

CHAPTER IV:

PROJECT PREPARATION

- ❖ **After Identifying promising project idea the next step is project preparation or developing the idea into project and analyzing it further.**
- ❖ **Project preparation also referred to as project design, project formulation, or project write-up**
- ❖ **Project preparation is writing up and processing of the project into a project document, which can be presented to funding agency.**
- ❖ **Project formulation (preparation) involves the analysis of a number of factors like,**
 - ❑ **Market Analysis and Marketing**
 - ❑ **Technical analysis**
 - ❑ **Financial Analysis of Investment projects**
 - ❑ **Economic and Environmental Analysis Of Investment projects**

Market Analysis and Marketing

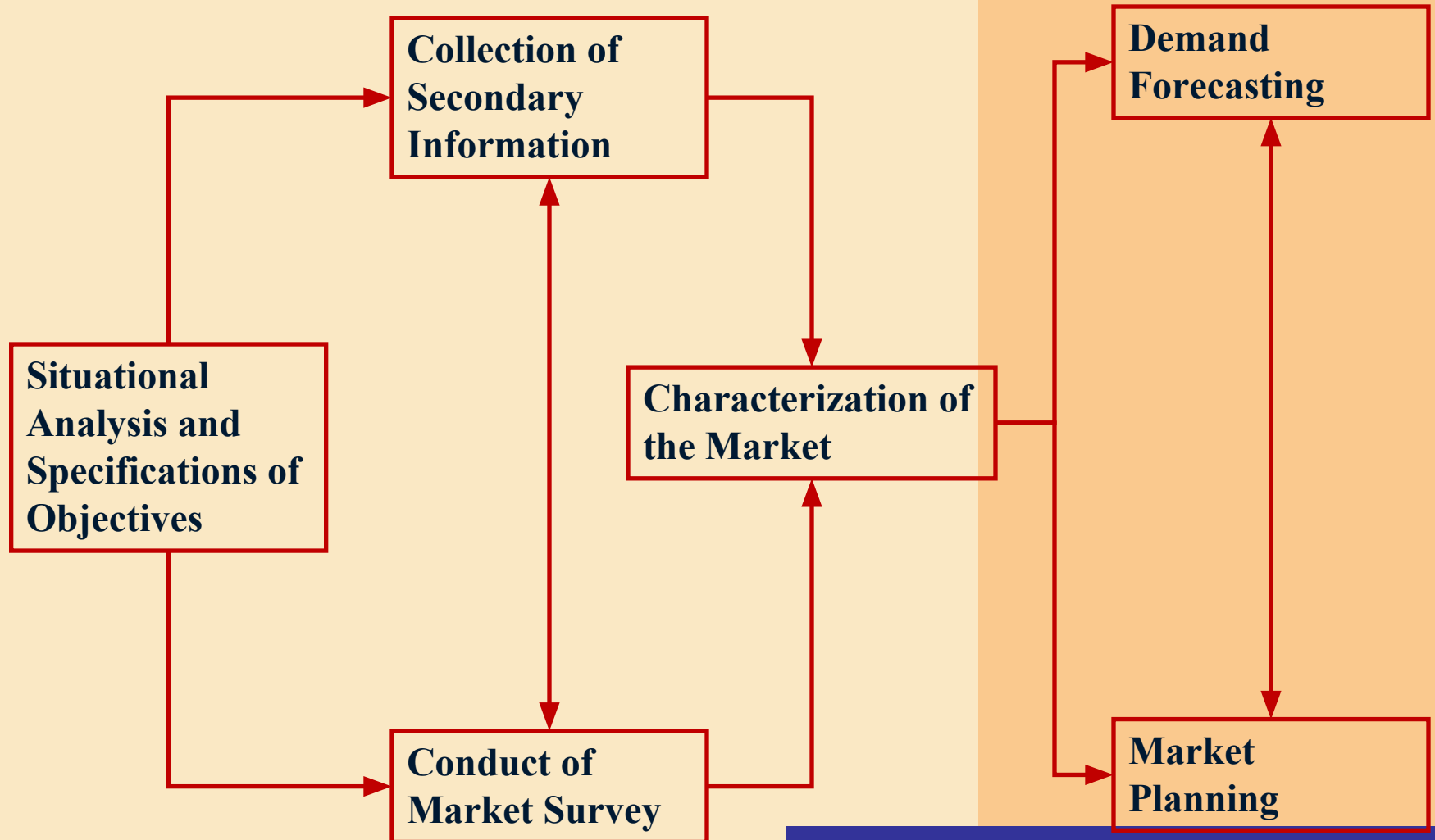
- ❑ Is the study of identifying clients or customers for the output (goods and services) and how they can be approached
- ❑ The process is comprised of analyzing the existing or potential market for the project's output and then developing a marketing strategy and a marketing programme to carry out the strategy.
- ❑ MKT analysis of a project is a systematic inquiry seeking to gain information about the whole environment in which the project is expected to operate and to forecast the future trends to which the project is expected to adapt
- ❑ It is concerned not only with individuals and organizations that are actual or potential consumers of the product of the project also with competitors and all kinds of technical, material, political, legal and **administrative constraints with in which the project is expected to operated and grow**

Market Analysis and Marketing

Objectives of Market Analysis

- ❖ The objective is to measure and forecast the market in order to determine whether the project will produce the right product at the right time and the right place.
- ❖ The specific objectives of the market analysis are to know:-
 - the market size and the growth rate
 - The volume of output the project plans to produce and sell in light of the competition
 - The geographic or sectoral markets the project's product is expected to compete
 - The method of distribution and marketing policy

Market Analysis and Marketing



Steps in Market and demand analysis

Market Analysis and Marketing

1. Market/Situational Analysis and Specifications Of Objectives

- This analysis is used in order to get general picture and basic information about the industry and /or the sector in general.
- In this analysis the project analyst may informally talk to
 - ✓ Customers,
 - ✓ Competitors, (in case of business project)
 - ✓ Middlemen,
 - ✓ and others in the industry (sector)
- It is also advisable to learn from the past experience in the area. That is learn about,
 - ✓ Preferences
 - ✓ Purchasing power
 - ✓ Action and strategies of competitors
- If the situational analysis generates enough data to measure the market and is enough to make a reliable projection of the demand and revenue, a formal study may not be necessary

Market Analysis and Marketing

1. Market/Situational Analysis and Specifications Of Objectives

- In order to successfully undertake the situational analysis, it is advisable to clearly spell out the operational objective of the project.
- The best way of spelling out the objective would be to put the operational objectives in the form of questions.
 - ✓ *Example : Suppose Sikina Flour Factory is considering to expand its business activity by producing Biscuit. In undertaking the situational analysis there is a need to clearly spell out the specific objective of the project.*
- For the sake of spelling out the objective it could put relevant issues in the form of questions like,

Market Analysis and Marketing

1. Market/Situational Analysis and Specifications Of Objectives

- ☐ Who are the potential customers of the product?
- ☐ What is the total current demand for biscuit in the town/ in the region?
- ☐ How is the demand currently distributed?
- ☐ What is the current price of the product and what price will the consumers be willing to pay for the product?
- ☐ Do consumers need the new biscuit product as a substitute for the biscuits in the market?
- ☐ What is the nature of distribution and what market channels are most suited for the product?
- ☐ What are the possible sales of the product ?
- ☐ If the satisfactory answer could be obtained form the above analysis no further study is necessary as a part of demand and market analysis

Market Analysis and Marketing

2. COLLECTION OF SECONDARY INFORMATION

- Secondary information is information that has been gathered in some other context and is already available
- It provides the base and the starting point for market and demand analysis
- It indicates what is known and often provides leads and clues for gathering primary information required for further analysis
- Sources of information are
 - General Sources of Secondary Information
 - Industry Specific Sources of Secondary Information
- Evaluation of Secondary Information
 - ✓ Although economically and readily available careful examination in terms of reliability, accuracy, and relevance for the purpose **under consideration is essential.**

Market Analysis and Marketing

3. CONDUCT OF MARKET SURVEY

- ❖ To be of any value, Secondary information must be supplemented with primary information through market survey
- ❖ Primary information represents information that is collected for the first time to meet the specific purpose on hand
- ❖ The market survey can be a census or sample survey
 - Census Survey covers the entire population
 - Sample Survey covers limited part of the total population
- ❖ The important types of information to be gathered through the market survey include:-
 - Total demand and rate of growth
 - Demand in different segments of the market
 - Motives for buying
 - Purchasing plan & intentions
 - Satisfaction with existing products
 - Unsatisfied needs
 - Attitudes towards various products etc

Market Analysis and Marketing

3. CONDUCT OF MARKET SURVEY

- **Steps in a Sample Survey**
 - **Define the Target Population**
 - **Select the Sampling Scheme and Sample Size**
 - **Develop the Questionnaire**
 - **Recruit and Train the Field Investigators**
 - **Obtain Information as Per the Questionnaire from the Sample of Respondents**
 - **Scrutinizes the Information Gathered**
 - **Analyze and interpret the Information**

Market Analysis and Marketing

4. CHARACTERISATION OF THE MARKET

- Based on the secondary and primary data gathered, the market for the product or service can be described in terms of the following aspects. :-
 - A. **Effective Demand in the Past and Present:** This is measured by the actual consumption level
$$\text{Production} + \text{Imports} - \text{Exports} - \text{Change in stock level}$$
 - B. **Breakdown of Demand:** In order to get a better picture about demand it is better to breakdown the entire market into demand of different segments of the market .
 - Income group
 - Geographic Location
 - Sex
 - Age category
- Segment analysis is required because the nature of demand (consumption) vary from one segment to another. (Consumers in high income group tends to be less sensitive to price change)

Market Analysis and Marketing

C. Prices: Price analysis is important in order to distinguish different types of prices like,

- Manufacturing price
- Whole sale price
- Retail price

D. Methods of distribution: method of distribution varies with the nature of the product.

- ✓ This analysis involves examining the available method of distribution that can be considered.
- ✓ That is, the market is characterized in terms of the availability and nature of distribution.

