers are as follows:

Product "S" Customers:

- 10% of the amount excluding tax at the time of order placement (on average, one month before delivery).
- 50% of the invoice value upon delivery.
- The remaining 30% after two months.

Product "A" Customers:

- 20% upon delivery.
- 50% after 30 days (one month).
- The remaining 30% after two months.

On 31/12/N, the accounts receivable (customers) have debit balances with the following values:

- Sales of product "A" for November N: 3,415,680 monetary units
- Sales of product "A" for December N: 3,486,840 monetary units

Required:

1. Prepare the sales budget for products "S" and "A" for the first half of year (N+1), noting that VAT = 19.6%.
2. Prepare the receipts budget for customer receivables for products "S" and "A" for the first half of year (N+1).
3. Determine the balance of the accounts receivable (customers) account as of June 30, (N+1).

Solution:

1. Preparation of the Sales Budget for the First Half (N+1)

a. Product "S"

	Jan	Feb	Mar	Apr	May	Jun
Quantity	9,000	9,000	10,000	8,000	7,000	7,000
Total Turnover HT	225,000	225,000	250,000	200,000	175,000	175,000
TVA (19.6%)	44,100	44,100	49,000	39,200	34,300	34,300
Turnover TTC	269,100	269,100	299,000	239,200	209,300	209,300

b. Product "A" (Price = 12)

	Jan	Feb	Mar	Apr	May	Jun
Quantity	235,000	230,000	235,000	170,000	150,000	170,000
Total Turnover HT	2,820,000	2,760,000	2,820,000	2,040,000	1,800,000	2,040,000
TVA (19.6%)	552,720	540,960	552,720	399,840	352,800	399,840
Turnover TTC	3,372,720	3,300,960	3,372,720	2,439,840	2,152,800	2,439,840

2. Preparation of the Receipts Budget for Customer Receivables:

a. Product "S"

	January	February	March	April	May	June
Deposit on order	22,500	25,000	20,000	17,500	17,500	-
50% upon delivery	134,550	134,550	149,500	119,600	104,650	104,650
Remaining (customer balance)	-	112,050	94,600	159,400	117,050	87,150
Total	**157,050**	**271,600**	**264,100**	**296,500**	**239,200**	**191,800**

b. Customers for sales of November N:

- Month of January: 3,415,680 × 30% = 1,024,704

Sales expenses for December N:

- Month of January: 3,486,840 × 50% = 1,743,420 (N+1)
- Month of February: 3,486,840 × 30% = 1,046,052 (N+1)

b. Preparation of the receipts budget for product "A"

	January	February	March	April	May	June
Customer balance (previous)	2,768,124	1,046,052				
Sales /01	674,544	1,686,360	1,011,816			
Sales /02		660,192	1,650,480	990,288		
Sales /03			674,544	1,686,360	1,011,816	
Sales /04				487,968	1,219,920	731,952
Sales /05					430,560	1,076,400
Sales /06						487,968
Total	**3,442,668**	**3,392,604**	**3,336,840**	**3,164,616**	**2,662,296**	**2,296,320**

Customer account balance as of June 30, N+1

- Product "S": 87,150
- Product "A":
  - For May: 2,152,800 - (70% × 2,152,800) = 645,840
  - For June: 2,439,800 - (20% × 2,439,800) = 1,951,840

Customer account balance as of 30/06/N+1 = 87,150 + (645,840 + 1,951,872*) = 87,150 + 2,597,712 = 2,684,862

Thus **The balance = 2,684,862**

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Applied Chapter:
Solved Case Studies

Case Study No. 01

❖ **Part I:** The company "Abdel Rahman" manufactures a single product. At the end of the year 2025, the quantity of products and annual sales reached 100,000 units at a total cost of 880,000 DZD.

Required:

1. Knowing that the unit selling price is 10 DZD and that the company has a contribution margin equal to 40% of net turnover, find the amount of variable costs and fixed costs, and prepare a differential operating statement in terms of value and percentage.
2. Find the equation of total costs "Y" as a function of "X," which represents the annual net turnover.
3. Calculate the break-even point in value, quantity, and time, both mathematically and graphically (represent graphically using three different methods).
4. Calculate the margin of safety, its rate, and the break-even date.
5. Find the turnover required to achieve a net result of 250,000 DZD.
6. Calculate the result required to achieve a turnover of 1,200,000 DZD.

❖ **Part II:** In the coming year, the company wishes to make a new investment (purchase of new equipment). After conducting a preliminary study, the company forecast the following for the next period:

- A 20% increase in sales volume with a 5% reduction in selling price.
- A 10% decrease in variable costs.
- An increase in fixed (structural) costs by 10,000 DZD.

Required:

1. Calculate the expected result for the coming year.
2. Calculate the new break-even point, margin of safety, and its rate.
3. Is it in the company's interest to accept or reject this investment project? Justify your answer.

Model Solution for Case Study No. 01

1. Preparation of the differential operating statement:

Contribution margin = 40% of Net Turnover = 0.4 × 1,000,000 = 400,000 DZD

Item	Amount	Percentage
Net Turnover = 100,000 × 10 = 1,000,000 DZD	1,000,000	100%
Variable Costs	600,000	60%
Contribution Margin	400,000	40%
Fixed Costs	280,000	28%
Operating Result	120,000	12%

Contribution margin = Turnover – Variable Costs ⇒ Variable Costs = Turnover – Contribution Margin = 400,000 DZD

Result = Contribution Margin – Fixed Costs ⇒ Fixed Costs = Contribution Margin – Result = 280,000 DZD

2. Finding the equation of total costs:

Y = aX + b

Y = 0.6X + 280,000, where X = Net Turnover, a = Variable cost percentage, b= Fixed Costs

3. Calculation of the break-even point mathematically and graphically:

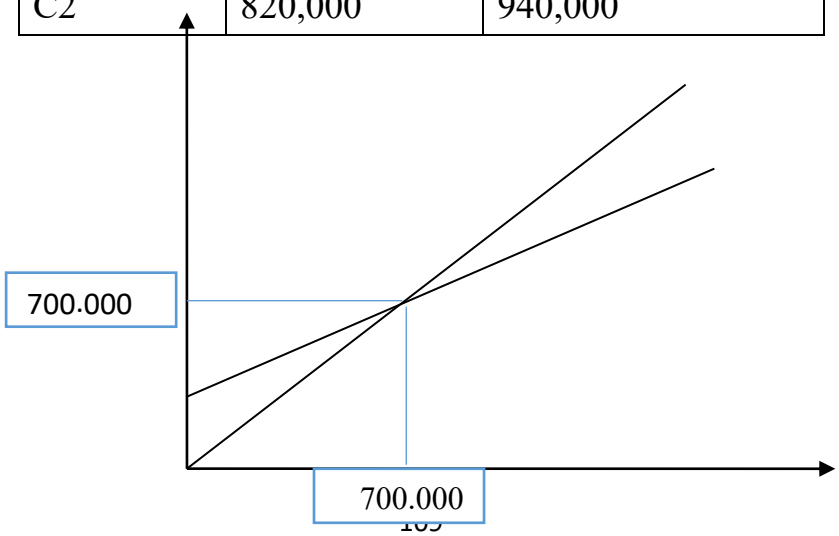
BEP (value) = Fixed Costs / Contribution Margin Rate = 280,000 / 0.4 = 700,000 DZD

Graphically using the method Turnover = Total Costs:

C1 = X

C2 = 0.6X + 280,000

X	900,000	1,100,000
C1	900,000	1,100,000
C2	820,000	940,000



Calculation of the margin of safety, its rate, and the break-even date:

Margin of Safety = Actual Turnover – BEP = 1,000,000 – 700,000 = 300,000

Margin of Safety Rate = [Margin of Safety / Actual Turnover] = 300,000 / 1,000,000 = 0.3

Break-even date: [BEP / Actual Turnover] × 12 = [700,000 / 1,000,000] × 12 = 8.4 months

That is, the break-even point is achieved after 8 months and 12 days.

4. Calculation of the turnover required to achieve a net result of 250,000 DZD:

Expected Turnover = [Fixed Costs + Expected Result] / Contribution Margin Rate

= [280,000 + 250,000] / 0.4 = 1,325,000 DZD.

The result required to achieve a turnover of 1,200,000 DZD is:

Result = (Contribution Margin Rate × Turnover) – Fixed Costs

For X = 1,200,000 = (0.4 × 1,200,000) – 280,000 = 200,000 DZD.

