

## UNIT 1 Introduction to Software Project Mgmt

Project : A specific plan or design / planned activity / planned undertaking.

Plan = determine how to carry out a task before we start.  
deals with non-routine tasks.

Programme mgmt = coordinate activities on concurrent job.

Routine task = project to develop a sm similar to previous ones that is already developed.

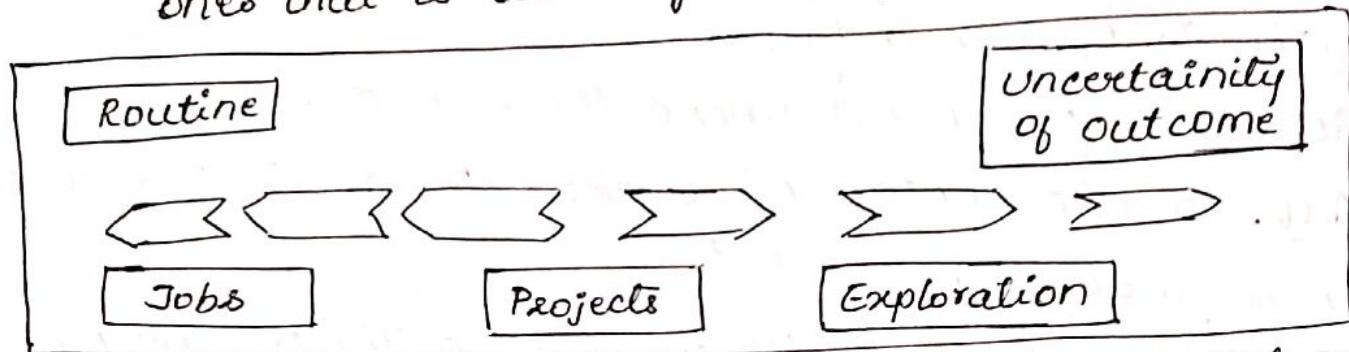


Fig: Activities most likely to benefit from project mgmt.

### characteristics of projects

1. Non-routine tasks are involved.
2. Planning is required.
3. Specific objectives are to be met or a specified product is to be created.
4. The project has a <sup>pre</sup>determined time span.
5. Work is carried out for someone other than yourself.
6. Work involves several specialisms.
7. People are formed into a temporary work group to carry out the task.
8. Work is carried out in several phases.
9. The resources that are available for use on the project are constrained.
10. The project is large or complex.

- Project size is particularly important, because as the size increases additional coordination is required.

### EXERCISE

1. Producing an edition of news paper.
2. Installing a new version of windows package in the org.
3. A second year programming assignment for a computing student.

Temporary sub-organization = A group of people brought together to perform a task.

- Authority is divided among the sub-org.
- Adv. group containing various specialists is focussed on a single important task.
- Disadv. expertise built up during the project may be lost when the team is eventually dispersed at the end of the project.

### Contract Management

- In house projects = where the users and the developers of new s/w work for the same organizations.
- Out sourcing = ICT (inform" & Comm" Technology) development is contract out to outside developers.
  - client org. appoints a project manager to supervise the contract who will delegate many technically oriented decisions to the contractors, maintain <sup>ein</sup> budget.
  - supplier side, project managers deal with more technical issues to pass on to client PM.

## Activities Covered by Software Project Management

- A s/w project is concerned with actual writing of software & other activities associated such as:

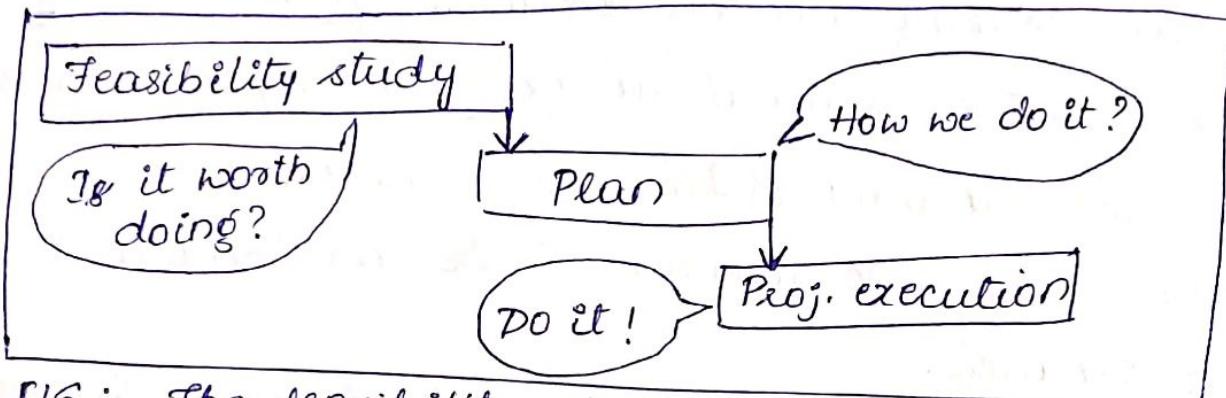
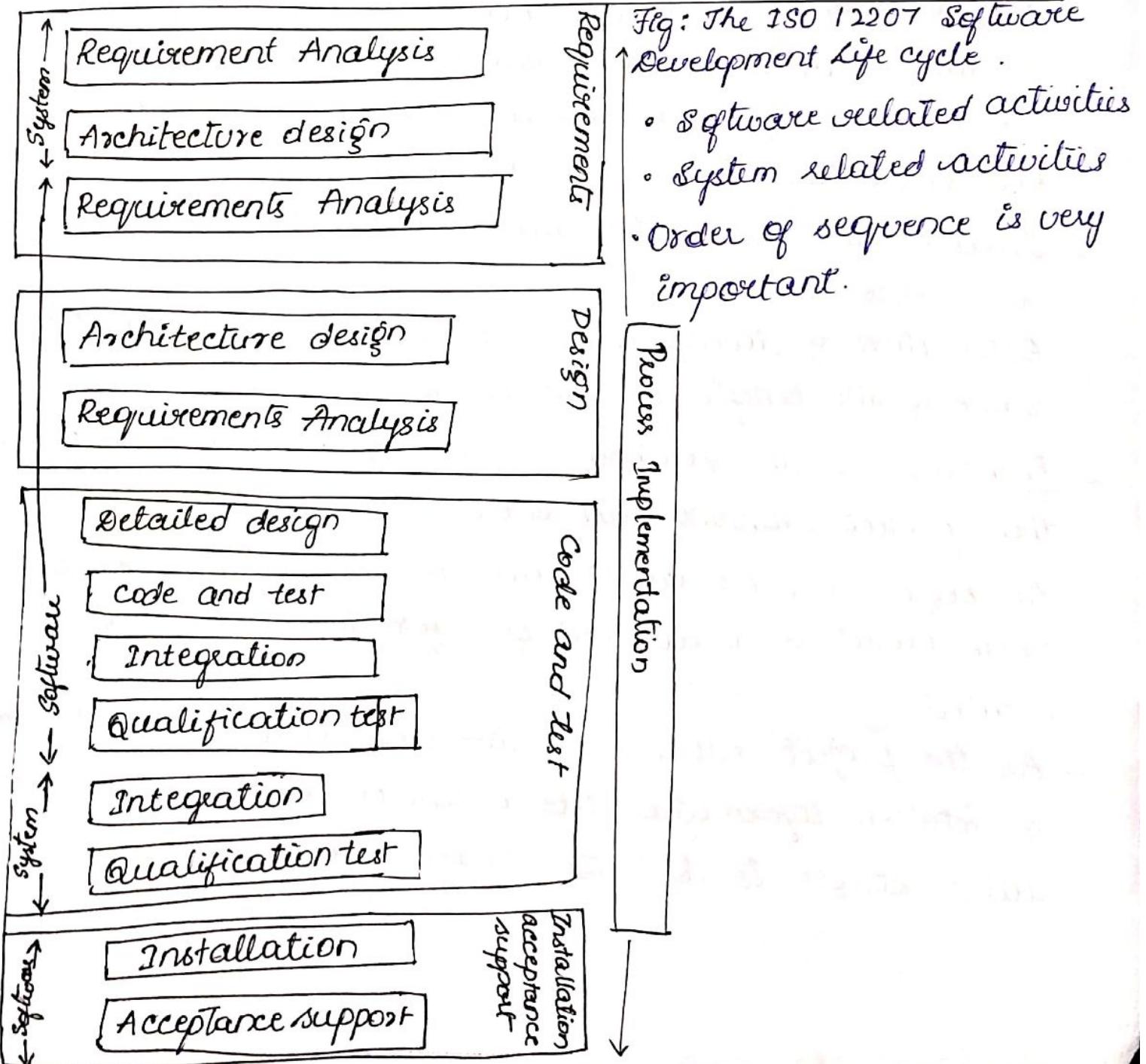