E. Suppliers: The market need to be characterized in terms of supply of similar products.

- ✓ Sources and Location of suppliers
- ✓ Present capacity and Planned expansion (if any)
- ✓ Problems in production
- ✓ Cost consideration (if possible)

F. Government policy: The market is characterized in terms of the prevailing government policy regarding the market.

Market Analysis and Marketing

5. DEMAND FORECASTING

A. Qualitative Methods

- ❖ These methods rely essentially on the judgment of experts to translate qualitative information into quantitative estimates
- ❖ Used to generate forecasts if historical data are not available (e.g., introduction of new product). The important qualitative methods are:
 - I. Jury of Executive Method
 - II. Delphi Method

B. TIME SERIES PROJECTION METHODS

- ❖ These methods generate forecasts on the basis of an analysis of the historical time series.
- ❖ The important time series projection methods are:
 - I. Trend Projection Method
 - II. Exponential Smoothing Method
 - III. Moving Average Method

C.. CASUAL METHODS

- ❖ Casual methods seek to develop forecasts **on the basis of cause-effects relationships** specified in an explicit, **quantitative manner. Simple and Multiple Regression**

Market Analysis and Marketing

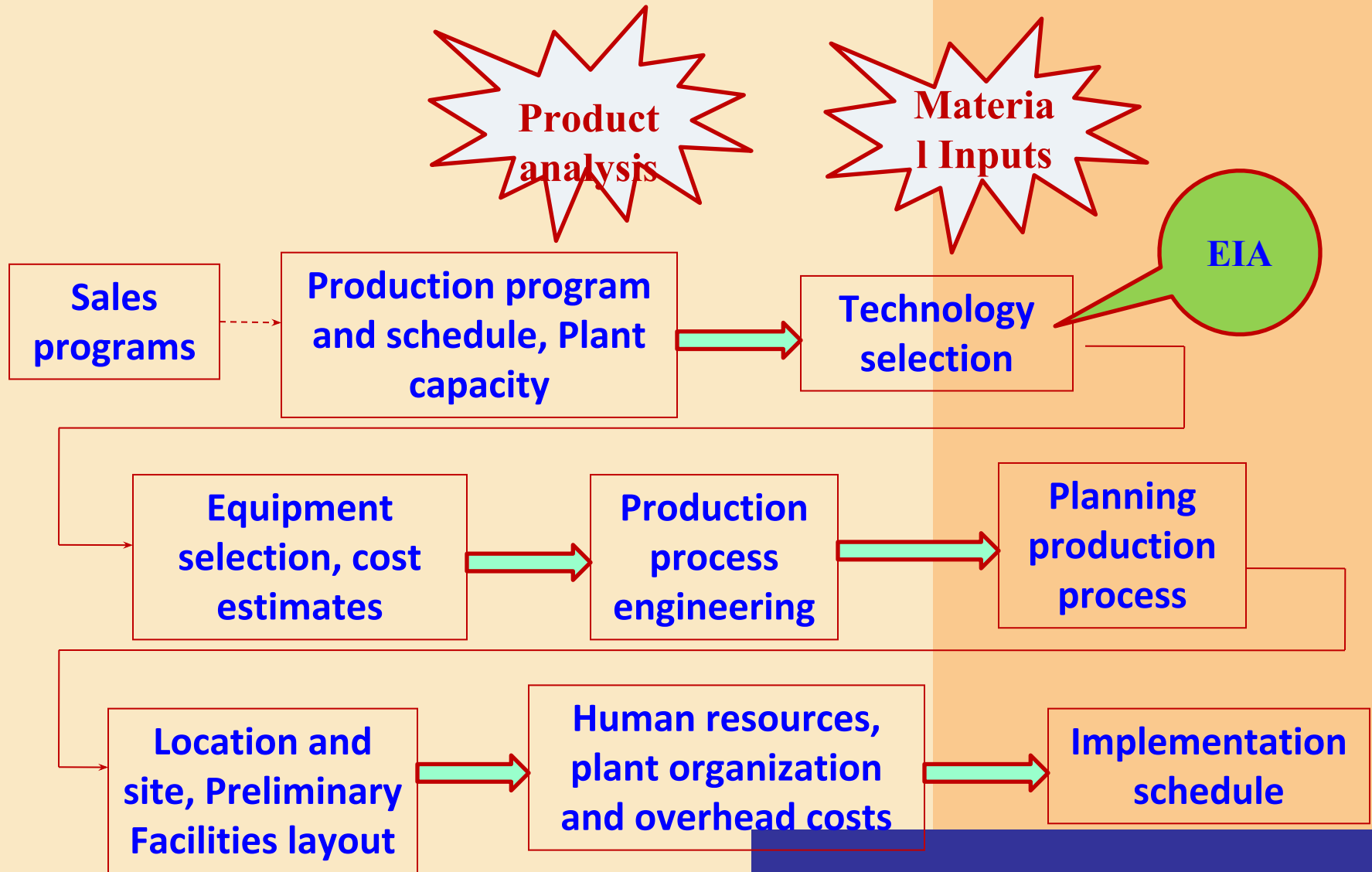
- ❖ **The output of the market analysis, for a commercial project, should of a set of forecasts of the following variables for the duration of the project:**
 - ✓ **Quantities of the expected sales and prices for goods to be sold in the competition regardless of whether such sales are made for domestic or foreign customers**
 - ✓ **Quantities of expected sales and prices for goods to be sold domestically and not in competition with internationally traded goods**
 - ✓ **Sales taxes and export taxes that are expected to be paid by the consumers of the traded goods**
 - ✓ **Sales taxes to be paid on goods not traded internationally**
 - ✓ **Subsidies to be received on the basis of production, sales, exports etc..**
 - ✓ **Government regulations (such as price ceilings and floors, or quotas) affecting the sales or price of the output**

Market Analysis and Marketing

6. Marketing plan

- ❖ To enable the product to reach a desired market segment a suitable marketing plan should be developed.
- ❖ The marketing plan has the following components:
 - Current market situation
 - ✓ The size of the market and customer buying behavior
 - ✓ Competitive situation
 - ✓ Distribution situation
 - ✓ Macro environment
 - Opportunity and issue analysis
 - Objective
 - Marketing strategy
 - ✓ Target segment
 - ✓ Product positioning
 - ✓ Product line
 - ✓ Price
 - ✓ Distribution
 - ✓ Promotion activity
 - Action plan (market program)

Technical analysis



The technical design process

Technical analysis

- ❖ Technical analysis is **needed** to select the **optimal plant design**. For any project there are technical parameters to be selected e.g. plant capacity, material quantities and qualities and production sequence.
- ❖ At the feasibility stage, issues related to
 - The selection of an appropriate technology
 - Planning of the acquisition and adoption of this technology
 - The corresponding know – how are important parts of engineering and technical analysis
- ❖ Technical aspect also includes the
 - Task of engineering to design the **functional and physical layout** of the plant in order to produce **the needed output** and
 - The determination of **the corresponding investment expenditure and costs arising during the operational phase**

Technical analysis

- The project analyst needs to identify the appropriate technologies and its implication in terms of
 - ✓ **Costs, Use of local raw materials, and Environmental impact and other factors**
- Technology which is most appropriate in industrialized economies may not necessarily be appropriate in the developing countries.
- *The trade – off* between the **capital and labor intensive technologies**
 - ✓ Countries which have more capital resources than labor, capital – intensive technologies may be appropriate and economically justified.
 - ✓ On the other hand, countries with excess labor resources, labor saving techniques may prove unnecessarily expensive and erroneous.
- In addition the technology should also be evaluated with regard to its **environmental impacts**.
 - Economic use of raw materials
 - Low emission technologies, and
 - Low – waste production **processes must be considered for the selection of suitable technologies**

