Unit III - Project management Performance

Ideally a project will be considered totally successful if it gets completed on time within budget. perform exactly to the designers specifications.

many projects would not meet these requirements.

In real life a project cannot be considered either a total succes or total failure; it would somehow fit somewhere in the behaviours between.

Performance Indicators of PM

1 Time Overrun
2 Cost Overrun
3 Project sickness
4 Productivity as the performance indicator
5 Value as performance indicator.

Time Over Run

Time Overrun is the non completion of the project within the original or stipulated or agreed contract period.

Time Over run is one of the most significant issues being faced by the projects today.

There are various factors responsible for the time overrun which require serious attention to understand and address in order to achieve successful completion of projects on time.

This is because time overrun has great impact on costs which can never be recovered.

Cost Over Run

Time can be misquoted, cost cannot.

Any thing done to a project would be reflected in the cost.

If a project is not managed well; it's cost will go up if a project is well managed the cost would come down gradually.

Therefore the costs can be estimated used as an indicator for the project management performance

Cost estimates are to be revised at various stages to improve their accuracy.

Project Sickness.

The project management is responsible to best use of resources in the project in project.

The resources used for project reflect in plant.

The ratio of this output to the cost incurred for putting up the plant could be an indicator of project management performance.

This indicates the health of plant.

If a project is implemented, at a lower installed cost, the plant performance will be so much better, if not the plant will face the risk of falling sick.

Installed cost per tonne is a performance indicator and commercial production cost per tonne is also an indicator.

If both production cost and commercial ~~production~~ installed cost are not managed well the project will fall sick.

Productivity as performance indicator.
Productivity at the project implementation stage will affect the productivity of an operating plant.

Operating cost per tonne reflects the productivity of an operating plant.

A productivity indicator reflects how resources have been utilized either for production of goods and services for creation of facilities for the same.

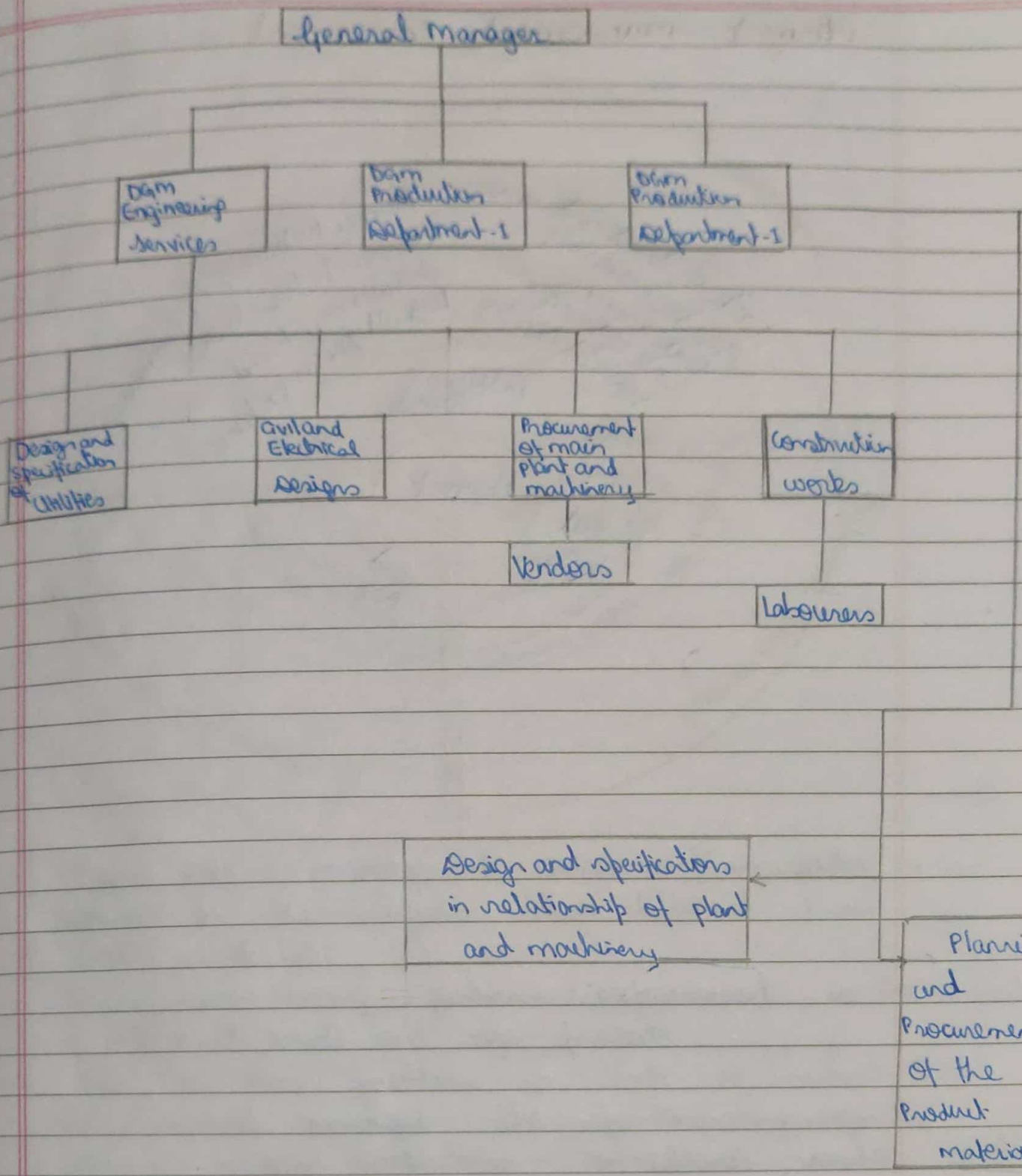
Value as Performance Indicator
Value which can be expressed as performance improves only when the performance is achieved as at no extra cost or when cost can be reduced for the desired level of the performance.