FIG: The feasibility study / plan / execution cycle.

1. The feasibility study: checks whether a project is worth starting - that is it has a valid business case.
  - Information is gathered about req. of proposed appl'.
  - Req. elicitation initially is difficult & complex.
  - Stake holders knows the aim but not the means of achievement.
  - Estimation of developmental & operational cost and the value of the benefits of new s/w has <sup>to be</sup> carried out.
2. Planning: If the feasibility study of a project is viable, then project planning can start.
  - At beginning, an outline plan for the whole project & a detailed one for the first stage is created.
  - As the project advances to the next stages, more accurate & detailed information are obtained & planning for later stages is left to nearer their start.

3. Project execution : After planning project is executed.

- Design Implementation ] sub-phases.
  - DESIGN = Making decisions about the form of products to be created, related to external appearance of sw.  
Ex: User Interface or Internal architecture.
  - Plan = Details the activities to be carried out to create these products.
- "Planning decisions are influenced by design decisions".



## 1. REQUIREMENT ANALYSIS:

- a) Req. elicitation or req. gathering - potential users & managers req. for new s/m.
  - what the s/m must do? = fun<sup>n</sup> req
  - Quality req. = how well fun<sup>n</sup> must work.

## 2. ARCHITECTURE DESIGN :

- Component of new s/m that fulfil each req. have to be identified. (Existing components may satisfy few req.) (New have to be made).
- Components = s/w or work processes.  
h/w

## 3. DETAILED DESIGN :

- Each s/w component is made up of a no. of s/w units that can be separately coded & tested.
- Detailed design of these units is carried out separately.

## 4. CODE & TEST :

- Code refers to writing code for each s/w unit.
- Initial testing to debug individual s/w units would be carried out at this stage.

## 5. INTEGRATION :

- Components are tested together to check whether they meet overall req.
- Integration can involve combining different s/w components.
- Combining & testing the s/w element of the s/m in conjunction with the h/w platforms & user interactions.

6. QUALIFICATION TESTING :
- S/m including s/w components is tested carefully to ensure that all req. are fulfilled.

7. INSTALLATION :

- Making new s/m operational.
- Activities includes - Setting up standing data, setting s/m parameters, installing the s/w onto the h/w platforms & user training.

8. ACCEPTANCE SUPPORT :

- Resolving of problems with the newly installed s/m,
- correction of any errors
- Implementing agreed extensions & improvements.

Plans, Methods and Methodologies

Plan = A plan for an activity must be based on some idea of a method of work.

Ex: Software testing, Req. includes:

1. Analyse the req. for the s/w.
2. Devise & write test cases that will check that each req. has been satisfied.
3. Create test scripts & expected results for each test case.
4. compare the actual results & the expected results & identify discrepancies.

Method = relates to a type of activity.