Technical analysis

- ❖ **Raw material:** It is required to establish the availability of raw material through companies supplying or producing them to avoid unnecessary delay.
 - Procurement of materials and equipment for construction and plant
- ❖ **Location study:** Proper selection of **site and its possession** is necessary to **meet targets relating to time and cost**.
 - The appropriate locations for the envisaged project in view of the **input, infrastructure as well as market for the output** are taken into account
 - Consideration for selection of project site may include the following: **cost of land, availability of land, labour factors, approach to site and market, raw material, transportation, availability of power, incentives, drainage and effluent disposal.**
 - The targets may be missed and **even viability of project may be lost if plant site has to be relocated at later date.**

Technical analysis

- ❖ **Plant Capacity:** It refers to the given the projected demand presented earlier in the estimation part of the project , and the planned technology, the envisaged plant capacity is set to produce estimated amounts of outputs.
- ❖ **Production Program:** The program is scheduled based on the consideration that the envisaged plant will work for an estimated number of days in a year
- ❖ **Human Resource and Training Requirement:** Inspite of problem of large unemployment the industry is still on lookout for skilled manpower.
 - The companies resort to training and upgradation in absence of its skill sets availability.
 - The list of required manpower for the envisaged plant is stated in the following table format

Technical analysis

position	Qualification level	Number required	Monthly salary

- ❖ **Power:** Regular feature of irregular power supply will not only cause heavy losses but may damage plant machinery and equipment.
 - ✓ If uninterrupted power supply is not available company may have to resort to standby generating systems.
- ❖ **Generally, the technical analysis is primarily concerned with**
 - ✓ Material inputs and utilities
 - ✓ Manufacturing process and technology
 - ✓ Product mix
 - ✓ Plant capacity
 - ✓ Location and site
 - ✓ Machines and equipment
 - ✓ Structure and civil works
 - ✓ Project charts and layouts
 - ✓ Work schedule

Technical analysis

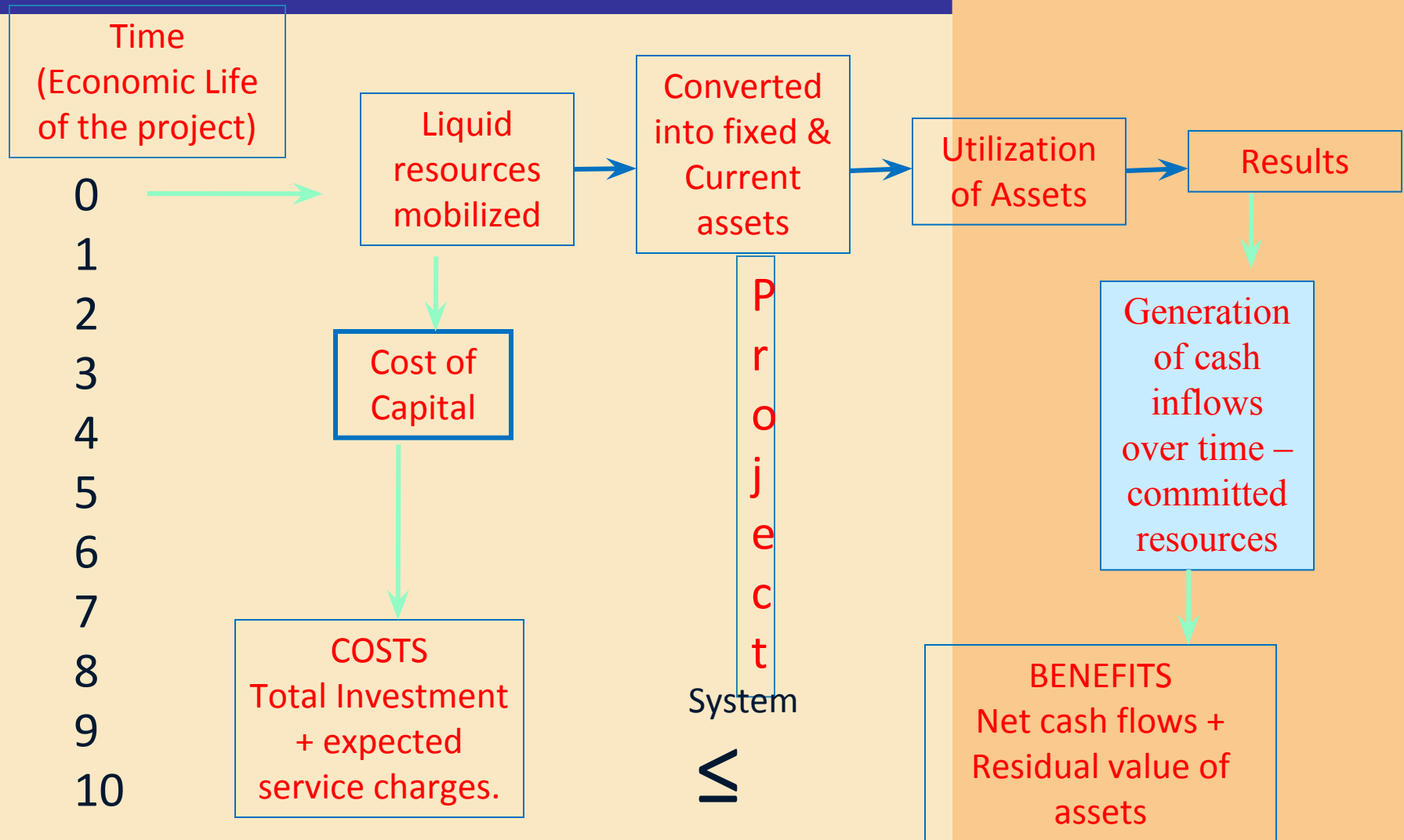
CONSEQUENCES OF INADEQUATE TECHNICAL ANALYSIS

- ❖ Inadequate technical analysis can have consequences similar to shortcomings in other areas of project analysis. Among the outcomes are:
 - Approval of an **ill-grounded project** resulting in loss of invested resources.
 - Approving a **viable project without complete** and competent technical analysis with consequent delays in project implementation and lower than expected profitability.
 - **Rejecting a viable project due to inadequate** technical analysis with resulting loss of anticipated profits and development **opportunities**

Financial Analysis of Investment projects

- ❖ Financial analysis of an investment project provides the "**bottom line**" for investors, a prediction of what the project holds in store in terms of **financial benefits and costs**.
- ❖ The **primary purpose** of doing a financial analysis of a project is to evaluate the project's **profitability or cost-effectiveness** relative to some alternative project or investment.
- ❖ Or , the results of the financial analysis are used to compare alternative projects to select which ones should be implemented
- ❖ is linked to the
 1. analysis of **markets** that provide an idea of **revenues (benefits)** that can be generated, and
 2. **technical analysis** that provides an idea of the necessary investment and operating costs

Financial Analysis of Investment projects



Financial Costs and Benefits

Financial Analysis of Investment projects

Cost analysis: Cost analysis is composed of two components:

□ Initial Investment Costs and Operation Costs

• **FIXED ASSETTS**

=

FIXED INVESTMENT COSTS

+

**PRE-OPERATION
EXPENDITURES**

**NET
WORKING
CAPITAL**

FIXED INVESTMENT COSTS include:

- ✓ Land and Site development
- ✓ Building and civil works
- ✓ Machinery and equipment
- ✓ Lump-sums for patents and know-how

PRE-OPERATION EXPENDITURES include:

- Administrative and legal fees
- Salaries for personnel during the implementation
- Travel expenses
- Training costs
- Interests on loans during the implementation
- Insurance costs during the implementation
- Trial runs, start-up and commissioning

NET WORKING CAPITAL =

Current assets (**inventories, accounts receivable and cash**) – Current **liabilities (accounts payable**

Financial Analysis of Investment projects

Operation Costs

- ❖ Operation costs should be **calculated as total annual costs** (if the financial coverage is on yearly basis) starting from the first year of operation of the project and should include:
 - costs for inputs and supplies
 - royalties for use of technology
 - overhead costs
 - labor costs (including **on-the-job training**)

Financial Analysis of Investment projects

Estimation of sales and production

- The **starting point for profitability projection** is an estimation of production and sales. This helps to estimate potential revenue of the project
- In **estimating sales revenue the following issues should be considered**
 - ❖ It is advisable **not to assume a high capacity utilization level** in the first year of operation.
 - ✓ This is because, even for simple technology and with no technical problem, firms may face other constraints like, Raw materials, Limited power supply, Marketing problem And other unexpected constraints
 - ✓ Gradually the level is increased year by year and at third and fourth years of operation the full capacity utilization can be assumed.
 - ❖ It is not necessary to make adjustment for stock in the first year of operation. That is, it is better to assume **that production = sales**
 - ❖ Selling price considered should **be realistic and the price considered should be on the basis of the current price**

Financial Analysis of Investment projects

The cost of production

Given the estimated level of production, the cost of producing the estimated amount can be worked out

The major components of cost of production are:

- ✓ **Material Cost:** These costs are comprise of the cost of raw materials
- ✓ **Utilities cost:** consisting of power, water, and fuel are production cost components
- ✓ **Labor cost:** this is the cost of all manpower employed in the farm.
- ✓ **Overhead cost:** the expense on repairs and maintenance, rent, taxes, insurance on firm's assets, etc. are collectively referred as farm overheads
- ✓ **Other costs**

Financial Analysis of Investment projects

Financial analysis is a process of evaluating an investment proposal. It is comprised of the following elements:

A. Cash-Flow Table: Shows the INFLOW and OUTFLOW of cash through a period of time

- The financial cash flow of a project is
 - ✓ the **stream of financial costs and benefits**, or
 - ✓ the **stream of expenditure and receipts** that will be generated by the project over its economic life.
- The project cash flows are defined with the help of inputs (information) provided by marketing, production, engineering, costing, purchasing, and other departments.