Study of next year's forecasts:

Item	Amount	Percentage
New Net Turnover = 1,000,000 × 1.2 × 0.95	1,140,000	100%
New Variable Costs = 600,000 × 1.2 × 0.9	648,000	56%
New Contribution Margin	492,000	44%
New Fixed Costs = 280,000 + 10,000	290,000	
Expected Operating Result	202,000	17%
New BEP = New FC / New CM Rate	659,091 DZD	
New Margin of Safety = New Turnover – New BEP	480,909 DZD	42%

Commentary:

Thus, it is in the interest of the company to undertake this investment, because this will allow it to achieve a result exceeding the previous result by 5%, and also allow it to achieve a larger margin of safety that will enable it to carry out its activity with complete comfort, with a safety margin of 42%, thereby moving the company completely away from the operating risk zone.

Case Study No. 02 - Variable Costs and the Break-Even Point -

Company "Jarjara" produces and markets product X. The current market is the central region of Algeria, where it has a contract with a customer as the sole distributor. The contract period extends for the next five years at a price of 400 monetary units per unit. The following information is available:

1. Cost of raw materials used: 4,000,000 MU
2. Wages of production line workers: 2,000,000 MU
3. Direct industrial expenses: 1,000,000 MU
4. Other industrial expenses (fixed): 50,000 MU
5. Direct marketing costs: 200,000 MU
6. Other marketing costs (fixed): 80,000 MU
7. Administrative costs: 170,000 MU

Knowing that the maximum production capacity of this enterprise is 30,000 units, while the units sold amounted to 20,000 units.

Required:

1. Calculate the company's result and determine the break-even point in value and quantity, and represent it graphically using only one graphical representation.

Due to intense competition, and seeking to achieve better profitability, the company conducted marketing studies and research in other regions in an attempt to find new markets. It concluded that it is possible to market 10,000 units in the southern region, but this requires the following expenses:

a. Sales transport expenses estimated at 5 MU/unit

b. Payment of salaries to point-of-sale workers amounting to 200,000 MU annually

c. Other marketing expenses estimated at 50,000 MU annually

Knowing that the selling price in the southern region can be increased by 12.5% compared to the central region price.

Required:

Is it in the company's interest to market its products in the southern region?

Model Solution for Case Study No. 02

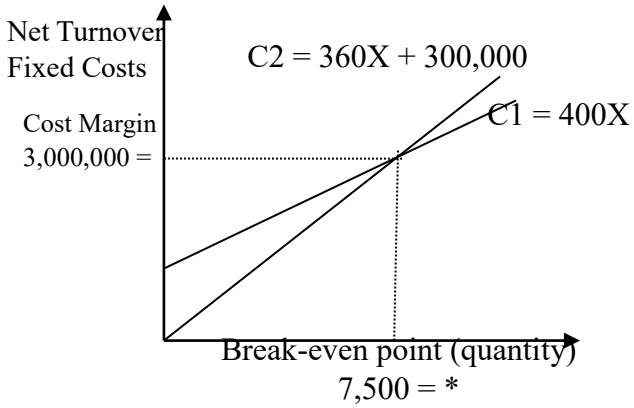
1. Calculation of the result:

Item	Partial Amounts	Total Amounts	Percentage
Net Turnover = 400 × 20,000		8,000,000	100%
Variable Costs		7,200,000	90%
Raw materials	4,000,000		
Workers' wages	2,000,000		
Direct industrial expenses	1,000,000		
Direct marketing costs	200,000		
Contribution Margin		800,000	10%
Fixed Costs		300,000	3.75%
Other industrial expenses	50,000		
Other marketing costs	80,000		
Administrative costs	170,000		
Result		**500,000**	**6.25%**

Calculation of the break-even point in value and its graphical representation:

BEP (value) = [Fixed Costs / Contribution Margin Rate] = [300,000 / 0.1] = 3,000,000 MU

BEP (quantity) = [Fixed Costs / Unit Contribution Margin] = [300,000 / 40] = 7,500 units



b. Graphically:

Using the method Turnover = Variable Costs + Fixed Costs

We have:

C1 = aX = 400X

C2 = aX + Fixed Costs = 360X + 300,000

Calculation of the result for the southern region and the company as a whole:

Item	Central Region	Southern Region	Total Company
Net Turnover	**8,000,000**	(10,000 × 400 × 1.125) = 4,500,000	**12,500,000 MU**
Variable Costs	**7,200,000**	3,650,000	**10,850,000 MU**
		Transport costs: 10,000 × 5 = 50,000 Variable costs: 10,000 × 360 = 3,600,000	
Contribution Margin	**800,000**	850,000	**1,650,000**
Fixed Costs	**300,000**	Fixed costs: 250,000 Worker salaries: 200,000 Marketing expenses: 50,000	**550,000**
Result	**500,000**	**600,000**	**1,100,000**

Model Solution for Case Study No. 02

An organization produces electronic products: 4 devices of type A for each device of type B. All products are distributed, therefore there is no ending inventory. Within the framework of the organization's policy, the task of producing device A is assigned to unit A, which sells 4,000 units of "A" to unit B at a price determined on the basis of the standard cost price. Unit B, after receiving these devices, assembles a final product, thus obtaining a total production of 1,000 units and markets it outside the group. For the coming year, the following data has been collected:

For unit A:

- Selling price to the external market: 35 MU/unit
- Raw materials used: total value estimated at 80,000 MU
- Direct labor: total value estimated at 48,000 MU
- Workshop overheads estimated at 72,000 MU, of which 40,000 MU are fixed costs, calculated on the basis of normal activity estimated at 10,000 units
- Estimated sales volume, including the part allocated to unit B, is 8,000 units.

For unit B:

- Selling price to the external market: 160 MU/unit
- Assembly costs for the final product are: Variable costs = 30 MU/unit // Fixed costs = 10 MU/unit

Required:

1. Determine the estimated result for units A and B and the parent company (in percentage and value).
2. Calculate the break-even point in quantity for units A and B.
3. An unexpected marketing opportunity is offered to the managers of unit B in the form of a sale of 500 units of its final product to South Africa at a price of 140 MU/unit (knowing that this does not lead to an increase in the unit's variable costs or fixed costs). Should the managers of unit B accept this order, with justification? And is it in the interest of the parent company to accept this order?

Model Solution for Case Study No. 02

1. Calculation of the estimated result for units A and B and the parent company:

a. For unit A:

Item		Operations	Partial Amount	Total Amount
Total Net Turnover	Internal turnover (to unit B):	4,000 units × 25	100,000 MU	240,000 MU
	External market turnover:	4,000 units × 35	140,000 MU	
Cost Price	Raw materials used		80,000 MU	200,000 MU
	Direct labor		48,000 MU	
	Workshop overheads		72,000 MU	
Analytical Result	= Total Turnover – Cost Price			**40,000 MU (16.66%)**

b. For unit B:

Item		Operations	Partial Amount	Total Amount
Turnover (Sales)		1,000 units × 160		**160,000 MU**
Cost Price	Purchased raw materials:	4,000 units × (200,000/8,000)	100,000 MU	**140,000 MU**
	Assembly costs:	Variable = 1,000 × 30 Fixed = 1,000 × 10	30,000 MU; 10,000 MU	
Analytical Result	= Total Turnover – Cost Price			**20,000 MU (12.5%)**
Total Net Result	= Analytical result of Unit A + Analytical result of Unit B			**60,000 MU**

2. Calculation of the break-even point in quantity for units A and B:

BEP (quantity) for A = [Fixed Costs / Unit Contribution Margin] = [40,000 / 20] = 2,000 units

BEP (quantity) for B = [Fixed Costs / Unit Contribution Margin] = [10,000 / 30] = 333 units

3. Is it in the interest of unit B and the parent company to accept this order?

Unexpected marketing opportunity for unit B estimated at 500 units of its product to a country in South Africa at a price of 140 MU/unit, knowing that this increase does not lead to any increase in (variable costs or fixed costs).

❖ **Regarding the decision of unit B:**

Since the fixed costs of the workshop for unit A are calculated on the basis of normal activity estimated at 10,000 units, it can increase production by 2,000 units without incurring fixed costs. Therefore, the marginal cost (additional cost price) for 500 units is:[(2,000 × 20) + (500 × 30) = 55,000 MU] with a unit value estimated at [55,000 / 500 = 110 MU/unit], while the proposed selling price is 140 MU/unit.

Thus, if the organization accepts this order, it will achieve a profit margin of [140 - 110] = [30 MU × 500 units = 15,000 MU].