- Plan takes that method & converts it into real activities, identifying for each activity :

a) its start & end dates

b) who will carry it out

c) what tools & materials - including information is needed.

Methodologies = O/P from one method might be input to another. Groups of methods or techniques are often grouped into methodologies such as object oriented design.

What is Management?

- Involves following activities :

a) Planning - deciding what is to be done

b) Organizing - making arrangements

c) Staffing - selecting the right people for the job etc.

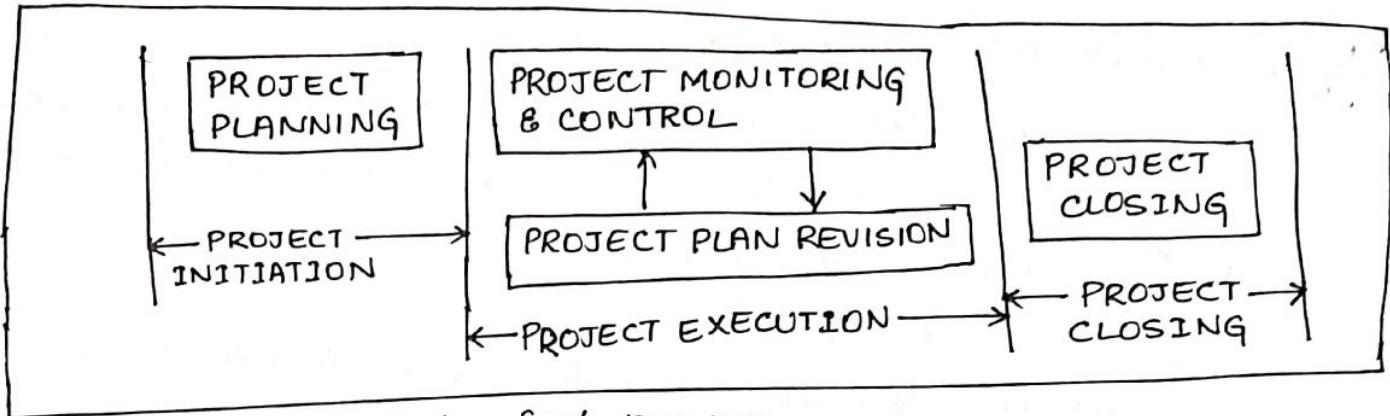
d) Directing - giving instructions

e) Monitoring - checking on progress

f) Controlling - taking action to remedy hold-ups.

g) Innovating - coming up with new solutions.

h) Representing - liaising with clients, users, developer, suppliers & other stakeholders.



## FIG: Principal project mgmt process

- Project planning, monitoring & control covers most of the well-defined stages or processes irrespective of the methodology used.
    - In the project initiation stage, an initial plan is made.
    - As the project starts, the project is monitored & controlled to proceed as planned.
    - The initial plan is revised periodically to accommodate additional details & constraints about the project as they become available.
    - Finally, project is closed. In this project closing stage, all activities are logically completed & all contracts are formally closed.

## PROJECT PLANNING

- Initial project planning is carried out after feasibility study phase and before starting requirements analysis & specification process.
  - Initial project planning involves estimating several char. of a project, based on these proj. activities are planned.
  - Based Periodic revision on project progresses & ~~data~~ is done as more proj. data becomes available.

- Once the project execution starts, monitoring & control activities are taken up to check & ensure project execution proceeds as planned.

Monitoring = checking progress of project.

Control = initiation to minimize any significant variation in a plan.

- During proj. planning following activities are outlined as below:

1. Estimation - project attributes are estimated.  
2. Cost - How much is it going to cost to complete the project?
3. Duration - How long is it going to take to complete the project?
4. Effort - How much effort would be necessary for completing the project?

- With respect to above parameters, other activities are estimated.

1. Scheduling - Based on estimations of effort & duration, the schedules for manpower & other resources are developed.
2. Staffing - staff organization & staffing plans are made.
3. Risk Management - This activity includes risk identification, analysis & abatement planning.
4. Miscellaneous Plans - This includes making several other plans such as quality assurance plan, configuration plan mgmt plan etc.