The cash flow of a project usually has:

- The **initial investment**: represents the relevant cash outflows when the project is set up.
- The **operating cash inflows**: are the cash inflows that arise from the operation of the project during its economic life.
- The **terminal cash flow**: is the **relevant cash flow occurring at the end of the project life on account of liquidation of the project**

Financial Analysis of Investment projects

- Financial cash flow lists the **difference between receipts and expenditures** against the years of project life.
- Usually the net financial cash flow is negative in the first years of the project's life, while in later years it becomes positive.

Year	0	1	2	3	4	5	6	7	8	9	10
Receipts				1.0	2.0	2.0	1.0	2.0	2.0	2.0	2.5
Expenditures	1.0	2.0	2.5	0.6	0.4	0.4	3.0	0.4	0.4	0.4	0
Net (R-E)	-1.0	-2.0	-2.5	+0.4	+1.6	+1.6	-2.0	+1.6	+1.6	+1.6	+2.5

- Thus, in estimating the future cash flow of a project, adequate care should be taken to minimize biases, *which may lead to over-estimate or under statement of project profitability*
 - An important consideration is to discount all income generated in the future
 - The basic assumption underlying the discounted cash-flow concept is that, sum of money available now is worth **more than an equal sum available in the future.**

Financial Analysis of Investment projects

Basic principles of measuring project cash flow

a) Incremental principle

- The cash flow of the project must be measured in incremental terms. To determine a project's incremental cash flows a project analyst has to look at what happens to the cash flows of the firm with the project and without the project

The difference between the two reflects the incremental cash flows attributable to the project

Project cash flow from
the time period t
equals

Cash flow for the firm
with the project at time
period t

less Cash flow for the firm
at time period t without
the project

b) Post-tax principle

- The cash flow should be measured on an after tax basis. Some people ignore taxes and will try to compensate by discounting pre-tax cash flows at the rate which is higher than the cost of capital of the firm.
- Actually there is no reliable mechanism that enable to make such adjustment. Tax payments like other payments must be properly deducted in deriving the cash flows. Thus, cash flows must be defined in post tax terms.

Financial Analysis of Investment projects

B. Income Statement: Shows the Revenues and Expenditures for a period of time.

REVENUES

Sales revenue +

Other revenues +

EXPENDITURES

Cost of goods sold -

Administrative costs -

Gross Profit (profit before tax) (- / +)

Net Taxes

NET PROFIT.

Financial Analysis of Investment projects

c. Balance Sheet: Shows the ASSETS and the LIABILITIES at a certain period of time

ASSETS

Liquid assets

Cash at Bank

Bonds and stocks

Inventories

Fixed Assests

Building

Mechinery

LIABILITIES

Short term Liabilities

Accounts Payable

Short Term Credits

Long Term Liabilities

Loan

=

Owner's Equity

Financial Analysis of Investment projects

METHODS OF PRIORITISING PROJECTS

- ❖ Several different financial criteria have been proposed for comparing different projects.
 - **Non-Discounted Measures**
 - ✓ Ranking by Inspection
 - ✓ Payback period
 - ✓ Peak profit period
 - ✓ Average profit
 - **Discounted Measures**
 - ✓ Net Present Value
 - ✓ Net Present value Ratio
 - ✓ Benefit–cost Ratio
 - ✓ Internal Rate of Return

Financial Analysis of Investment projects

Non-discounting methods

- The non-discounted criteria **will not in general take into account the time value of money**. There are different methods under this category

1. Ranking by Inspection

- By simple inspection it is possible to determine which of the two or more investment projects is more desirable.
- ❖ There are two cases under consideration
 - When two projects have identical cash flows but different project life, i.e.,
 - One has shorter life
 - while the other has longer project life
 - ✓ then, the project with the longer life would be more desirable.
 - When two projects have the same initial outlay the same earning life and earn the same total proceeds (profits), but one project has more of the flow earlier in the time sequence,
 - ✓ Then we choose the project **having higher proceeds in the earlier period than later**.

Financial Analysis of Investment projects

Ranking by Inspection

Consider the following example

Investment (project)	Initial cost	Net cash proceeds per year	
		Year I	Year II
A	10,000	10,000	---
B	10,000	10,000	1,100
C	10,000	3,762	7,762
D	10,000	5,762	5,762

Financial Analysis of Investment projects

Ranking by Inspection

- From the above table, comparison of project A and B
- Investment B is better than investment A, since all things are equal except that B continues to earn proceeds after A has been retired.
- More analysis is required to decide between C and D.
- Investment D is more profitable than investment C, since D earns 2000 more in year 1 than investment C, which does not make up the difference until year two.

Financial Analysis of Investment projects

Payback Period/Method

- This is the **simplest technique** used in industry.
- It consists of selecting those projects whose profits are big enough to repay the amount invested within a chosen number years.
- Consider two projects A and B. In both cases €100m is invested today i.e. year 0. It is expected, that, the cash inflows for both projects be as follows:

Year	0	1	2	3	4	5	6	7
A	-100	30	30	40	20	10	0	0
B	-100	30	30	30	30	30	10	10

Financial Analysis of Investment projects

Payback Period/Method

- ❖ If a payback period of three years were chosen, which of the projects would be selected? The procedure
 - adding up the cash-flows.
 - observes which project attains €100m first
 - For project A total cash-flow is €130m.
 - Project B's is €170m.
 - Looking at the year-by-year addition, Project A attains €100m by end of year three,
 - Whilst Project B attains €90m during the same period.
 - With a three-year payback, Project A is selected.

Financial Analysis of Investment projects

Payback Period/Method

□ Advantages

- This technique is simple.
- It has a built-in safeguard for investment protection because of the X years time limit. Risk is based on the unknown future thus the shorter the period the less the risk
- Useful in times of **rapidly changing technology** – need to recover the costs of investment before a new machine is designed.
- Takes into account the timing of cash-flows

Financial Analysis of Investment projects

Payback Period/Method

Disadvantages

- ❑ Perhaps, the most serious disadvantage is the **non-consideration of the time value of money.**
- ❑ Cash inflows, in the pay back calculation, are simply added without suitable discounting.
- ❑ Benefits of investment may accrue over periods longer than the chosen payback period. As a result, such projects may be undervalued
- ❑ It does not measure the profitability of the project but it measures only capital recovery.
- ❑ Though the technique is claimed to minimise risk, it may result in projects with high risk. It is possible to choose projects with higher risk **with short payback periods.**
- ❑ May encourage a **short-termist attitude**

Financial Analysis of Investment projects

Discounted payback period

- A major deficiency of a conventional payback period is that it does not take into account the time value of money.
- To overcome this limitation, the discount payback has been suggested.

In this modified method,

- ◆ cash flows are first converted into their present values
- ◆ and then added to determine the period of time required to recover the initial outlay on the project.

Financial Analysis of Investment projects

Peak Profit Method

- ❖ This technique is similar to that of payback.
- ❖ Here, the value used is the peak profit and not the cash-flow.
- ❖ Additionally, a decision is based on only on a measure; the highest profit.
- ❖ Consider two projects; C and D. Initial investment in each is estimated at €100m
 - Lay out the profits year-by-year.
 - Express each year's profit in terms of the initial investment
 - Multiply by 100,
 - This is the profit rate.
 - Select the project with the highest profit rate.

Financial Analysis of Investment projects

Peak Profit Method

Year	0	1	2	3	4	5
C	-100	20	40	60	40	20
D	-100	50	50	50	50	50

Year	0	1	2	3	4	5	Peak Profit
C	-100	20%	40%	60%	40%	20%	60%
D	-100	50%	50%	50%	50%	50%	50%

- ❑ From the above, the peak profit for Project C is 60%
- ❑ That for Project D is 50%.
- ❑ Project C is selected.