If the installed cost per tonne of ~~cap~~ capacity is higher than normal then plant will invariably fall sick

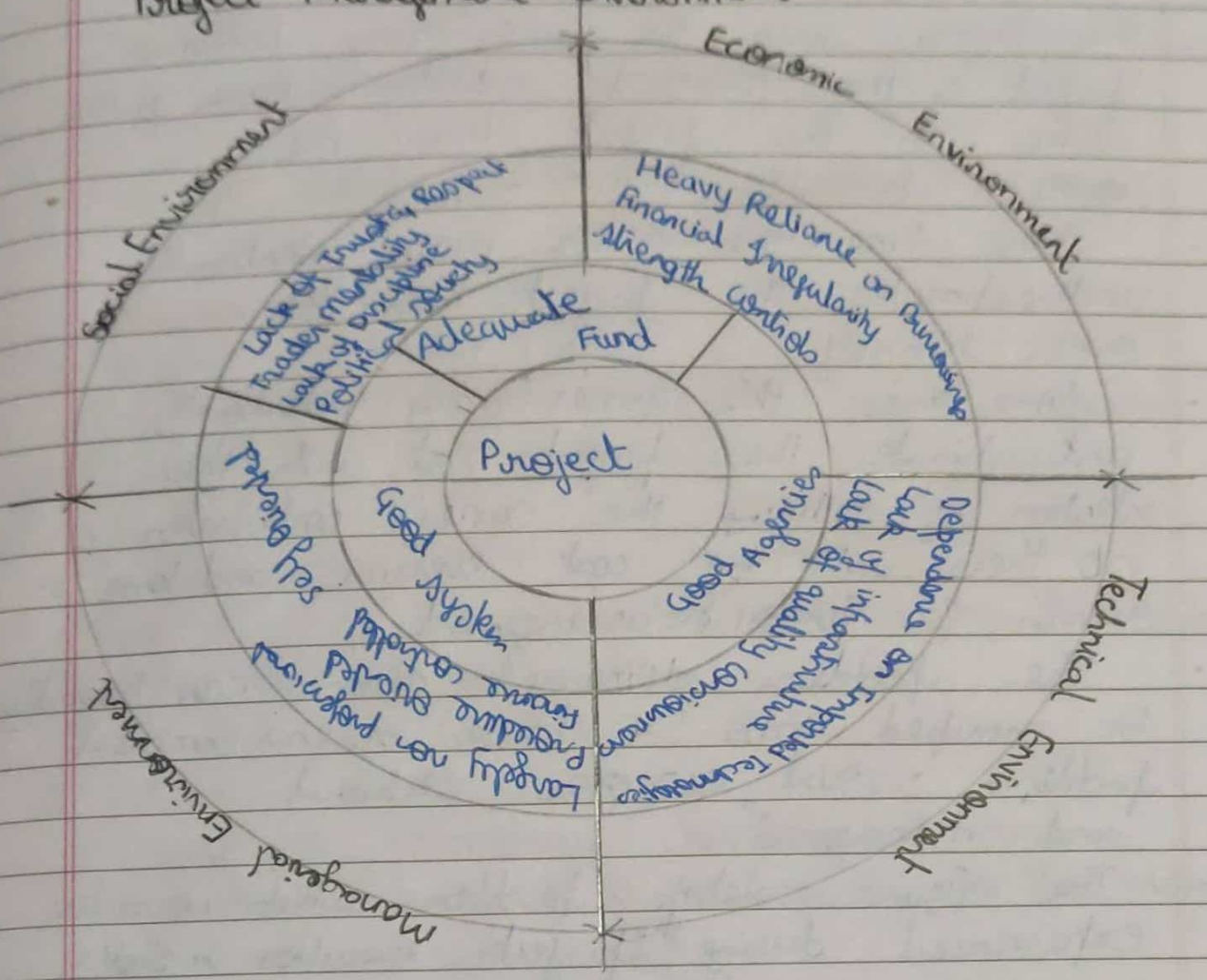
In fact value engineering encourages increase in the quality if it can be attained at no extra cost.

## Do it yourself Trap

- Many owners would feel tempted to do everything themselves to bring down project cost.
- In such cases, the owner engages the team of production to manage the project.
- The owner may try to get all the design work done in house, fabrication as much as possible at his shop, engage labour contractors for construction and supervise the design, procurement and construction work all by himself.
- Unfortunately those projects which have maximum time and cost overrun, they are also the ones where the quality is ~~got~~ ignored.
- The main drawback with this arrangement that it imposes a tremendous load of coordination on a working group which has no ~~experience~~ experience nor is equipped with tools and techniques for project coordination.
- Working team do not have the experience of working in an uncertain and a dynamic work; this results in time and cost over run for the given project.
- The operating project people will invariably expand the scope of the project for the sake of flexibility to avoid any possible difficulties during an operation.
- There are endless changes even after the basic packages have been finalized.
- Contractor is enough to take the fun of "Do it yourself" ~~type~~ type of management unless some one intervenes, contractors are only interested in picking up payments.
- A project does not get completed easily and it costs very heavily.


General Manager
D&M Engineering Services
D&M Production Department-1
D&M Production Department-1
Design and specification of Utilities
Civil and Electrical Designs
Procurement of main plant and machinery
Construction works
Vendors
Labourers
Design and specifications in relationship of plant and machinery
Planning and Procurement of the Product materials.

# Project management Environment




- The project management environment in India is as shown in the figure it is different from other countries.
- There are many problems experienced in the execution of both and small and big projects.
- The important problem is lack of mutual trust and respect amongst the participating agencies owner, financial institutions, consultants, vendors and the contractors.
- The owner believes that the agencies would take him for a ride.
  Lack of professional ethics to consultants
- A site may often be selected purely on personal rather than techno economical considerations.