Therefore, it is in the interest of unit B to accept this order because it allows it to achieve a profit margin of 15,000 MU.

❖ **Regarding the decision of the parent company including unit A:**

Since unit A is not affected by this order (given that it does not exceed or utilize its maximum capacity estimated at 10,000 units), and therefore is not affected by profit or loss, the parent company in turn earns the same profit achieved in unit B. Therefore, it is in the interest of the parent company to accept this order.

Case Study No. 04 - Variable Costs and Transfer Prices -

Equipment and Assembly companies are two branches of the same parent company. Within the framework of the group's policy, the Equipment company sells 5,000 units of its spare parts production to the Assembly company at a price determined on the basis of the standard cost price plus a profit margin estimated at 2.5% for the Equipment company. The Assembly company, after receiving the spare parts, assembles a final product, thus obtaining a total production of 1,000 units, and markets it outside the group. For the coming year, the following data has been collected:

For the Equipment company:

- Selling price to the external market: 350 MU/unit
- Standard cost (based on normal production of 12,500 units) of spare parts is:
  - Variable cost = 120 MU/unit
  - Fixed cost = 80 MU/unit
- Estimated sales volume, including the part allocated to the Assembly unit, is 10,000 units.

For the Assembly company:

- Selling price to the external market: 1,300 MU/unit
- Assembly costs for the final product are: Variable cost = 40 MU/unit // Fixed cost = 25 MU/unit

Required:

1. Determine the estimated result for each of the subsidiary companies and the parent company.
2. Due to exceptional circumstances, the organization found itself facing two situations:

a. **Situation 01:** Due to rising prices globally, this led to an increase in the unit cost price of the Equipment company by 10%, which resulted in a 20% decrease in the level of demand for the Assembly company's products, with other variables remaining unchanged.

b. **Situation 02:** The Equipment company decided to utilize all its maximum capacity. To do this, the marketing manager studied the market and found that it could sell the unused capacity in the southern region at a

price of 280 MU/unit, provided that the company bears transport and distribution expenses estimated at 175,000 MU.

Evaluate and analyze the performance of both companies and the parent company according to each situation.

Model Solution for Case Study No. 04

1. Calculation of the estimated result for each subsidiary company and the parent company:

a. For the Equipment company:

Item	Operations	Partial Amount	Total Amount
Total Net Turnover	Internal turnover (to Assembly): 5,000 units × [220 × 1.025]	1,127,500 MU	2,877,500 MU
	External market turnover: 5,000 units × 350	1,750,000 MU	
Cost Price	Variable costs: 10,000 units × 120	1,200,000 MU	2,200,000 MU
	Fixed costs: 12,500 units × 80	1,000,000 MU	
Analytical Result	= Total Turnover – Cost Price		**677,500 MU**

b. For the Assembly company:

Item	Operations		Partial Amount	Total Amount
Turnover (Sales)			1,000 units × 1,300	**1,300,000 MU**
Cost Price	Purchased raw materials:	5,000 units × 225.5	1,127,500 MU	**1,192,500 MU**
	Conversion costs:	Variable =; 1,000 × 40 Fixed =1,000 × 25	40,000 MU; 25,000 MU	
Analytical Result	= Total Turnover – Cost Price			**107,500 MU**
Total Net Result	= Analytical result of Equipment + Analytical result of Assembly			**785,000 MU**

Calculation of changes according to the first situation for the Equipment company:

Item	Operations		Partial Amount	Total Amount
Total Net Turnover	Internal turnover (to Assembly):	4,000 units × [243.11 × 1.025]	996,751 MU	**2,746,751 MU**
	External market turnover:	5,000 units × 350	1,750,000 MU	
Cost Price	Variable costs:	9,000 units × 120 × 1.1	1,188,000 MU	**2,188,000 MU/9000= 243,11 MU**
	Fixed costs:	12,500 units × 80	1,000,000 MU	
Analytical Result	**= Total Turnover – Cost Price**			**588,751 MU**

Calculation of changes according to the first situation for the Assembly company:

Item	Operations		Partial Amount	Total Amount
Turnover (Sales)		800 units × 1,300		**1,040,000 MU**
Cost Price	Purchased raw materials		996,751 MU	**1,053,751 MU**
	Conversion costs:	Variable; =800 × 40 Fixed	32,000 MU; 25,000 MU	
Analytical Result	= Total Turnover – Cost Price			**(13,751) MU**
Total Net Result	= Analytical result of Equipment + Analytical result of Assembly			**575,000 MU**

Calculation of changes according to the second situation for the Equipment company:

Item	Operations		Partial Amount	Total Amount
Total Net Turnover	Internal turnover (to Assembly):	5,000 units × [200 × 1.025]	1,025,000 MU	3,475,000 MU
	External market turnover:	5,000 units × 350	1,750,000 MU	
	Southern region turnover:	2,500 × 280	700,000 MU	
Cost Price	Variable costs:	12,500 units × 120	1,500,000 MU	2,500,000 MU/12,500 =200 MU
	Fixed costs:	12,500 units × 80	1,000,000 MU	
	Transport expenses		175,000 MU	
Analytical Result	= Total Turnover – Cost Price			**800,000 MU**

Calculation of changes according to the second situation for the Assembly company:

Item	Operations		Partial Amount	Total Amount
Turnover (Sales)		1,000 units × 1,300		1,300,000 MU
Cost Price	Purchased raw materials		1,025,000 MU	1,090,000 MU
	Conversion costs:	Variable =1,000 × 40 Fixed = 1,000 × 25	40,000 MU; 25,000 MU	
Analytical Result	= Total Turnover – Cost Price			**210,000 MU**
Total Net Result	= Analytical result of Equipment + Analytical result of Assembly			**1,010,000 MU**

Case Study No. 05 - Standard Costing -

An organization produces industrial parts and uses the standard costing method to calculate their cost. The standard unit cost of these parts is recorded as follows:

- Raw materials used: M1: 23 kg at 0.6 MU/kg; M2: 14 kg at 10.5 MU/kg
- Direct labor: 36 hours at 16 MU/hour
- Indirect expenses: 234,600 MU, calculated on the basis of normal activity estimated at 8,500 direct labor hours per month, of which 78,200 MU are fixed and the remainder variable.

During the month of October 2010, the following actual costs were recorded:

- Raw materials used: M1: 5,560 kg at 0.62 MU/kg; M2: 3,420 kg at 10 MU/kg
- Direct labor: 141,680 MU, equivalent to 8,700 working hours
- Indirect expenses amounted to: 239,150 MU
- Production for October was 240 industrial parts.

Required:

1. Prepare the standard cost card for producing one unit.
2. Calculate the total variance between standard costs and actual costs for October production.
3. Analyze the total variance into raw material variance, direct labor variance, and indirect expense variance.
   Note: "Analyze only the unfavorable variances"

Model Solution for Case Study No. 05

1. Preparation of the standard cost card for producing one unit:

Elements	Partial Measures	Unit Cost	Total
Raw material M1	23 kg	0.6 MU/kg	13.8
Raw material M2	14 kg	10.5 MU/kg	147
Direct labor	36 hours	16 MU/hour	576
Indirect expenses	36 hours	27.6 MU/hour	993.6
Standard production cost per unit			**1,730.4 MU/unit**

234,600 / 8,500 = 27.6 MU/hour

Determination of the total variance on production cost:

	Standard Production Cost			Actual Production Cost			Variance	
	Qs	Ps	Amount	Qr	Pr	Amount	Favorable (+)	Unfavorable (-)
Raw material M1	5,520	0.6	3,312	5,560	0.62	3,447.2		135.2 DEF
Raw material M2	3,360	10.5	35,280	3,420	10	34,200	1,080 FAV	
Direct labor	8,640	16	138,240	8,700	16.285	141,680		3,440 DEF
Indirect expenses	8,640	27.6	238,464	8,700	27.49	239,150		686 DEF
Total			**415,296**			**418,477.2**	**1,080**	**4,261.2**
Total unfavorable variance								**-3,181.2 DEF**

a. Analysis of raw material M1 variances:

Statement Quantity Variance	Variance +	Variance -
Ps × (Qs – Qr) (5560 – 5520) × 0.6	DEF	24
Price Variance (Cost Variance) Qs × (Ps – Pr) (0.62 – 0.6) × 5520	DEF	110.4
Combined Variance = – [–40 × –0.02]	DEF	0.8
	DEF	**135.2**

b. Analysis of the direct labor variance:

Statement	Variance	
	+	-
Quantity Variance Ps × (Qs – Qr) (8700 – 8640) × 16	DEF	960
Price Variance (Cost Variance) Qs × (Ps – Pr) (16.285 – 16) × 8640	DEF	2462.4
Combined Variance = [–60 × –0.285]	DEF	17.1
	DEF	**3439.5**

c. Calculation of the variance on indirect expenses:

Flexible budget rate per hour E = [(234,600 - 78,200) / 8,500 hours] + [78,200 / 8,700 hours] = 27.38 MU.