Financial Analysis of Investment projects

Peak Profit Method

- The major assumption of this technique is that;
- peak profit rate of return is a guide to average profitability of a project.
- This assumption is valid, if and only if, projects have similar lengths of life and also, similar profit streams.
- In practice, project lives do vary and so do profit streams.
- Some projects have profits that build up slowly to a peak whilst others attain their peak early.

Disadvantages

- The peak method does not allow high early profits to be invested.
- It does not deal adequately with capital allowance.
- It does not calculate profit.

Financial Analysis of Investment projects

Average Profit Method

- Another non-discounted measure
- This technique uses all data over the project life to compute a statistic.
- Uses profit and not cash-flow
- The assignment is to select one project out of the two for funding.
- Each profit stream is summed
- The sum divided by the number of years; in this case 5 years
- Each mean is expressed as a percentage of the initial investment
- The choice is in favour of the project with the highest average profit rate

Year	0	1	2	3	4	5	Total Profit	Mean Profit	Mean Rate
E	-100	40	40	60	40	20	200	40	40%
F	-100	50	50	50	20	20	190	38	38%

Financial Analysis of Investment projects

Average Profit Method

Advantage

- Focuses upon profitability
- Easy to compare % returns on different investments, to help make a decision.
- Important advantage of this method as opposed to two earlier methods is that, **all the data provided is used** to estimate the statistic.
- In addition, this statistic, a measure of central tendency is preferred to the others.
- Easier to identify the opportunity cost of investment

Disadvantages

- It ignores time value of the money invested.
- Average profit method does not allow for the fact that profits can be re-invested. From the above example, Project F has a lower average profit but makes higher profits in year 1 and 2.
- This surplus profit can be re-invested **so that by the end of the project life the proceeds may offset that of Project E.**

Financial Analysis of Investment projects

Accounting Rate of Return

- A modification of the average profit method is the accounting rate of return. The formula is:

$$ARR = \left(\frac{\textit{Estimated Average Profit}}{\textit{Estimated Average Investment}} \right) * 100$$

Advantages

- Easy to understand.

- Widely used.

- Data readily available to calculate it.

Disadvantages

- It does not take into account the **time value of money.**

- It is based on accounting profits **and these are subjective.**

Financial Analysis of Investment projects

DISCOUNTED MEASURES OF PROJECT WORTH

Net Present Value (NPV)

- The cash-flows estimated for the project are in the future; they are not yet realised
- The future is not here yet, but decisions would have to be taken in the present time
- The question then is, what is the value of these future estimated cash-flows in the present or current period, or better still today?
- future estimated cash-flows would have to be 'brought' to the current or present period
- The net present value of a project is the sum of the present values of all the net cash flows that are expected to occur over the life of the project

Financial Analysis of Investment projects

Net Present Value (NPV)

$$NPV = \sum_{t=1}^T \frac{B_t - C_t}{(1+r)^t}$$

$$NPV = \sum_{t=1}^T \frac{B_t}{(1+r)^t} - \sum_{t=1}^T \frac{C_t}{(1+r)^t}$$

Where :

B_t *is periodic benefit*

C_t *is periodic cost*

\sum *is the summation sign*

□ The discounted rate should be either

- ✓ the actual **rate of interest** on long term loans in the capital market or the interest rate paid by the borrower
- ✓ The discounting period is normally equal to the life of the project.

Financial Analysis of Investment projects

Net Present Value (NPV)

Decision Rule:

$NPV > 0$; project is viable, accept.

$NPV < 0$; project is not viable, reject.

$NPV = 0$; project is neither viable or not viable

- The value of NPV suggests how much a project is adding in value terms to an existing entity or how much value the project is creating.
- A positive NPV means that the project is expected to add value to the firm and will therefore increase the wealth of the owners
- Since the goal of projects is to add value or increase owner's wealth, NPV is a direct measure of how well this project will meet the goal.
- NPV has units of currency such as cedis (¢) or US dollars (US\$).

Financial Analysis of Investment projects

Net Present Value (NPV)

Consider a project, which has a cost of capital 10 percent

Year	0	1	2	3	4	5
Cash flow	-1,000,000	200,000	200,000	300,000	300,000	550,000

Therefore,

$$NPV = \frac{-1,000,000}{(1.10)^0} + \frac{200,000}{(1.10)^1} + \frac{200,000}{(1.10)^2} + \frac{300,000}{(1.10)^3} + \frac{300,000}{(1.10)^4} + \frac{550,000}{(1.10)^5} = 118,913$$

Financial Analysis of Investment projects

Net Present Value (NPV)

We can also use the discount factor from present value tables and compute the NPV as shown in following table

Year	Cash flow	PV Discount Factor	PV
0	-1,000,000	1	(1,000,000)
1	200,000	.909091	181,818
2	200,000	.826446	165,259
3	300,000	.751315	225,395
4	300,000	.683013	204,904
5	550,000	.620921	341,507
NPV			118,913

Financial Analysis of Investment projects

- Independent projects are projects that are not in any way substitutes for each other.
- In such cases the decision rule is to accept the project having positive NPV
- Which means, if two projects have positive NPV and there is no budget constraint both could be accepted and we do not need to choose the one with higher NPV.
- A mutually exclusive project is a project that can only be implemented at the expense of an alternative project as they are in some sense substitutes for each other.
- Example of the mutually exclusive projects includes two versions of the same project, say with different technology, scale or time.
- The decision rule for such projects is to accept the project with the highest NPV.

Financial Analysis of Investment projects

Net Present Value (NPV) Consider projects, which has a cost of capital 30 percent

Year	0	1	2	3	4	5	6	7
A	-100	30	70	60	30	10	0	0
B	-100	60	50	40	30	30	10	10

Cash-flow Analysis for Project A and B

	Cashflow		Discount Factor	Discounted Cashflow	
Year	A	B	$(1+0.30)^{-t}$	A	B
0	-100	-100	1.0000	-100.00	-100.00
1	30	60	0.7692	23.08	46.15
2	70	50	0.5917	41.42	29.58
3	60	40	0.4552	27.31	18.21
4	30	30	0.3501	10.50	10.50
5	10	30	0.2693	2.69	8.08
6	0	10	0.2072	0.00	2.07
7	0	10	0.1594	0.00	1.59
			Net Present Value	5.003	16.178

Financial Analysis of Investment projects

Net Present Value (NPV)

Advantages

- Takes opportunity cost of money into account.
- A single measure, which takes the amount and timing of cash-flows into account.
- With NPV one can consider different scenarios.
- Results are expressed in value terms units of currency. So one is able to know the impact the value that the project would create.
- It is based on cash-flows, which are less subjective than profits.

Disadvantages

- Complex to calculate and communicate.
- Only comparable between projects if the initial investment is the same.
- It can be difficult to identify an appropriate discount rate.
- Cashflows are usually assumed to occur at the end of a year, but in practice this is over simplistic.

Financial Analysis of Investment projects

Net present value Ratio

- Investments are required for project benefits to be realised.
- These investments in the project cashflow can be identified as negatives.
- One of the limitation of NPV is that it does not consider the scale of the initial investment.
- The Net Present Value Ratio (NPVR) is an attempt to improve this limitation.
- When there are two or more alternatives, it is advisable to know how much investment will be required to generate these positive NPV
- The ratio of **the NPV** and **the present value of initial investment (PVI)** is called the net-present-value ratio (NPVR)
- This should be used for comparing alternative projects.

$$NPVR = \frac{NPV}{PVI}$$

Given alternative projects, the one with the **highest NPVR should be chosen**

Consider a project, which has a cost of capital 30 percent

Financial Analysis of Investment projects

Net present value Ratio

Cash-flow Analysis for Project A and B						
	Cashflow		Discount Factor		Discounted Cashflow	
Year	A	B	$(1+0.30)^{-t}$		A	B
0	-100	-100	1.0000		-100.00	-100.00
1	30	30	0.7692		23.08	46.15
2	30	30	0.5917		41.42	29.58
3	40	30	0.4552		27.31	18.21
4	20	30	0.3501		10.50	10.50
5	10	30	0.2693		2.69	8.08
6	0	10	0.2072		0.00	2.07
7	0	10	0.1594		0.00	1.59
			NPV		5.3	16.18
			Investment		100.00	100.00
			NPVR		0.0500	0.1618

Financial Analysis of Investment projects

Benefit – Cost Ratio (BCR)

- A variant of the formula for NPV uses the subtraction of discounted cash outflow from discounted cash inflow.
- In the case of BCR, the discounted cash inflow is expressed in terms of the discounted cash outflow.
- It is defined as the ratio of the sum of the project's present value of benefits to the sum of present value of its initial investment.

$$BCR = \frac{\sum_{t=0}^n \frac{B_t}{(1+r)^t}}{\sum_{t=0}^n \frac{C_t}{(1+r)^t}}$$

This can be viewed as:

- how many times the discounted cash inflow covers the discounted cash outflow over the project horizon.