- Project monitoring & control activities carried out after initiation & aim of this is to ensure that the dev'l development proceeds as planned.

- During this phase a PM may find it necessary to change the plan to cope with specific situations & make the plan more accurate as more project data becomes available.

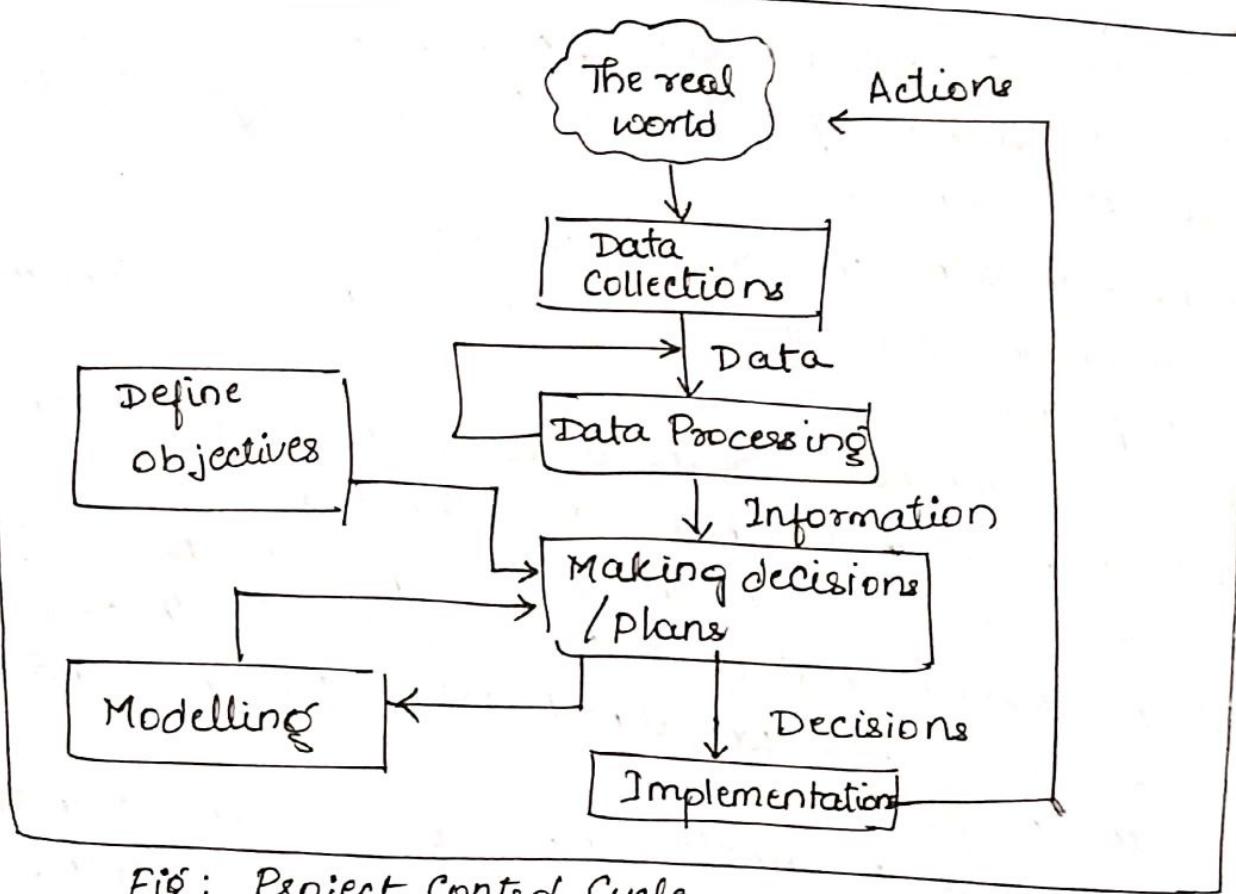


Fig: Project Control Cycle

### MANAGEMENT CONTROL

- mgmt involves setting objectives for a sm & then monitoring the sm performance. Fig as →
- 1. Local managers involve in data collection.
- 2. Higher mgmt involves in data processing - where raw data is transformed into information.
- 3. If any of the branch/ workgroup fails to perceive the task assigned then Making decisions/plans becomes necessary.
- 4. Making the new decisions/plans to work & checking out the impact of it - Modelling.
- 5. Out of different proposals selecting one model to implement - Implementation.
- 6. Having impltd a decision, the situation kept under review by collecting & processing further progress details.

## EVALUATION OF INDIVIDUAL PROJECTS -

How the feasibility  
of an individual proj  
can be evaluated?

### i. Technical Assessment

- Tech. assessment of a proposed s/m consists of evaluating whether the required functionality can be achieved with current affordable technologies.
- Organizational policy provides a consistent hardware/software infrastructure to limit the technical solutions considered.
- The costs of the technology adopted must be taken into account in the cost - benefit analysis.

### 2. Cost - Benefit Analysis

a) Identifying all of the costs and benefits of carrying out the project & operating the delivered application including development costs, operating costs & benefits expected from new s/m.

If it is a replacement, these estimates should reflect the change in costs & benefits due to the new s/m.