Item	Favorable (+)	Unfavorable (-)
Budget variance = (Ps – E) × Qs = (27.38 - 27.6) × 8,640	1,900.8	Fav
Activity variance = Qs × (E – Pr) = (27.49 - 27.38) × 8,640	DEF	950.4
Efficiency variance = Ps × (Qs – Qr) = (8,700 - 8,640) × 27.6	DEF	1,656
Combined variance = (Qs – Qr) × (Ps – Pr) = (27.49 - 27.6) × (8,700 - 8,640)	DEF	6.6
Total	**1,900.8**	**2,613**
Net unfavorable variance		**712.2 DEF**

Case Study No. 06 - Standard Costing -

The Jerusalem Company uses two raw materials to produce a product, which passes through two workshops: the preparation workshop and the finishing workshop. This company has prepared the following standard cost card for one unit of product X in January 2025:

Item	Quantity	Unit Cost
Raw material M1	5.4 kg	30.5 MU
Raw material M2	2.3 kg	16 MU
Direct labor for preparation workshop	10 minutes	33.6 MU/hour
Direct labor for finishing workshop	8 minutes	51 MU/hour

As for indirect expenses, prepared on the basis of 2,800 units produced as normal monthly activity (corresponding to 840 machine hours), they amount to 455,000 MU, of which 192,500 MU are fixed.
During March 2010, the following information was recorded in this company:

- Beginning inventory of the month:
  - Raw material M1: 3,400 kg for a total of 100,320 MU
  - Raw material M2: 1,200 kg for a total of 15,600 MU
- Purchases for the month:
  - Raw material M1: 15,200 kg at 30.6 MU/kg
  - Raw material M2: 8,400 kg at 17 MU/kg
- Usage and production: 14,850 kg of M1 and 6,200 kg of M2 were used to produce 2,700 units
- Direct expenses:
  - 450 hours at 33.7 MU/hour in the preparation workshop
  - 351 hours at 50.8 MU/hour in the finishing workshop
- Indirect expenses: amounted to 434,700 MU for actual activity of 851 machine hours

Required:

1. Prepare the standard cost card for producing one unit.
2. Calculate the total variance.
3. Analyze the recorded variances for raw materials, direct expenses in the preparation department, and indirect expenses.

Model Solution for Case Study No. 06

1. Calculation of the weighted average cost of raw materials M1 and M2:

For M1:

	Quantity	Price	Value		Quantity	Price	Value
Beg. Inv.	3,400 kg	-	100,320 MU	Usage	14,850 kg	30.4	451,440 MU
Purchases	15,200 kg	30.6	465,120 MU	End. Inv.	3,750 kg	30.4	114,000 MU
Total	**18,600 kg**	**30.4 MU/kg**	**565,440 MU**	**Total**	**18,600 kg**	**30.4 MU/kg**	**565,440 MU**

For M2:

	Quantity	Price	Value		Quantity	Price	Value
Beg. Inv.	1,200 kg	-	15,600 MU	Usage	6,200 kg	16.5	102,300 MU
Purchases	8,400 kg	17	142,800 MU	End. Inv.	3,400 kg	16.5	56,100 MU
Total	**9,600 kg**	**16.5 MU/kg**	**158,400 MU**	**Total**	**9,600 kg**	**16.5 MU/kg**	**158,400 MU**

2. Preparation of the standard cost card for producing one unit:

Elements	Partial Measures	Unit Cost	Total
Raw material M1	5.4 kg	30.5 MU/kg	164.7 MU
Raw material M2	2.3 kg	16 MU/kg	36.8 MU
Direct labor for preparation	(10/60) hour	33.6 MU/hour	5.6 MU
Direct labor for finishing	(8/60) hour	51 MU/hour	6.8 MU
Indirect expenses	(840/2800) = 0.3 hour	541.66 MU/hour	162.498 MU
Standard production cost per unit			**373.458 MU**

Determination of the total variance on production cost:

Item	Standard Production Cost			Actual Production Cost			Variance	
	Qs	Ps	Amount	Qr	Pr	Amount	Fav (+)	Unfav (-)
Raw material M1	14,580	30.5	444,690	14,850	30.4	451,440	DEF	6,750
Raw material M2	6,210	16	99,360	6,200	16.5	102,300	DEF	2,940
Direct labor (preparation)	450 hrs	33.6	15,120	450	33.5	15,165	DEF	45
Direct labor (finishing)	360 hrs	51	18,360	351	50.8	17,830.8	529.2	FAV
Indirect expenses	810 hrs	541.66	438,750	851	510.81	434,700	4,050	FAV
Total			**1,016,280**			**1,021,435.8**	**4,579.2**	**9,735**
Total unfavorable variance							**DEF**	**-5,155.8**

a. Analysis of raw material M1 variances:

Statement	**Variance**	
	+	-
Quantity Variance Ps × (Qr – Qs) (14,850 – 14,580) × 30.5	DEF	8,235
Price (Cost) Variance Qs × (Pr – Ps) (30.4 – 30.5) × 14,580	1,458	FAV
Combined Variance = (Qr – Qs) × (Pr – Ps) = (+270) × (–0.1) = –27	27	FAV
Total	**6,750 DEF**	

b. Analysis of direct labor variance in the preparation department:

Statement	Variance	
	+	-
Quantity Variance Ps × (Qs – Qr) (450 – 450) × 33.6	–	–
Price (Cost) Variance Qs × (Ps – Pr) (33.5 – 33.6) × 450	45	DEF
Combined Variance = [0 × 0]	–	–
Total	**45 DEF**	

c. Calculation of the variance on indirect expenses:

Flexible budget rate per hour = [Standard variable cost per hour] + [Total fixed expenses / Actual number of hours]

E = [Variable expenses / Standard hours] + [Total fixed expenses / Actual hours]

E = [(455,000 - 192,500) / 840 hours] + [192,500 / 851 hours] = 538.7 MU.

Item	Favorable (+)	Unfavorable (-)
Budget variance = (Ps – E) × Qs = (538.7 - 541.66) × 810	2,397.6	Fav
Activity variance = Qs × (E – Pr) = (510.81 - 538.7) × 810	22,590.9	Fav
Efficiency variance = Ps × (Qs – Qr) = (851 - 810) × 541.66	DEF	22,208.06
Combined variance = (Qs – Qr) × (Ps – Pr) = (510.81 - 541.66) × (851 - 810)	1,264.85	Fav
Total	**26,253.35**	**22,208.06**
Net favorable variance	**4,045.29 FAV**	

Case Study No. 07: "Preparation of the Sales Budget"

We have the quarterly sales for the previous four years of an organization in the following table:

Seasons	1	2	3	4
Year 1	1,000	1,200	1,400	1,150
Year 2	1,050	1,350	1,500	1,300
Year 3	1,100	1,450	1,700	1,400
Year 4	1,250	1,650	1,850	1,550

Required:

1. Find the equation of the general trend line.
2. Find the quarterly coefficients.
3. Forecast the sales for the fifth year.