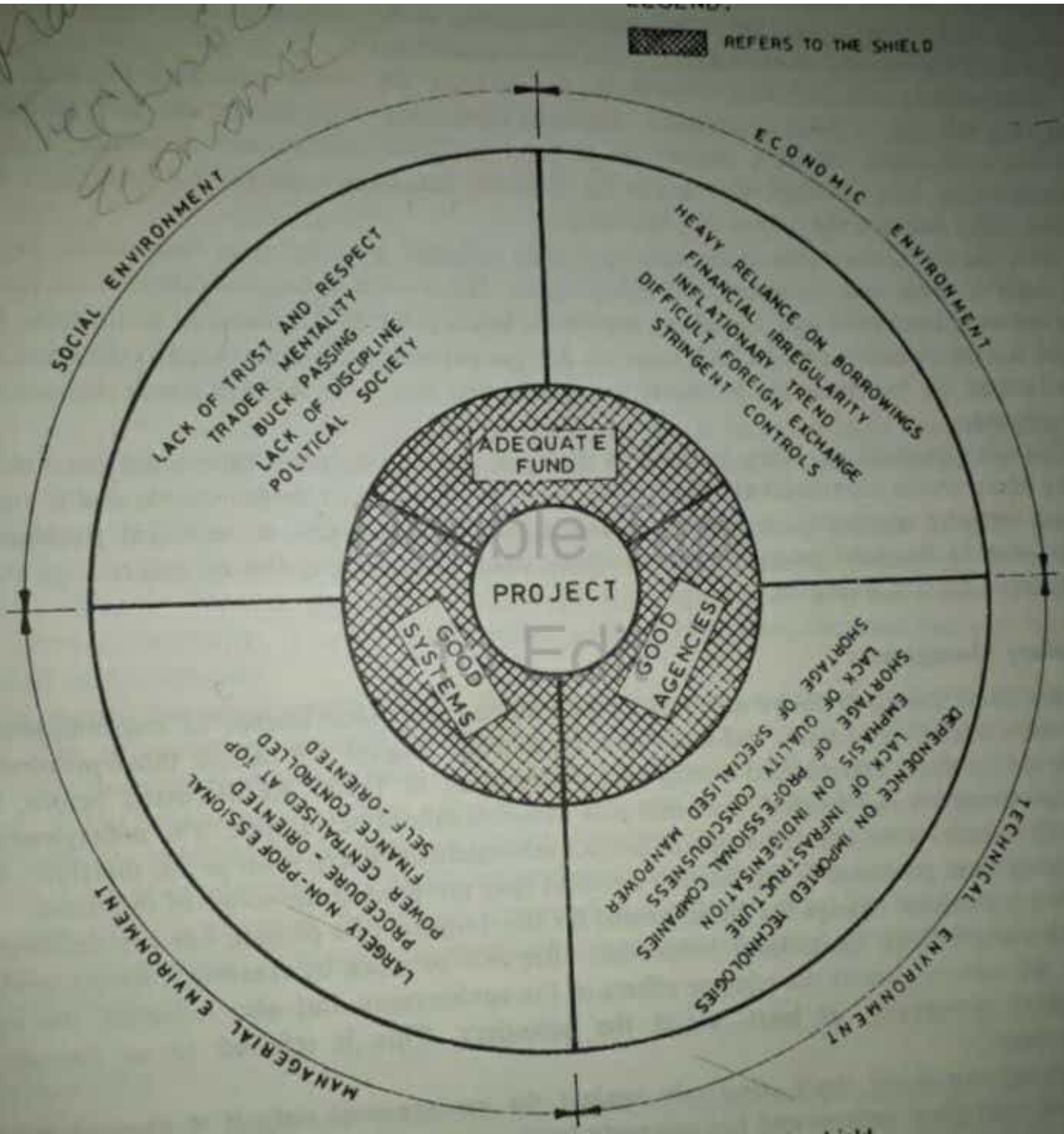



FIG. 6.8 Project management environment and the shield

- The financial institution may not trust the owner since the owner may disown a project & the financial institutions have more stakes in the project than the owner himself.
- Some time the owner may intentionally underestimates the project than the owner himself.
- Some times the owner may intentionally underestimate the project cost with the intention of reducing the owner's contribution so there will be cost overrun and time overrun for financial arrangement.
- The problems discussed above can broadly be grouped into 4 classes of environmental problems, social, economic, technical and managerial.
- The figure details problems which normally experienced during the project execution in India.