Ex: A new sales order processing s/m can be beneficial to an organization by increasing the sales due to use of new s/m.

b) Expressing these costs & benefits in common units -  
each cost - ~~is~~ benefit = net benefit in money.

- Development cost - staff cost & etc...
- Setup cost - putting s/m into place (new h/w), file conversions, recruitment, staff training.
- Operational cost - related to os after installation.

3. Cash Flow Forecasting - indicates when expenditure and income will take place.

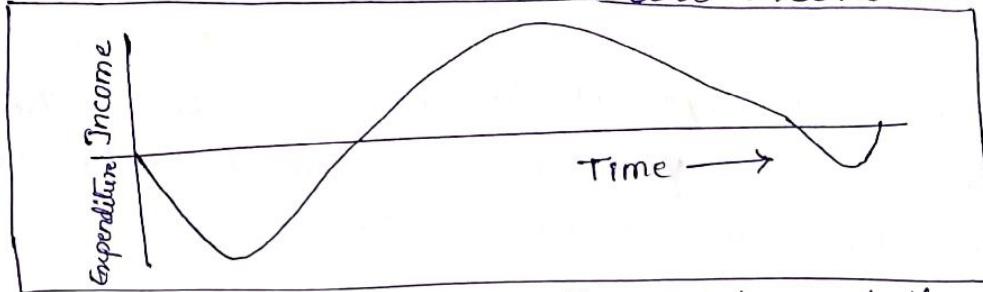


FIG: Typical product life-cycle cash flow

- A forecast is needed of when expenditure, such as the payment of salaries, & any income are to be expected.
- Accurate cash flow forecasting is difficult, as it is done early in the project's life cycle (at least before any significant expenditure is committed) & many items to be estimated (particularly the benefits of using s/w) might be some years in the future.
- When estimating future cash flows, it is usual to ignore the effects of inflation. Forecasts of inflation rates tend to be uncertain. If expenditure is increased due to inflation it is likely that income will increase proportionately.

### COST-BENEFIT EVALUATION TECHNIQUES

1. NET PROFIT of a project is the difference b/w the total costs & the total income over the life of the project.  
- cash flows takes place at the end of each year. The year 0 represents the initial investment made at the start of the project.

by covering previous's year,

2. PAY BACK PERIOD is the time taken to break even or pay back the initial investment.

- shortest payback period project will minimize the org. project 'in debt' period.
- Adv. is it is simple to calculate & is not particularly sensitive to small forecasting errors.
- Disadv.: as a selection technique is that it ignores the overall profitability of the project - it totally ignores any income (or expenditure) once the project has broken even.