Financial Analysis of Investment projects

Benefit – Cost Ratio (BCR)

- Consider a project, which has a cost of capital 12 percent annually and the initial investment Birr 100,000

Year	Benefit
1	25,000
2	40,000
3	40,000
4	50,000

The benefit – cost ratio measures for this project are:

$$BCR = \left(\frac{25000}{(1.12)} + \frac{40000}{(1.12)^2} + \frac{40000}{(1.12)^3} + \frac{50000}{(1.12)^4} \right) / 100,000 = 1.145$$

Financial Analysis of Investment projects

Benefit – Cost Ratio (BCR)

Decision criteria

- ✓ For a single project, a B/C ratio which is greater than 1 indicates acceptability
- ✓ For multiple (competing) projects, the project(s) with the **highest** B/C ratios (greater than 1) should receive highest priority
- NPV measures totals, indicates the amount by which benefits exceed (or do not exceed) costs.
- B/C measures the ratio (or rate) by which benefits do or do not exceed costs.
- They are clearly similar, but not identical.
- With multiple projects, some may do better under NPV analysis, others under B/C.

Financial Analysis of Investment projects

Internal Rate of Return (IRR)

- is the discount rate at which the present value of all cash flows is equal to the present value of the initial cash outflows.
- In other words, it is the discount rate for which the present value of the net receipts from the project is equal to the present value of the investment,
- IRR is the rate of return or discount rate that makes the $NPV=0$
- The IRR of a project is probably the most commonly used assessment criterion in project appraisal.
- This is because the concept of IRR is in some way comparable to the profit rate of a project. The method utilizes present value concept but will avoid the arbitrary choice of a discount rate.

Decision Rule:

- Once the IRR is identified, the decision rule is 'accept the project if the IRR is greater than the cost of capital, say r (cost of borrowing).
- That is, all projects with an internal rate of return greater than some target rate of return, should be accepted.

Financial Analysis of Investment projects

Internal Rate of Return (IRR)

- If the net cash flow of the project is a constant amount throughout the project life, then the determination of the IRR is some how easier.
- Take for example, a hypothetical project with the initial cash outlay of birr 10,000 and has a net cash flow after tax birr 3000 each year up to five years where the project will be retired.

$$10,000 = \frac{3,000}{(1+r)^1} + \frac{3,000}{(1+r)^2} + \frac{3,000}{(1+r)^3} + \frac{3,000}{(1+r)^4} + \frac{3,000}{(1+r)^5}$$

This can be written as,

$$10,000 = 3,000 \left(\frac{1}{(1+r)^1} + \frac{1}{(1+r)^2} + \frac{1}{(1+r)^3} + \frac{1}{(1+r)^4} + \frac{1}{(1+r)^5} \right)$$

- This is a present value of annuity which can be solved as

$$\frac{10,000}{3000} = \sum_{t=1}^5 \frac{1}{(1+r)^t}$$

- From the table value in the year's row (5th row) we find the value closer to 3.333 and we read the interest rate which is the IRR. The interest rate is 15%

Financial Analysis of Investment projects

Internal Rate of Return (IRR)

- In many cases the cash flow of the project is not the same amount throughout the project life. As a result the IRR is determined through iterative process. Without a financial calculator, this becomes a trial and error process

The IRR calculation procedure includes

- Preparation of a cash flow table
- An estimation of any discount rate to discount the net cash flow to the present value
- If the NPV is positive, a higher discount rate is applied
- If the NPV is negative at this higher rate, the IRR must be between these two rates.
- But, if the higher discount rate still gives a positive NPV, the discount rate must be increased until the NPV becomes negative
- If the positive and negative NPVs are close to zero, a good approximation of the IRR can be obtained, using the linear interpolation formula.

$$\frac{(\text{High value} - \text{Initial investment})}{(\text{High value} - \text{Lower value})} = \frac{(\text{Lower interest rate} - X)}{(\text{Lower interest rate} - \text{Higher interest rate})}$$

Financial Analysis of Investment projects

Internal Rate of Return (IRR)

- To illustrate the calculation of internal rate of return, consider the cash flows of the following hypothetical project

<u>Year</u>	<u>Cash flow</u>
0	-100,000
1	30,000
2	30,000
3	40,000
4	45,000

The IRR is the value of r , which satisfies the said condition

Let us, begin with, say, $r = 12$ percent. The right – hand side of the above equation becomes:

$$\frac{30,000}{(1.12)} + \frac{30,000}{(1.12)^2} + \frac{40,000}{(1.12)^3} + \frac{45,000}{(1.12)^4} = 107,773$$

Financial Analysis of Investment projects

Internal Rate of Return (IRR)

- Since this value is higher than the target value of 100,000, we have to try a still higher value of r .
- Now let us try $r = 15$ percent. This makes the right – hand side equal to:

$$\frac{30,000}{(1.15)} + \frac{30,000}{(1.15)^2} + \frac{40,000}{(1.15)^3} + \frac{45,000}{(1.15)^4} = 100,806.5$$

- This value is still higher than our target value, 100,000. So we increase the value of r from 15 percent to 16 percent

$$\frac{30,000}{(1.16)} + \frac{30,000}{(1.16)^2} + \frac{40,000}{(1.16)^3} + \frac{45,000}{(1.15)^4} = 98,637.5$$

- Now this value is less than 100,000, we conclude that the value of r lies between 15 percent and 16 percent. For most of the purposes this information is sufficient.
- However, if a single value is required, we have to resort to interpolation.

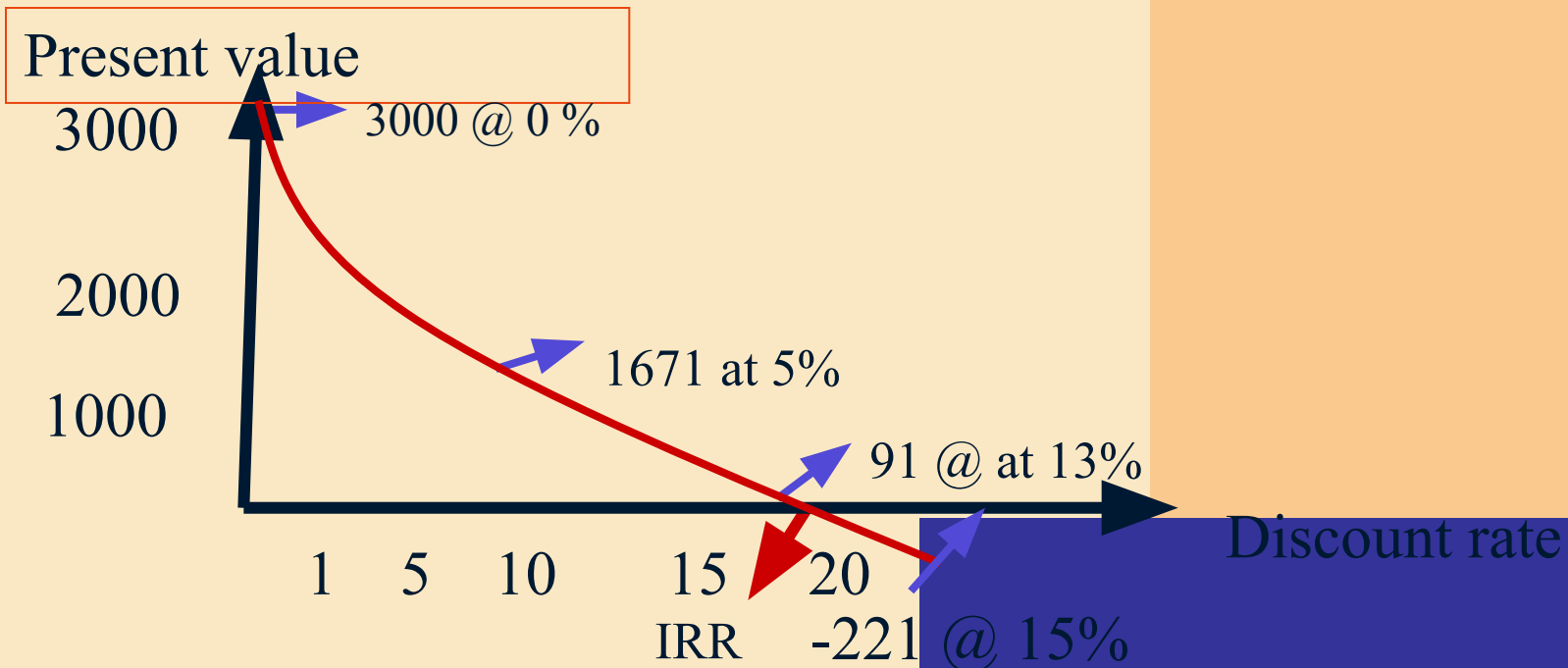
$$= \frac{100806.5 - 100,000}{(100,806.5 - 98637.5)} = \frac{15 - X}{(15 - 16)} \Rightarrow X = 15.3718$$

IRR would be 15.3711

Financial Analysis of Investment projects

Internal Rate of Return (IRR)

- Another approximate solution to the **IRR** is to plot the NPVs corresponding to several discount rates to give what we call the NPV curve
- The present values are plotted on the y-axis and the discount rates on the X-axis.
- A curve is then drawn to connect the various points on the graph. The point at which the curve cuts the X-axis represents the rate at which the present value of the investment is equal to 0.