## Risk Analysis

- Investment risk is the probability or likelihood of occurence of losses relative to the expected return on any particular investment.

- Risk is inherent in almost every business decision.

- Different techniques have been suggested to handle risks in capital budgeting falls into two broad categories.

1 Technique that considers the stand alone risk of a project.

2 Techniques that consider the risk of a project in the context of the firm or in the context of market.

Sources, meanings and Perspective on Risks

Sources of Risk.

1 Project - specific risk
This type of risk is specific to the project like the quality of management.

2 Competitive Risk
This type of risk may be affected by the unanticipated actions of the competations

3 Industry - specific Risk
Unexpected technology development and regulatory changes that are specific to the industry will cause different risks.

4 market Risk
Unanticipated changes in macro economic factors like the GDP growth rate, interest rate and inflection have an impact on all the projects.

5 International Risk
In the case of Foreign Project, earnings and cash flows maybe different than expected due to the exchange rate risk / political risk.

# Measures of Risk

- A variety of measures have been used to capture different facts of the risk.
- These are range, standard deviation, co-effient of variation and semi-variation.

## Range

- It is simplest measure of Risk, the range of distribution is the difference between highest and lowest value.

## Standard Deviation

- The standard deviation of distribution is

$$\sigma = [\Sigma p_i (x_i - \bar{x})^2]^{1/2}$$

$p_i$ = Probability associated with i value
$X_i$ = $i^{th}$ value.
$\bar{X}$ = expected value.

## Co-effient of variation

Coeffient of variation adjusts the standard deviation for the scale.

$$\text{Coeffient of variation} = \frac{\text{standard Deviation}}{\text{Expected value}}$$

## Semi-Variance

The semi-variance is compared the way the variance is computed, except that only outcomes below the expected values are taken into the consideration.

$$\text{Semi Variance} = \Sigma p_i d_i^2$$

## Sensitivity Analysis

→ It is a technique for investigating the impact of changes in project variables on net present value and the internal rate of returns.

→ Only one adverse change is considered in the sensitivity analysis

## Purpose of Sensitivity Analysis

1 To identify the key variations which influences the project cost and benefits.

2 To investigate the consequences of adverse changes by the variables on project by considering each key variables at a time.

3 To identify the actions that could mitigate possible adverse effects on project.

## Scenario Analysis

- The variables are interrelated.
- No need of considering appearing variables to study the effect of variables on projects.
- Each scenario represents a combination of certain variables.

## Steps involved in the scenario analysis:

1 Select the factors around which scenario will be built.

2 Estimate the values of each of the variables in the investment analysis for each of the different scenarios.

3. Calculate the net present value and internal rate of returns, under each ~~of the~~ scenario.

Best Scenario : High Demand
High selling Price
Low variable cost

Normal Scenario : Average Demand
Average Selling Price
Average variable cost

Worst Scenario : Low Demand
Low Selling Price
High variable ~~cost~~ Cost

Break Even Anonlysis :

- Accounting Break Even Point on the ~~other~~ one hand is the easiest and most common method of anonlyzing profits.
- It is easily calculated by taking the total expenses on a particular production and computing how many units of a product need to be sold to cover expenses.

- Financial Break Even Point on the other hand it does not address a specific product or units number but instead a company's earnings specifically about how much it needs to earn in order that the earnings per share is equal to zero.
Earnings means the gross amount of money earned by the company before taxes and expenses are taken out.