3. RETURN ON INVESTMENT = Accounting Rate of Return (ARR)  
provide a way of comparing the net profitability to the investment required.

$$ROI = \frac{\text{average annual profit}}{\text{total investment}} \times 100$$

Ex: calculating ROI, net profit = 50,000/- total investment  
= 1,00,000/- tenure = 5 yrs.

$$ROI = \frac{50,000/5}{1,00,000} \times 100 = \underline{\underline{10\%}}$$

- ROI provides a simple, easy-to-calculate measure of return on capital.
- Disadv. ① net profitability takes no account of timing of the cash flows. ② This rate of return bears no relationship to the interest rates offered or charged by banks since it takes no acc't of the timing of the cash flows or of the compounding of interest.
- very misleading.

4. NET PRESENT VALUE is a project evaluation technique that takes into account the profitability of a project & the timing of the cash flows that are produced.

YEAR	PROJECT 1	PROJECT 2	PROJECT 3	PROJECT 4
0	-1,00,000	-1,00,000	-1,00,000	-1,20,000
1	10,000	2,00,000	30,000	30,000
2	10,000	2,00,000	30,000	30,000
3	10,000	2,00,000	30,000	30,000
4	20,000	2,00,000	30,000	30,000
5	1,00,000	3,00,000	30,000	75,000
Net Profit	50,000	1,00,000	50,000	75,000

Table : 4 Project cash Flow projections - figures are end of year total.

( Negative values = expenditure )

( positive values = income )

- Rank the four projects in order of financial desirability & make a note of your reasons for ranking them.
  - a) Project 2 requires a very large investment compared to its gain.
  - b) Undertaking project 1 & 3 for a lower cost is beneficial than project 2.
- Calculate the payback period for each of them.

by covering up

## Net present value

3. Calculate Returns on investment for each project.

→ Project 1

$$\text{ROI} = \frac{\text{average annual profit}}{\text{total investment}} \times 100$$

$$= \frac{50,000/5}{100,000} \times 100 = 10\%$$

Project 2

$$\text{ROI} = \frac{100,000/5}{100,000} \times 100 = 2\%$$

Project 3

$$\text{ROI} = \frac{50,000/5}{100,000} \times 100 = 10\%$$

Project 4

$$\text{ROI} = \frac{75000/5}{120,000} \times 100 = 12.5\%$$

↓ Most beneficial as it earns highest return.

4. calculate net present value.

YEAR	DISCOUNT FACTOR	DISCOUNTED CASH FLOW (Rs)		
		PROJECT 2	PROJECT 3	PROJECT 4
0	1.00	-1,000,000	-1,00,000	-120,000
1	0.90	181,820	27,273	27,273
2	0.82	165,280	24,792	24,792
3	0.75	150,260	22,539	22,539
4	0.68	136,600	20,490	20,490
5	0.62	186,270	18,627	46,568
NPV		-179,770	13,721	21,662

$$\text{Present Value} = \frac{\text{value in year } t}{(1+r)^t}$$

$r$  = discount rate  
in decimal value  
 $t$  = no. of years

6. Calculate the net present value for each of the project A, B, C using each of discount rates 8%, 10%, 12%. The estimated project cash flows.

YEAR	PROJECT A	PROJECT B	PROJECT C
0	-8000	-8000	-10,000
1	4000	1,000	2000
2	4000	2000	2000
3	2000	4000	6000
4	1000	3000	2000
5	500	9000	2000
6	500	-6000	2000
NP	4000	5000	6000

→ The effect on net present value of varying the discount rate.

YEAR	CASH FLOW VALUES (RS)		
	PROJECT A	PROJECT B	PROJECT C
0	-8000	-8000	-10,000
1	4000	1000	2000
2	4000	2000	2000
3	2000	4000	6000
4	1000	3000	2000
5	500	9000	2000
6	500	-6000	2000
NET PROFIT	4,000	5,000	6,000
NPV @ 8%	2,111	2,365	2,421
NPV @ 10%	1,720	1,818	1,716
NPV @ 12%	1,356	1,308	1,070

## Net present value

$$\text{Present value} = \frac{\text{(value in year } t\text{)}}{(1+r)^t}$$

-  $r$  is the discount rate

-  $t$  is the no. of years into the future that the cash flow occurs.