Financial Analysis of Investment projects

Advantages of IRR

- It takes into account the time value of money, which is a good basis for decision-making.
- Useful for international institutions like the WB since they are dealing with different discount rate for different countries.
- Results are expressed as a simple percentage, and are more easily understood than some other methods.
- It is a simple way to communicate the value of a project to someone who doesn't know all the estimation details.
- If the IRR is high enough, you may not need to estimate a required return, which is often a difficult task.

Financial Analysis of Investment projects

Disadvantages

- ❑ For mutually exclusive projects: timing and scale differences. This may lead to incorrect decisions in comparisons of mutually exclusive investments.
- ❑ Assumes funds are re-invested at a rate equivalent to the IRR itself, which may be unrealistically high
- ❑ IRR will produce more than one mathematically correct rate for each year in which inflows are followed by outflows and vice versa. This is common with projects with unconventional cash flows. This can create some confusion to the user.

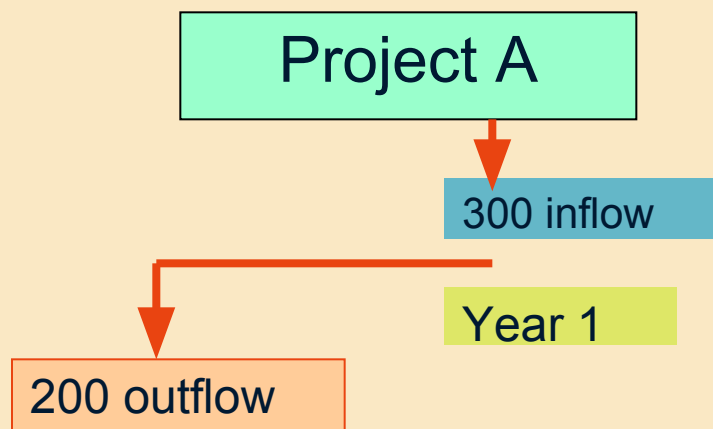
❖ A break-even analysis is an analysis to determine the point at which revenue received equals the costs associated with receiving the revenue. Break-even analysis calculates what is known as a margin of safety, the amount that revenues exceed the break-even point.

Problem with Project Ranking

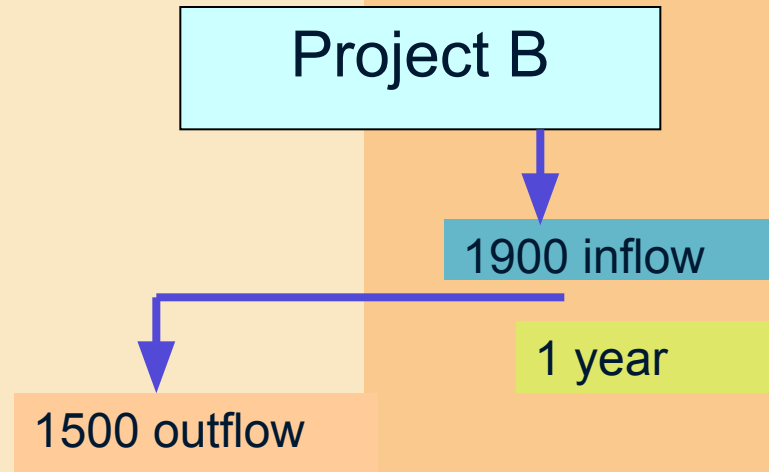
- ❖ In our previous discussion we have proposed that all projects
 - with a positive NPV, with IRR greater than the required rate of return, or BCR (profitability index) greater than one be accepted.
 - However, accepting all projects is not always possible. In many cases it may be necessary to select only one of them. This is true particularly for mutually exclusive projects.
- ❖ There are two major types of ranking problems.
 1. **The size disparity problem**
 - The size disparity problem occurs when mutually exclusive projects of unequal size are compared.
 - **This problem is easily clarified with the help of example.**
 - Suppose a firm is considering two mutually exclusive projects A and B, both with the required rate of return of 10%.
 - Project A involves 200 initial cash outflow and cash inflow of 300 at the end of the year.
 - Whereas project B involves 1500 initial cash outflow and cash inflow of 1900 at the end of the year.

Problem with Project Ranking

The NPV, the IRR, and BCR for each of them is presented below



NPV= 72.70
IRR = 50%
BCR = 1.36



NPV= 227.10
IRR = 27 %
BCR = 1.15

Problem with Project Ranking

- In this example if the NPV criterion is used project B would be selected. But if the IRR and BCR are used project A would be the preferred one.
The question is which project is better?
- The answer depends up on whether capital rationing exists. Without capital rationing project B is better because it provides the largest increase in the shareholders wealth
- If there is capital constraint,
 - then focuses is on what can be done with the additional 1300 ($1500-200=1300$) that is freed if project A is chosen?
- If the firm can earn more on project A plus the project financed with the additional money of 1300 than on project B
 - then project A and the marginal project will be selected.
- In effect we are attempting to select the set of projects that maximize the firm's NPV.
- If the marginal project has the NPV greater than 154.4 ($227.10-72.70$) we select this new project plus project A.
- *In summery, whenever the size disparity problem result in conflicting ranking between mutually exclusive projects, the project with the largest NPV will be selected, provided that there is no capital rationing.*
- *When there is capital rationing the firm should select the set of projects with the largest NPV.*

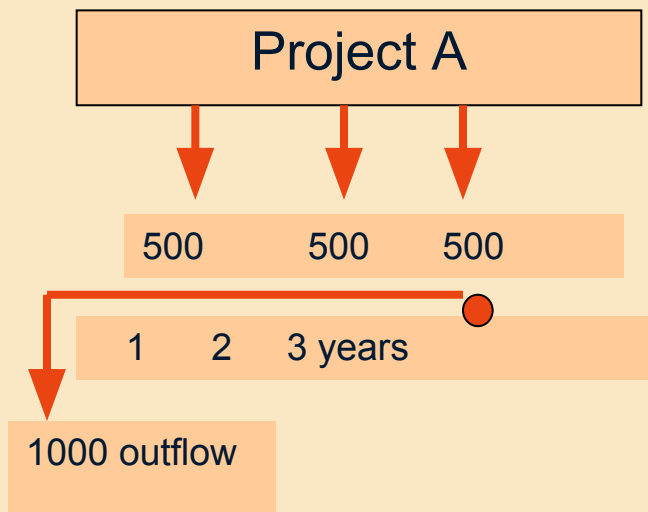
Problem with Project Ranking

2. Unequal Projects' life

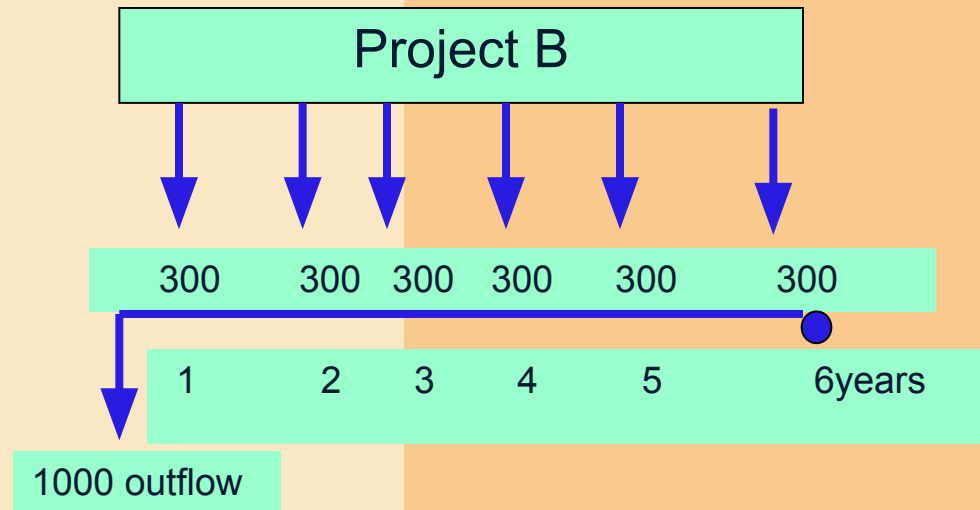
- The other problem of project ranking of mutually exclusive projects is problem associated with unequal life. Is it appropriate to compare two projects having different life span?