Model Solution for Case Study No. 07

Time	Sales	Adjusted values			
Xi	Yi	Xi x Yi	Xi^2	Y'	y I Y'
1	1,000	1,000	1	1,101.83	0.91
2	1,200	2,400	4	1,137.41	1.06
3	1,400	4,200	9	1,172.99	1.19
4	1,150	4,600	16	1,208.57	0.95
5	1,050	5,250	25	1,244.15	0.84
6	1,350	8,100	36	1,279.73	1.05
7	1,500	10,500	49	1,315.31	1.14
8	1,300	10,400	64	1,350.89	0.96
9	1,100	9,900	81	1,386.47	0.79
10	1,450	14,500	100	1,422.05	1.02
11	1,700	18,700	121	1,457.63	1.17
12	1,400	16,800	144	1,493.21	0.94
13	1,250	16,250	169	1,528.79	0.82
14	1,650	23,100	196	1,564.37	1.05
15	1,850	27,750	225	1,599.95	1.16
16	1,550	24,800	256	1,635.53	0.95
136	**21,900**	**198,250**	**1,496**	**21,898.88**	**16.00**

Calculation of the enterprise coefficients

Xi	Year 1	Year 2	Year 3	Year 4	Total	Enterprise
1	0.91	0.84	0.79	0.82	3.36	0.84
2	1.06	1.05	1.02	1.05	4.18	1.05
3	1.19	1.14	1.17	1.16	4.66	1.16
4	0.95	0.96	0.94	0.95	3.80	0.95
						4.00

Calculation of estimated sales for the fifth year

Xi	y = 35.58 xi + 1,066.25	Estimated sales	Seasonal coefficients
17	1,671.11	0.84	1,404.80
18	1,706.69	1.05	1,785.34
19	1,742.27	1.16	2,028.22
20	1,777.85	0.95	1,688.58
	6,897.92	4.00	6,906.94

Case Study No. 08 - Control of the Sales Budget -

A manufacturing company produces and sells three products A, B, and C. The basic information for the sales budget for the month of May is as follows:

- The organization expects to sell 1,500 units of A at 15 MU/unit, 2,100 units of B at 20 MU/unit, and 1,800 units of C at 29 MU/unit.
- The budgeted production cost per unit is estimated at 7, 12, and 16 MU/unit for products A, B, and C, respectively.
- While other budgeted costs are estimated at 1, 2, and 7 MU/unit for products A, B, and C, respectively.

At the end of May, we obtained the following information from cost accounting:

- The number of units sold was 1,800 units for each product A, B, and C, at selling prices of 14, 18, and 33 MU/unit, respectively.
- The total production cost at the end of the period was estimated at 13,020 MU, 22,800 MU, and 29,550 MU for products A, B, and C, respectively.
- While other costs were estimated at 1,605 MU, 3,300 MU, and 11,850 MU for products A, B, and C, respectively.

Required:

1. Prepare the budget of this organization and calculate the actual result.
2. Calculate the variance on the result and assign responsibilities (administrative, commercial, or production departments).
3. Analyze the variance on margin and turnover into three partial variances.

Model Solution for Case Study No. 08

1. Preparation of the budget of this organization:

Item	Standard	Actual	+	-
Sales Budget	116,700	117,000	300	fav
A: 15×1,500	22,500	14×1,800 = 25,200		
B: 20×2,100	42,000	18×1,800 = 32,400		
C: 29×1,800	52,200	33×1,800 = 59,400		
Production Cost Budget	64,500	65,370	DEF	870
A: 7×1,500	10,500	13,020		
B: 12×2,100	25,200	22,800		
C: 16×1,800	28,800	29,550		
Other Budgets	18,300	16,755	1,545	fav
A: 1×1,500	1,500	1,605		
B: 2×2,100	4,200	3,300		
C: 7×1,800	12,600	11,850		
Result	**33,900**	**34,875**	**975**	**fav**

2. Calculation of the result variance and assignment of responsibilities:

We have:

Standard production cost = 1,800 × [7+12+16] = 63,000

CAp (standard turnover at actual quantity) = (15+20+29) × 1,800 = 115,200

Result variance = Margin variance – Production cost variance – Other costs variance

= [(Actual turnover – Standard production cost) – (Budgeted turnover – Standard production cost)] – (Actual prod. cost – Standard prod. cost) – (Actual other costs – Standard other costs)

= [(117,000 – 63,000) – (116,700 – 64,500)] – (65,370 – 63,000) – (16,755 – 18,300)

= [54,000 – 52,200] – (2,370) – (-1,545)

= 1,800 (FAV) – 2,370 (DEF) + 1,545 (FAV) = 975 FAV

Comment: The actual result is greater than the standard result, due to:

1. The commercial departments achieved a favorable variance of 1,800.
2. The production departments achieved an unfavorable variance of 2,370.
3. A favorable variance attributable to strategic senior management of +1,545.

3. Analysis of the margin variance into three partial variances:

1. Price variance = (Actual unit margin – Standard unit margin) × Actual quantity

$$M/prix = [(p_r - C_b) - (P_b - C_b)] \times Q_r \Rightarrow M/prix = (P_r - P_b) \times Q_r$$

- M/price A = (14-15) × 1,800 = -1,800 DEF
- M/price B = (18-20) × 1,800 = -3,600 DEF
- M/price C = (33-29) × 1,800 = +7,200 FAV
- E/price = -1,800 + (-3,600) + 7,200 = 1,800 FAV

2. Sales mix variance

E/ composition des ventes = E/CV = (tp – tb) × Cap

tp = (Standard turnover at actual quantity – Standard production cost) /Standard turnover at actual quantity = (115,200 – 63,000) / 115,200 = 52,200 / 115,200 = 0.453125

tb = (Budgeted turnover – Budgeted production cost) / Budgeted turnover = (116,700 – 64,500) / 116,700 = 52,200 / 116,700 = 0.4473

E/CV = (0.453125 – 0.4473) × 115,200 = 0.005825 × 115,200 = **670.04 FAV**

3. Total volume variance

E/ volume global = E/ VG = (CA_p – CA_b) x t_b = (115,200 – 116,700) × 0.4473 = (-1,500) × 0.4473 = -670.95 FAV

E/M = E/price + E/CV + E/VG = 1,800 + 670 – 670 = **+1,800 FAV**

Analysis of turnover variance:

E/CA = CAr – CAb = 117,000 – 116,700 = +300 FAV

Actual	Standard at actual Q	Budgeted
CAr = 117,000 Qr = 5,400	CAp = 115,200 Qr = 5,400	CAb = 116,700 Qb = 5,400
$\overline{p}_r = 21{,}667$	$\overline{P}_p = 21{,}333$	$\overline{P}_b = 21{,}611$

a. Price variance = E/prix = CAr – CAp = 117,000 – 115,200 **= +1,800 FAV**

b. Sales mix variance $E/CV = (\overline{P}_p - \overline{P}_b)Qt_r = (21{,}333 - 21{,}611)5400 = -1500$

c. Total volume variance

E/ volume Global = (Qtr – Qtb) × Pb = (5,400 – 5,400) × 21.611 = 0

Total variance = E/price + E/CV + E/VG = 1,800 – 1,500 + 0 = **+300 FAV**

Case Study No. 09: "Preparation of the Selling and Distribution Expense Budget"

An organization produces and distributes a single product in two regions: the central region and the eastern region. The organization decided to distribute its product in the western region starting from the year 2026. The headquarters and the factory are located in the central region. In 2025, the organization incurred the following selling and distribution expenses:

Items	Central Region	Eastern Region	Headquarters	Total
Direct selling expenses	317	292		609
1. Salesmen's salaries	243	237		
2. Commissions	26	24		
3. Travel and accommodation expenses	48	31		
Distribution expenses	226	253		519
1. Warehouse workers' wages	122	118		
2. Warehouse services	21	16		
3. Transport vehicle expenses	123	119		
Sales administration			106	106
1. Salaries			62	
2. Building services			29	
3. Miscellaneous expenses			15	
Advertising	125	125		250
1. Newspapers	40	40		
2. Radio and television	85	85		
Total	**708**	**670**	**106**	**1,484**

In addition to the budget shown above, we have the following data:

1. Estimated sales for the coming year are as follows: Central 1,215 MU; Eastern 1,185 MU; Western 650 MU.

2. Salaries of salesmen in the western region are estimated at 93 MU. This amount includes the salary of one worker from the central region and two workers from the eastern region who will be transferred to the western region. The salary of each is estimated at 7 MU per year.
3. Commissions are paid at 2.5% of sales value.
4. Travel and accommodation expenses in the western region are estimated at 18.4 MU, and are expected to increase by 1% in the eastern and central regions.
5. Warehouse workers' wages will increase by 2% in the eastern and central regions, and are estimated at 67 MU in the west.
6. Warehouse services in the western region are estimated at 8.4 MU.
7. Transport vehicle expenses will increase by 3% from their current level, while in the western region they are estimated at 78.45 MU.
8. Two employees will be hired at headquarters with an annual salary estimated at 6 MU each.
9. Building services are expected to increase by 4% and other expenses by 2%.
10. Advertising on radio and in newspapers is expected to increase by 10%. The amount allocated to the western region for newspapers is 26 MU and for radio 93.5 MU. The organization has also allocated 42 MU to cover participation expenses in an international fair.

Required: Prepare the estimated budget for selling and distribution expenses.