- The term contribution margin is often heard but it is relation to the break even point.
- It refers to the actual profit, a business can earn from every single unit sold in the market.
- It is understood that to be the product's price, less is the variable costs
- The contribution shows the real profit and not the revenue.

| Break Even Quantity = | Fixed costs |
|---|---|
| | Sales per unit - variable cost / unit |

Fixed costs : Costs which do not change with varying output (ex salary and rent)

Sales price per unit : Selling price per unit

Variable cost per unit : Variable costs incurred to create units

# Hillier Model of Risk Analysis

* The risk associated with the project can be assessed through the standard deviation of the expected cash flows

* In other words, determining the viability of the project through calculating the deviations in the cash flow from the mean of the expected cash flows.

Two cases of such analysis are
1 Uncorrelated cash flows
2 Correlated cash flows

Un-correlated cash flows.

→ In this type of investment in a project; there is no relationship between cash flows from one period to another.

$$\overline{NPV} = \sum_{t=1}^{t} \frac{\overline{A_t}}{(1+i)^t} - I$$

$$\sigma_{(NPV)} = \sum_{t=1}^{n} \left[ \frac{\sigma_t^2}{(1+i)^{2t}} \right]^{1/2}$$

$\overline{NPV}$ - Expected Net Profit value
$\overline{A_t}$ - Expected cash flow for the TCS
$i$ - interest rate (risk free)
$I$ - initial outlay
$\sigma_{NPV}$ - std deviation of NPV
$\sigma_t$ - Std deviation of cash flow for TCS

$\sigma(NPV)$ - risk of the project

Perfectly correlated cash flows

⇒ If cash flows are perfectly correlated, the behaviour of the cash flows in all the periods are alike to each other.

⇒ The cash flow of all the years are linearly related to one another then;

$$\overline{NPV} = \sum_{t=1}^{n} \frac{\overline{A_t}}{(1+i)^t} - I \qquad \sigma_{NPV} = \sum_{t=1}^{n} \left[\frac{\sigma_t}{(1+i)^t}\right]$$

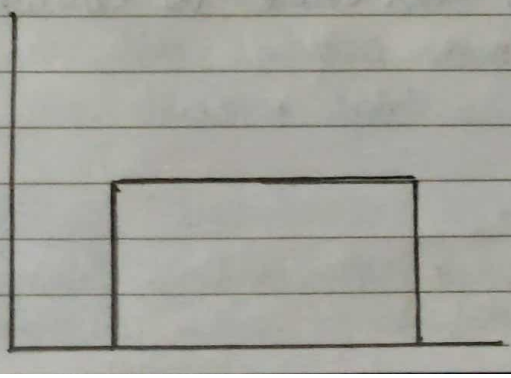
Simulation Analysis

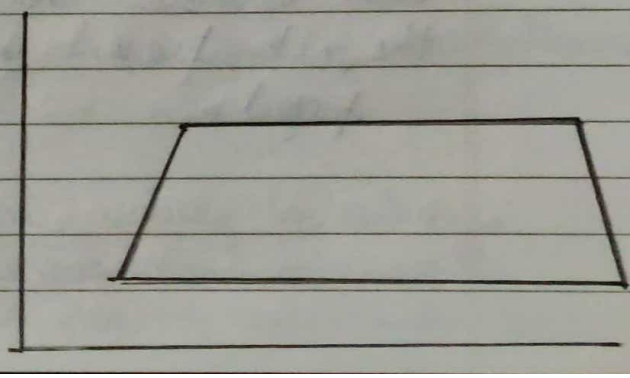
# The information can be generated by simulation analysis