Example

- Suppose a firm with a 10% required rate of return is faced with the problem of selecting between two projects having different life time.



NPV= 243.5
IRR = 23%
BCR = 1.2435



NPV= 306.5
IRR = 20 %
BCR = 1.306

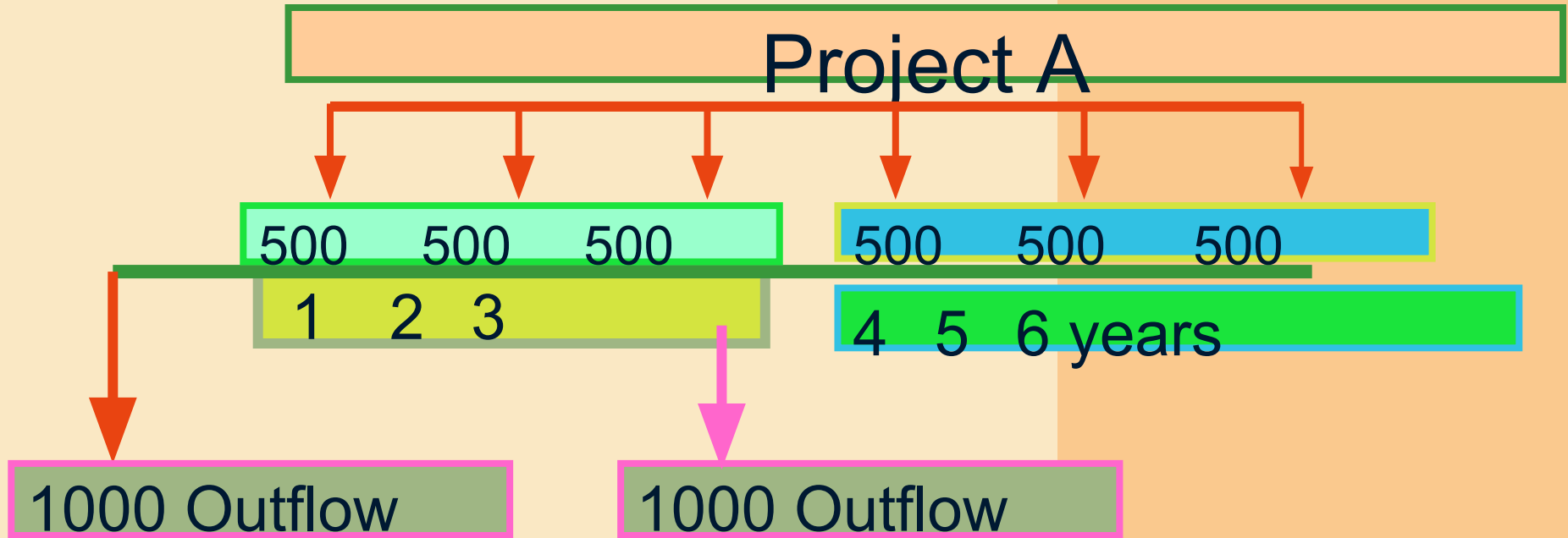
Problem with Project Ranking

- When we examine these two projects we find that the NPV, and BCR criteria indicate that project B is better project. But the IRR criteria favors project A.
- In this case the decision is a difficult one as the two projects are not comparable.

How such projects are compared?

- There are different methods to deal with such problem.
 1. The first approach is to assume that the cash inflow from the shorter life project will be reinvested at the required rate of interest until the termination of the longer life project.
 - This approach is the simplest one. But when calculating the NPV it ignore the problems at hand. That is, it ignores the possibility of participating in other replacement projects
 2. Another option is the projection of reinvestment opportunities into the future.
 - That is, making assumption about possible future investment opportunity. Unlike the first approach this is very difficult and requires extensive cash flow forecast
 3. The final technique is to assume that reinvestment opportunity in the future will be similar to the current one.
 - Meaning creating a replacement chain to equalized life span. In the replacement chain, we can create two chain cycle for project A.
 - That is, we can assume that project A can be replaced with a similar investment at the end of three years. Thus, project A would be viewed as two A projects occurring back to back as illustrated below.

Problem with Project Ranking



- The present value on this replacement chain is 426.4 which is comparable with project B's NPV.
- Therefore, project A should be accepted as its NPV is greater than NPV of project B.

Economic Analysis Of Investment projects

❖ *The economic analysis appraises the project's contribution to the economic welfare of the region or country. It is made on behalf of the whole of society instead of just the owners of the infrastructure, as in the financial analysis*

In particular, the economic analysis can help

- decide whether the private or the public sector should undertake the project;
- estimate the project's fiscal impact;
- determine whether the arrangements for cost recovery are efficient and equitable; and
- assess the project's potential environmental impact and contribution to poverty reduction

Economic Analysis Of Investment projects

1. The purpose of the economic analysis is to ensure that the project has a positive net contribution to society and is therefore worth to be financed by financiers.
2. Since projects are considered from the perspective of society as a whole, economic analysis differs from financial analysis in that
 - ✓ benefits are monetized and market prices are converted into accounting prices.
3. The net contribution to society is measured, expressed as a positive ENPV, as an ERR higher than the discount rate, or as a B/C ratio higher than 1.

Economic Analysis Of Investment projects

The standard methodology for the economic analysis can be summarised in four steps:

- estimation of benefits, with monetisation of non-market impacts when necessary;
- inclusion of additional indirect effects (if relevant);
- conversion of project costs from market to accounting prices;
- calculation of the economic performance indicators.

Economic Analysis Of Investment projects

Estimation of benefits

- Market prices are in some cases a good proxy to calculate the benefits of the project to society.
 - ✓ Example: a project to increase water supply in a region suffering with water restrictions.
- However, projects in the environment sector often result in economic benefits like the “improvement of quality of life” or the “improvement in ambient quality”, which are difficult to quantify in monetary terms.

Identification of benefits – water

- Improved access to drinking water:
 - Increased coverage of the water supply system; and
 - Increased quality of the service (through better quality of water, better pressure and/or increased continuity of supply).
- Improved access to sewerage:
 - Increased coverage of the sewerage system
- Improved quality of bathing and other surface waters:
 - Elimination of untreated wastewater discharges to receiving water bodies.
- Resource cost savings:
 - For the customer: no need for private wells, private pumps, bottled water, septic tanks
 - For the operator: lower operating costs (including energy)

Economic Analysis Of Investment projects

Identification of indirect benefits – waste

- Resource cost savings:
 - Recovery of recyclable products
 - Production of compost and energy; and
 - Reduction of the total amount of waste finally going to final disposal, which extends the economic life of the landfills
- Reduction of visual disamenities, odours and direct health risks;
 - Elimination of uncontrolled dump sites; and
 - Avoidance or proper collection and treatment of waste leachate
- Reduction of greenhouse gas emissions.
 - Avoidance (or proper collection) of methane and carbon dioxide emissions from decomposing waste; and
 - Emissions saved due to the generation of heat and electricity with replacement of fossil fuel sources

Economic Analysis Of Investment projects

Conversion market to accounting (1)

The calculation of the project economic costs involves the conversion of project investment and operating costs from market to economic prices, which implies the breakdown of the project cost into the following categories:

- **Traded items:** Goods and services included in the project cost that can be valued on the basis of world prices
- **Non-traded items:** Goods and services that have to be procured domestically, like for example domestic transport and construction, some raw materials and water and energy consumption
- **Skilled labour:** [Self-explanatory]
- **Non-skilled labour:** [Self-explanatory]
- **Land acquisition:** Land implicitly used in the project, even when no financial cost is included as part of the project cost (for example if the land for the landfill was provided free of cost by the project beneficiary).
- **Transfer payments:** Indirect taxes (e.g., VAT), subsidies, and pure transfers payments included in the market prices used to estimate the project costs

Economic Analysis Of Investment projects

Calculation of the project's ENPV (1)

Once the economic benefits have been quantified and the project cost have been converted to their economic values, the next (and final) step is to calculate the project's economic performance using the following indicators:

- economic net present value (ENPV): the difference between the discounted total social benefits and costs;
- economic internal rate of return (ERR): the rate that produces a zero value for the ENPV;
- B/C ratio, i.e. the ratio between discounted economic benefits and costs.

The ENPV is the most important and reliable economic indicator and should be used as the main reference for the economic analysis.

The discount rate used for the economic analysis (i.e. the social discount rate) is normally set by the Managing Authority at the national level.