Model Solution for Case Study No. 09

Detailed operations:

2. Salesmen's salaries:			**6. Warehouse Services**		
✓ Central	243 – 7	236	✓ Central	21	
✓ Eastern	14 – 223	223	✓ Eastern	16	
✓ Western		93	✓ Western	8.4	
3. Commissions:			**7. Transport Vehicle Expenses**		
✓ Central	1,215 × 0.025	30.375	✓ Central	123×1.03	126.69
✓ Eastern	1,185 × 0.025	29.625	✓ Eastern	-	122.57
✓ Western	650 × 0.025	16.25	✓ Western	119×1.03	48.45
4. Travel and accommodation expenses:			**Advertising in Newspapers:**		
✓ Central	1.01 × 48	48.48	✓ Central	40×1.1	44
✓ Eastern	1.01 × 31	31.31	✓ Eastern	40×1.1	44
✓ Western		18.4	✓ Western		
5. Warehouse workers' wages:			**Advertising on Radio:**		
✓ Central	1.02 × 122	124.44	✓ Central	85×1.1	93.5
✓ Eastern	1.02 × 118	120.36	✓ Eastern	85×1.1	93.5
✓ Western		67	✓ Western	85×1.	93.5
8. Salaries: "Headquarters" 62 + 12 = 74			**International Fair "Headquarters 42"**		
9.Building services "Headquarters" 29 + 1.04 × 30.16 = 30.16			**10. Other Expenses "Headquarters 15.3 - 15.1 and 15.3 - 15.2"**		

Preparation of the estimated budget for selling and distribution expenses for the coming year 2026:

Items	Central Region	Eastern Region	Western Region	Headquarters	Total
Direct selling expenses	**314.855**	**283.935**	**127.65**		**726.44**
1. Salesmen's salaries	236	223	93		552
2. Commissions	30.375	29.625	16.25		76.25
3. Travel and accommodation	48.48	31.31	18.4		98.19
Distribution expenses	**272.13**	**258.93**	**153.85**		**684.91**
1. Warehouse workers' wages	124.44	120.36	67		311.8
2. Warehouse services	21	16	8.4		45.4
3. Transport vehicle expenses	126.69	122.57	78.45		327.71
Sales administration				**119.46**	**119.46**
1. Salaries				74	74
2. Building services				30.16	30.16
3. Miscellaneous expenses				15.3	15.3
Advertising	**137.5**	**137.5**	**119.5**	**42**	**436.5**
1. Newspapers	44	44	26		114
2. Radio and television	93.5	93.5	93.5		280.5
3. International fair				42	42
Total	**724.485**	**680.365**	**401**	**161.46**	**1,967.31**

Case Study No. 10 - Production Budget -

An organization produces two products A and B which pass through three workshops. The standard cost card for the two products is shown as follows:

	Product A	**Product B**
Raw materials	2.75	5.2
Direct labor	2.35	3.4
Variable costs		
Workshop 01	1.65	3.3
Workshop 02	1.8	2.7
Workshop 03	1.65	1.65
Fixed costs		
Workshop 01	0.6	1.2
Workshop 02	1.2	1.8
Workshop 03	1.4	1.4
Distribution cost = 8% of production variable cost	**0.82**	**1.3**
Total	**14.22**	**21.95**

According to the commercial departments, 9,000 units of product A can be sold at a price of 16.7 MU/unit, and 5,000 units of product B at a price of 26 MU/unit.

	Workshop 01	Workshop 02	Workshop 03
Product A	0.2 hours	0.2 hours	0.3 hours
Product B	0.4 hours	0.3 hours	0.3 hours
Maximum capacity	2,400 hours	2,400 hours	3,000 hours

Required:

1. Calculate the contribution margin per unit for the two products, and express this margin as a percentage of the unit selling price.
2. Determine the production program that maximizes the result (using graphical method).
3. Calculate the total result.
4. In order to achieve full capacity utilization of the three workshops, and assuming that the commercial constraints do not change and the

capacity of workshop 02 also does not change, by how much should the capacities of workshops 01 and 03 be increased?

Considering that the unit selling price and unit variable cost remain constant, and the organization always seeks to maximize profit, what would be the total result in this case? (Take into account the cost of necessary investments to increase workshop capacities).

Model solution for case study No. 10

Calculation of the contribution margin (variable costing margin):

CMu A = 16.7 - [3.75 + 3.35 + 1.65 + 1.8 + 1.65 + 0.82] = 5.68 MU/unit ← 34%
CMu B = 26 - [5.2 + 3.4 + 3.3 + 2.7 + 1.65 + 1.3] = 8.45 MU/unit ← 32.5%

Determining the production program that maximizes the result:

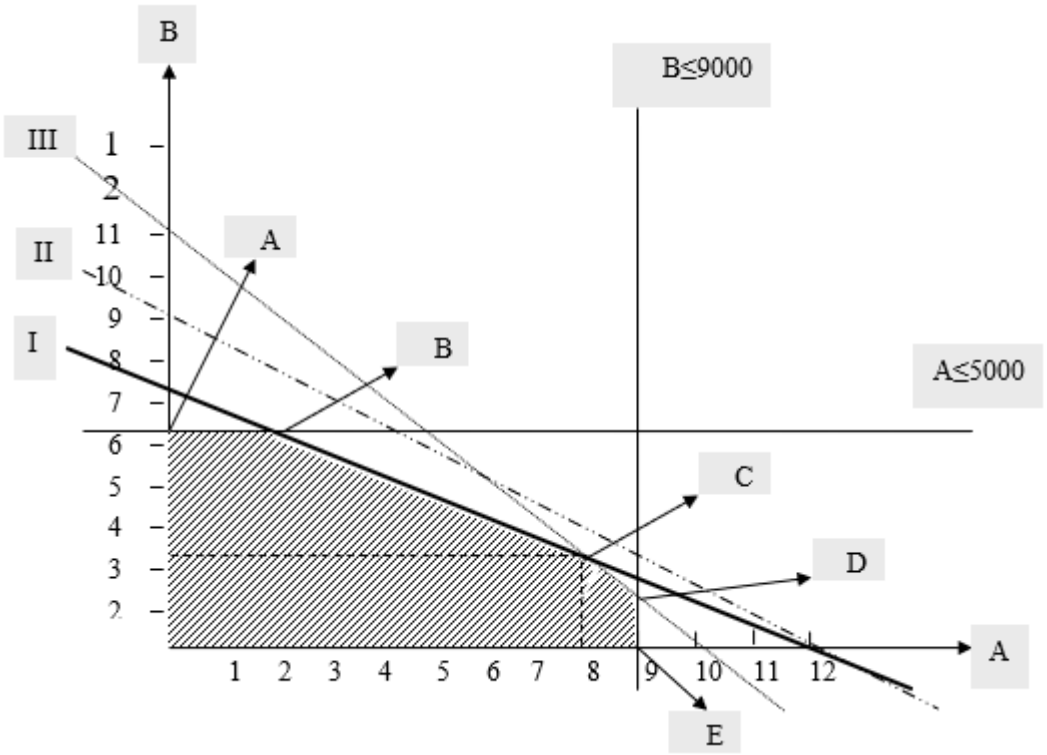
1. Objective function:
   Max Z = 9.68 A + 8.45 B
2. Technical constraints:

Auxiliary points:

I	0	6000
	12000	0
II	0	8000
	12000	0
III	0	10000
	10000	0

$$\begin{cases} 0{,}2A + 0{,}4\,B < 2400 \\ 0{,}2A + 0{,}.3\,B < 2400 \\ 0{,}3\,A + 0{,}3\,B < 3000 \\ A<9000, \quad B<5000 \\ A, B \geq 0 \end{cases}$$

Graphical representation:



By substituting the various combinations (intersection points of the lines), we find that the optimal combination that allows the organization to achieve the largest profit margin is: (8,000, 2,000) units of (B, A) respectively:

C = 5.68 × (8,000) + 8.45 × (2,000) = 45,440 + 16,900 = **62,340**

Calculation of the result:

Result = Contribution margin – Fixed costs = 62,340 – 35,600 = **26,740**

Fixed costs for workshop 01:[2,400 / 0.6] × (0.6 + 1.2) = 4,000 × 1.8 = 7,200
Fixed costs for workshop 02:[2,400 / 0.5] × (1.2 + 1.8) = 4,800 × 3.0 = 14,400
Fixed costs for workshop 03:[3,000 / 0.6] × (1.4 + 1.4) = 5,000 × 2.8 = 14,000

∑ Fixed Costs = 35,600

In order to achieve full capacity utilization of the three workshops, and assuming that the commercial constraints do not change, by how much should the capacities of workshops (III) and (I) be increased?