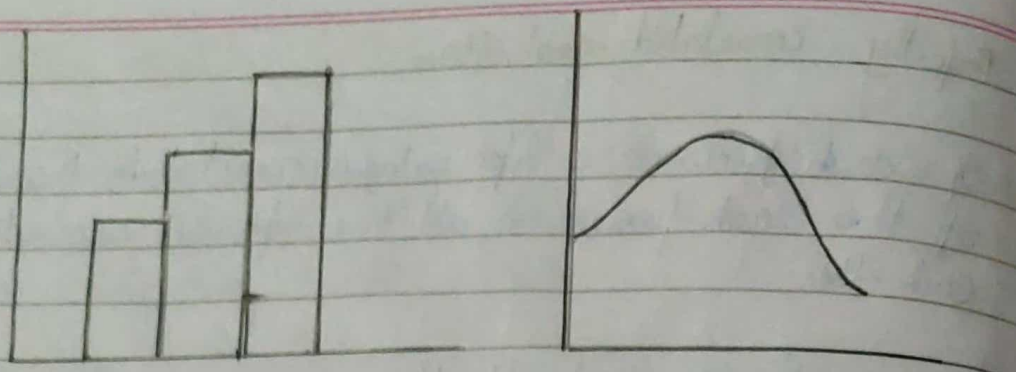
# Simulation Analysis is a computer based exercise that generates large no of simulations and computes Net Present value of each of them to find out the distribution of Net Present Value; it's expected value and standard deviation as a measure of risk.

# Simulation analysis computes the probability distribution of Net Present value.

# Commonly used distributions are 1. uniform distribution, 2. trapezoidal distribution, 3. step regular distribution and 4. normal distribution.







Steps in Simulation Analysis

1. Identification of exogenous variables that influence cash inflows and out flows of a project and it's net present value (NPV).
   ex - demand, selling price, variable costs,
2. market size, market growth, variable and fixed costs.

2 Understanding the relationship among the variables and net present value.
ex - Revenue depends on sales volume and price.
Sales volume depends on market size and the market shares

3 Specify the probability distribution ~~of each on market size~~ the exogeneous activities

4 Develop a computer programme that randomly selects the one value from probability distribution of each variable and uses this value to calculate the net present value.
project's

Delineate - describe or portray precisely

## Decision Tree Analysis

- It is a graphical representation of relationship between a present decision and future decisions and their consequences.
- The sequence of events is shown in a format resembling the branches of tree
- The decision tree branches depict the cost and return associated with each branch and the probabilities are estimates for each possible outcome.
- The alternative with the highest amount of expected monetary is being selected.

## Steps in Decision Tree Analysis

1 Identification of problem and the alternatives
→ To understand the problem and develop the alternatives, information from different sources has been to be tapped. Imaginative efforts must be made to identify the nature of alternatives that may arise as the decision situation.

2 Delineating the decision tree
→ Constructing decision tree indicates the decision points ~~regarding~~ representing the various managerial courses of action available at a given point and following by the chance events that follow each action that inputs the future courses of action and is again followed by the decision points.

3 Specifying Probabilities & monetary values for outcomes
→ Assignment of probabilities of chance events and determination of monitary values of cash ~~inflows~~ in-flows of each decision point.

4 Evaluating alternatives
→ The alternative decision with the highest amount of expected monetary value is being selected.

Managing Risks

1 Fixed and variable costs
By increasing the variable cost and reducing the fixed costs, risk may be reduced.
By buying the most of it's components from a manufacturing and assembly company fixed costs is reduced and increases the variable costs; the net effect is that it's break-even level is declined.

2 Pricing strategy
Lower price increases potential demand but also raises the break-even point.

3 Sequential Investment
Firm is started with low investment; after knowing the mark response.
Later expands as the market grows.
This reduces risk exposures

4. Improving Information
It is good to gather more information about the market & technology before taking the plunge.
Additional study often improves the quality of forecasts but involves direct costs.

5 Financial Leverage
Reducing the dependence on debts (loan), lowers risk.
The debt entitles a definitive contractual commitment where as equity carries no fixed burden.

6 Insurance
Insurance covers a variety of risks like the physical damages, theft, loss of key person and so on.
For insurance we need to pay the insurance ~~premium~~premium.

7 Long Term Arrangements
One way to mitigate the risk to enter long-term arrangements with suppliers, employees, lenders and customers.
A long term contract with suppliers ensures the availability of inputs at predictable price.
A long term wage contract with employees removes uncertainty about employee cost.