The capacity of the workshops must be increased in the case of full capacity utilization. If the organization is constrained by the commercial constraints and the constraint related to workshop 02, the optimal combination in this case is (2,000, 9,000). In this case, the capacities of the workshops must be increased by the following values:

0.2 × (9,000) + 0.4 × (2,000) = 1,800 + 800 = 2,600 ===== (2,600 – 2,400) = **+200 hours**
0.3 × (9,000) + 0.3 × (2,000) = 2,700 + 600 = 3,300 ===== (3,300 – 3,000) = **+300 hours**

Calculation of the current result:

Result = Contribution margin – Fixed costs = [(5.68 × 9,000) + (8.45 × 2,000)] – 35,600 = (51,120 + 16,900) – 35,600 = 68,020 – 35,600 **= 32,420**

Case Study No. 11 - Investment Budget -

A company purchased a new machine with a useful life of 10 years. It allows the production of 1,000 tons of cement at an estimated production cost of 450 MU per ton, and a selling price estimated at 900 MU per ton. Given that the cost of purchasing the machine is estimated at 1,800,000 MU. Due to the lack of sufficient financial resources, the organization decided to finance its project either through a leasing loan or a bank loan according to the following terms:

a- Bank loan:

- Amount: 1,000,000 MU
- Interest rate: 12% per year
- Repayment over 10 years in fixed installments.

b- Leasing loan (Finance lease):

- Contract amount: the amount of the investment
- Lease duration: 5 years
- Annual lease payment: invested amount / 4

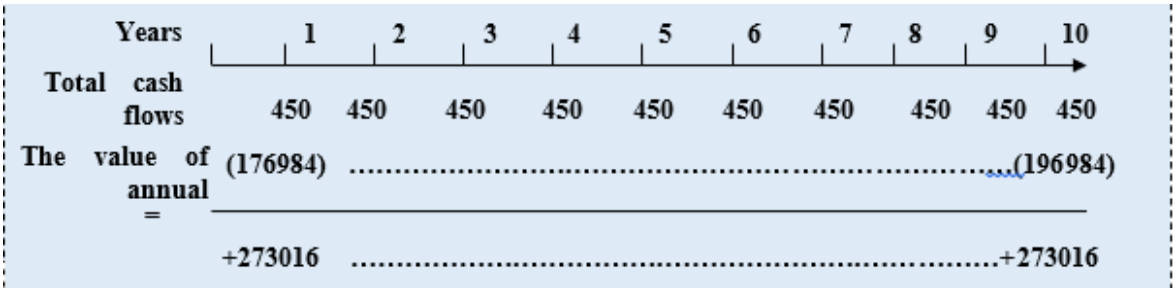
Required: Choose the optimal financing model.

1. It is the company's custom not to accept any investment project unless it ensures a pre-tax return of at least 15% on invested capital, and 20% on equity capital.
2. In the case of a leasing loan, either the company pays 1/3 of the investment value in cash as an advance before the start of the project, or it continues the lease at the end of the fifth year for one-third (1/3) of the initial lease amount for another 5 years.

Model solution for case study No. 11

1- Choosing the optimal financing model:

a- Bank loan:



To calculate the net cash flow, it is necessary to know the amount of the installments that the organization will pay at the end of each year according to the following relationship:

C_0 = 1,000,000 (loan amount); **n = 10** installments; **t = 12%** interest rate

Installment amount = $a = I_0 \times [t / (1 - (1+t)^{-n})] = 1{,}000{,}000 \times [0.12 / (1 - (1.12)^{-10})]$ = **176,984**

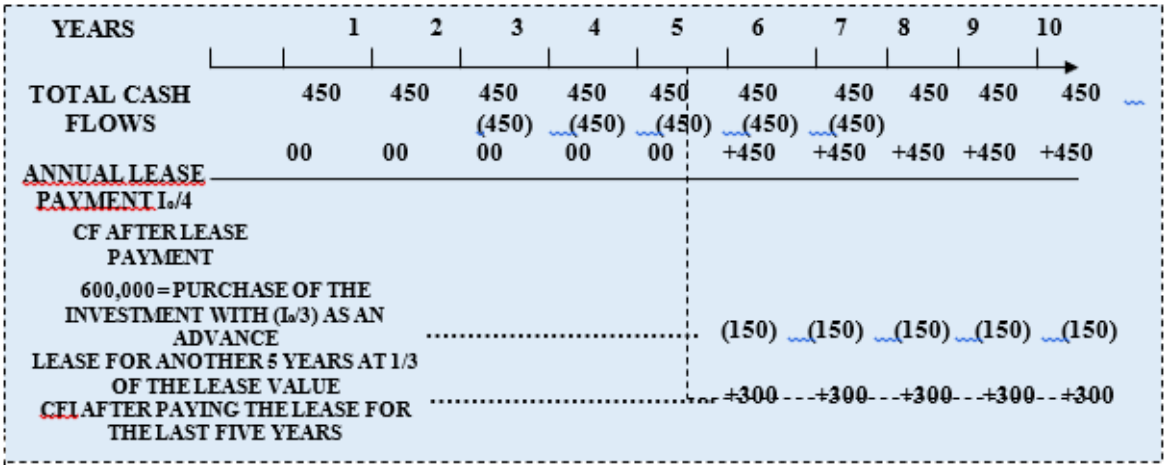
Thus, the net cash flow becomes as follows: CF = R – a = 450,000 – 176,984 = **273,016**

Hence, the NPV at (t = 20%) (rate of return on equity capital) is as follows:

$NPV = 273{,}016 \times [1 - (1.20)^{-10} / 0.20] - 800{,}000 =$

NPV (bank loan) = 344,611

b- Leasing loan (Finance lease):



1- Testing the optimal model between purchasing the investment before implementing the project, or leasing it for another 5 years:

Cost of purchasing in the case of leasing the investment for the last 5 years (between the 6th and the last 10 years):

L'acte = -150,000 × [1 – (1+t)$^{-5}$ / t] × (1.20)$^{-5}$ = (t = 20%) = 448,591.8 × (1.2)$^{-5}$ = (180,279) acquisition cost

Thus, it appears that in the case of leasing for another 5 years, a present value of 180,279 MU must be paid, whereas in the case of purchasing it, the investor pays 600,000 MU. Therefore, it is in the investor's interest to lease rather than to pay the advance.

Calculation of the net present value in this case:

NPV (lease) = 300,000 × [1 – (1.20)$^{-5}$ / 0.20] × (1.20)$^{-5}$ = 360,558

NPV (bank loan) < NPV (lease)

Case Study No. 12 - Investment Budget and Cost of Financing -

An organization intends to invest in a project costing 45,000 MU with a useful life of 5 years. This investment allows for the achievement of equal net cash flows during its useful life, estimated at 20,000 MU annually, with an expected rate of return of 16%.
The organization can finance the proposed project using three financing methods:

a. Finance the project entirely with equity capital.
b. Finance the project with 20% equity capital and 80% with a medium-term loan for 5 years at an interest rate of 12% (the loan is repaid in equal installments at the end of each period, noting that the borrowed amount is obtained on the date of acquisition of the investment).
c. Finance the project through a leasing loan with four equal installments, each estimated at 12,000 MU, with the possibility of purchasing at the end of the lease contract for an amount of 12,000 MU at the end of the fifth year.

Required: What is the most successful method of financing the project?

Model solution for case study No. 12

Choosing the optimal financing model:

1- Financing with equity capital:

$NPV = PV - I_0$

$NPV = CF_i \times [(1 - (1+t)^{-n}) / t] - I_0$

$NPV_1 = 20,000 \times [(1 - (1.16)^{-5}) / 0.16] - 45,000 = 65,485.88 - 45,000$
$= 20,485.88$

2- Partial financing through borrowing:

$45,000 \times 0.8 = 36,000$, and the remainder $I_0 = 9,000$.

Finding the installment amount: $a = I_0 \times [t / (1 - (1+t)^{-n})] = 360,000 \times 0.277410 = 9,986.76$

Thus: $CF_i = CF_i - a = 20,000 - 9,986.76 = 10,013.24$

$NPV_2 = 10,013.24 \times [(1 - (1.16)^{-5}) / 0.16] - 9,000 = 32,786.29 - 9,000 = 23,786.29$

3- Financing through leasing:

Year	1	2	3	4	5	
Cash flow	20,000	20,000	20,000	20,000	20,000	$I_0 = 12,000$
– Lease payment	12,000	12,000	12,000	12,000	0	
Net cash flow	8,000	8,000	8,000	8,000	8,000	

Thus:

$NPV_3 = 8,000 \times [(1 - (1.16)^{-5}) / 0.16]$ **= 26,194.352**

$NPV_3 = 8,000 \times [(1 - (1.16)^{-4}) / 0.16] + 2,000 \times (1.16)^{-5} - 12,000 \times (1.16)^{-5}$
= 26,194.352

Therefore, the most suitable method is financing through the leasing loan

Case Study No. 13 - Investment Budget and Cash Flow -

An organization intends to undertake a new project as part of its expansion activity. The financial manager proposed the following offer, given that this organization is subject to a profit tax rate of 30%:

- Initial value of the project = 400,000 DZD
- Project life = 10 years
- Depreciation is calculated on a straight-line basis over 10 years
- Estimated revenues amount to 100,000 DZD per year
- Annual costs excluding depreciation are estimated at 10,000 DZD per year

Required:

1. Calculate both the net income and the net cash flow.
2. Calculate the net present value of the project based on a current discount rate of 9%.
3. Calculate the internal rate of return (IRR) of this project.
4. Can the organization accept the project using the average rate of return criterion, knowing that the reference rate is estimated at 30%?
5. Calculate the profitability index and determine the payback period of this project.

Note: From the financial table, we have: $[1 – (1+t)^{-n}] / t = 6.417658$ for $n = 10$ and $t = 9\%$.

Model solution for case study No. 13

1. Calculation of net income and net cash flow:

Item	Amount (DZD)
Expected annual revenues	100,000
– Expected annual costs (excluding depreciation)	(10,000)
= Margin before depreciation	90,000
– Depreciation (400,000 / 10)	(40,000)
= Margin after depreciation	50,000
– Tax (50,000 × 30%)	(15,000)
= Net income	35,000
+ Depreciation	+40,000
= Annual net cash flow	75,000

2. Calculation of the net present value at a discount rate of 9%:

$NPV = CF \times [1 – (1+t)^{-n}] / t – I_0$

NPV = 75,000 × 6.417658 – 400,000

NPV = 481,324.35 – 400,000 = 81,324.35 DZD

3. Calculation of the internal rate of return (IRR):

Using trial and error, the IRR is approximately 13.44% (the precise calculation would be shown as in the original solution).

4. Acceptance using the average rate of return criterion (reference rate 30%):

Average rate of return = (Average annual net income) / (Average investment)
= 35,000 / (400,000 / 2) = 35,000 / 200,000 = 0,0875

Since 8,75% < 30%, the project would be rejected according to this criterion.

5. Profitability index and payback period:

Payback period = Initial investment / Annual net cash flow

Dr = I0 / CFm = 400,000 / 75,000 = 5.333 years = 5 years and 4 months.

Profitability index = NPV / Initial investment = 81,324.35 / 400,000 = 0.2033 (or 20.33%)

Case Study No. 14 - The Cash Budget -

The general manager expects that a cash deficit will occur, which will push him to request a loan from the bank to cover it. Undoubtedly, before agreeing to the loan, the bank will request the submission of the estimated cash budget for the coming year. For the purpose of preparing the cash budget for the first half of the year 2012, the following data is available:

- The estimated annual sales quantity is 18,000 units at a price of 1 MU per unit. The seasonal coefficients are as follows:

January: 1.1; February: 1.1; March: 1.04; April: 1.01; May: 1; June: 0.9

- **Customers:**
  Customer collections are as follows: 20% of monthly sales are received in cash during the same month with a 1% discount; the remaining amount is collected as 30% after one month, and 50% after two months.
- The customer receivable balance on 31/12/2011 was 2,374 MU, of which 1,400 MU will be collected in January and the remainder in February.
- A piece of land will be sold for 1,000 MU, with 40% received in March and the remainder in June.

- **Payments:**

	January	February	March	April	May	June
Purchases	950	880	870	870	850	850
Production expenses	90	85	88	90	76	85
Selling and distribution expenses	60	55	57	60	54	55

- Supplier payments are made as follows: 20% cash upon receipt, 50% after one month, and 30% after two months.
- Spare parts will be imported for 1,800 MU, with 800 MU paid upon receipt in March and the remainder after one month.
- Inventory debts: The balance on 31/12/2011 is 2,380 MU, of which 1,380 MU will be paid in January and the remainder in February.
- Wages: Annual wages are estimated at 1,080 MU, and social charges are 70% of the wage amount. Wages are paid in the same month, while social charges become due after one month. Their outstanding balance on 31/12/2011 is 54 MU.

- Production expenses and selling and distribution expenses are paid in the same month.
- Investment: New equipment is expected to be acquired in May for 950 MU, with 50 MU paid in the same month, 250 MU in June, 250 MU in July, and 400 MU in November.
- The retained earnings balance on 31/12/2011 is 290 MU, of which 140 MU will be distributed in June.
- Taxes: Taxes due for the previous year will be paid in April for 23 MU. Advance payments of corporate income tax for the current year will be made in March (40 MU), June (45 MU), and September (45 MU).

Required:

- Prepare the receipts and payments budget for the first half of 2012.
- Prepare the cash budget, given that the cash balance on 31/12/2011 is 200 MU.

Model solution for case study No. 14

Calculation of the receipts table:

	January	February	March	April	May	June
Customers	1,400	974				
Cash sales	326.7	326.7	308.88	299.97	297	267.3
Credit sales						
One month (30%)	**–**	**495**	**495**	**468**	**454.5**	**450**
Two months (50%)	**–**	**–**	**825**	**825**	**780**	**757.5**
Sale of land	–	–	400	–	–	600
Total	**1,726.7**	**1,795.7**	**2,028.88**	**1,592.97**	**1,531.5**	**2,074.8**

Example of calculating sales for January: [18,000 / 12] = 1,500 units × 1 MU/unit = 1,500 × 1.1 = 1,650 MU

Cash sales for January: 1,650 × 0.2 × 0.99 = 326.7

Credit sales for one month: 1,650 × 0.3 = 495

Credit sales for two months: 1,650 × 0.5 = 825

Payments table for the first half:

	January	February	March	April	May	June
Value of purchases	950	880	870	870	850	850
20% cash upon receipt	190	176	174	174	170	170
Deferred payments (50% after 1 month)	–	475	440	435	435	425
Remaining (30% after 2 months)	–	–	285	264	261	261
Spare parts			800	1,000		
Inventory debts	1,380	1,000				
Wages Social charges	90 54	90 63	90 63	90 63	90 63	90 63
Production expenses	90	85	88	90	76	85
Selling & distribution expenses	60	55	57	60	54	55
Purchase of investments					50	250
Distribution of retained earnings						140
Taxes			40	23		45
Total	**1,864**	**1,944**	**2,037**	**2,199**	**1,199**	**1,584**

Estimated cash budget:

	January	February	March	April	May	June
Beginning balance	200	62.7	–85.6	–93.72	–699.75	–367.25
+ Cash receipts	1,726.7	1,795.7	2,028.88	1,592.97	1,531.5	2,074.8
= Total available	1,926.7	1,858.4	1,943.28	1,499.25	831.75	1,706.75
– Payments	1,864	1,944	2,037	2,199	1,199	1,584
Ending balance (surplus or deficit)	**62.7**	**–85.6**	**–93.72**	**–699.75**	**–367.25**	**122.75**

Conclusion

Conclusion

In conclusion, it can be said that the Management Control course is one of the vital applied subjects that contributes to providing students with essential analytical and practical skills to understand the reality of modern organizations. Through theoretical lectures supported by applied examples and simplified exercises, we have sought to enable students to grasp key concepts and link them to field practices, thereby enhancing their abilities to monitor, evaluate, and make sound decisions.

In the applied chapter, we adopted the case study method, all of which are derived from real-world situations, in order to apply the theoretical aspect and project it onto the practical side, hoping that this will be an effective contribution to providing such references that many students and professionals, at various academic and managerial levels, rely upon.

While we hope that this publication will serve as a pedagogical reference that helps students in their academic path, it is also an invitation to further research and deeper exploration in this dynamic field, which constantly evolves with economic and technological changes. Theoretical knowledge becomes more effective when combined with practical application, which makes management control an essential tool for improving performance and ensuring the sustainability of organizations

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