8 Strategic Alliance.
It is a legal agreement between two or more companies to share or access to their technology, trademarks and other assets.

9 Derivatives
Derivate instruments like options and futures can be used for managing ~~risk~~ risk.
An option gives it's owner the right to buy or sell an underlying assets on or before a given date at a pre-determined price.
A future contract is an agreement between two parties to exchange an asset for cash at a pre-determined future date for a price that is specified today.

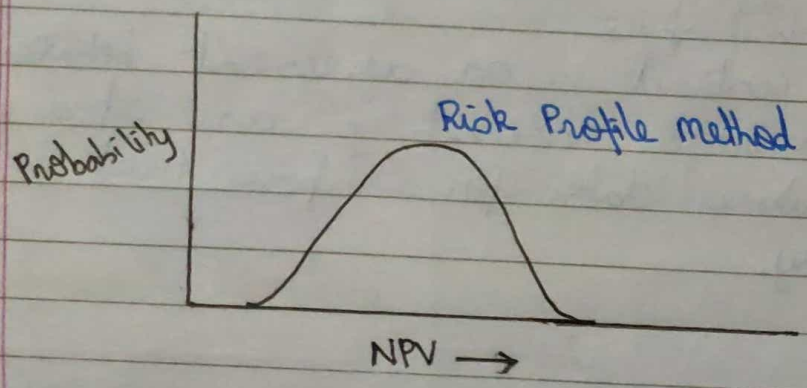
# Project Selections under Risk

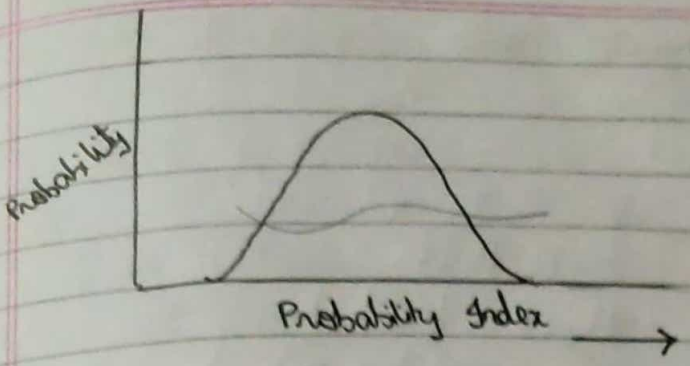
Several methods are there to accept or reject a project proposed proposal after gathering the information about expected return and variability on the return.

1 Judgemental evaluation Judgemental evaluation
The decision, to accept or reject a project, is based on collective view of some group like the "board of directors."
Executive committee etc without using any formal method of the decision analysis.

2 Payback period Requirement
If the risk is function of a time; a shorter payback period is required even if the Net Present Value is positive.
Lower the pay back period is better to come out from risk.

3 Risk Profile method
In this method, transform the probability distribution of the Net Present value into probability distribution of profitability index.
The higher the expected value of profitability index, greater the dispersion that is acceptable to management.






4. Risk Adjusted Discount Rate method:
The Risk adjusted method calls for adjusting rate to reflect project risk.
If the risk of the project is greater than the risk of the existing investments of the firm; the discount rate used is higher than the average capital of firm.

$$r_k = i + n + d_k$$

$r_k$ - risk adjusted discount rate for ~~the~~ project k
$i$ - risk free rate of intrest
$n$ - adjustment for firm as normal risk
$d_k$ - adjustment for differential risk of project k

Once the project's risk adjusted discount rate is specified; the project is accepted if it's Net Present value is positive.

5. Certainity equivalent method:

$$NPV = \sum_{t=1}^{n} \frac{a_t \overline{A_t}}{(1 + i_c)^t} - I$$

$\overline{A_t}$ - expected cash flow for the yeart
$a_t$ - certainity equivalent coefficient for the cash flow of the year t
NPV - net present value
$I$ - initial investment
Certainity equivalent ~~method~~ co-effents transform expected values of uncertain flows into their certainity equivalent.