NPV = Proj. evaluation technique that takes into account the profitability of a project and the timing of the cash flows that are produced.

= sum of all incoming and outgoing payments, discounted using an interest rate, to a fixed point in time (the present).

$$(1+r)^t = \text{discount factor}$$

Ex: If 10% rate for 1 year

$$\text{discount factor} = \frac{1}{(1+0.10)} = 0.9091$$

If 10% rate for 2 years

$$\text{discount factor} = \frac{1}{(1.10 \times 1.10)} = 0.8294$$

PROJECT	YEAR	CASH FLOW	DISCOUNT FACTOR $(10\%)$	DISCOUNTED CASH FLOW
	0	-100,000	1	-100,000
10%	1	10,000	0.9091	9,091
	2	10,000	0.8264	8,264
	3	10,000	0.7513	7,513
	4	20,000	0.683	13,660
	5	100,000	0.6209	62,090
	6		0.5646	100,618

$$NPV = 100618 - 100,000 = 618$$

$\Rightarrow NPV$  for Project 2, 3, 4 = 10%

Year	Discount Factor	Discounted Cash Flow		
		Project 2	Project 3	Project 4
0	1.00	-1,000,000	-1,00,000	-120,000
1	0.90	181,820	27,273	27,273
2	0.82	1,65,280	24,792	24,792
3	0.75	1,50,260	22,539	22,539
4	0.68	1,36,600	20,490	20,490
5	0.62	1,86,270	18,627	46,568
NPV		-1,79,770	13,721	21,662

NPV

$$\text{At } 8\% \text{ rate for one year} = \frac{1}{(1+0.08)} = 0.9259$$

$$\text{two years} = \frac{1}{(1.08 \times 1.08)} = 0.8573$$

$$\text{three years} = \frac{1}{(1.08 \times 1.08 \times 1.08)} = 0.7938$$

$$\text{four years} = \frac{1}{(1.08 \times 1.08 \times 1.08 \times 1.08)} = 0.7350$$

$$\text{five years} = 0.6805$$

NPV

$$\text{At } 12\% \text{ rate for one year} = \frac{1}{(1+0.12)} = 0.8928$$

$$\text{two years} = \frac{1}{(1.12 \times 1.12)} = 0.7971$$

$$\text{three years} = 0.7117$$

$$\text{four years} = 0.6355$$

$$\text{five years} = 0.5674$$



## RISK EVALUATION

1. Project Risk - prevent the project from being completed

Year	Project 1	Project 2	Project 3
0	-8000	-8000	-10000
1	4000	1000	2000
2	4000	2000	2000
3	2000	4000	6000
4	1000	3000	2000
5	500	9000	2000
6	500	-6000	2000

a) Net profit  $\Rightarrow P_1 = 4000$

$$P_2 = 2000$$

$$P_3 = 6000$$

b) ROI  $\Rightarrow P_1 = 8.33\%$

$$P_2 = 4.16\%$$

$$P_3 = 10\%$$

c) PBP  $\Rightarrow P_1 = \text{end of } 2^{\text{nd}} \text{ year}$

$$P_2 = \text{beginning of } 4^{\text{th}} \text{ year}$$

$$P_3 = \text{end of } 3^{\text{rd}} \text{ year}$$

d) 10%

NPV

Year	Discount factor (10%)		Discounted Cash flow	
1	0.9091	7272.8	7272.8	9091.0
2	0.8264	6611.2	6611.2	8264.0
3	0.7513	6010.4	6010.4	7513.0
4	0.6830	5464.0	5464.0	6830.0
5	0.6209	4967.2	4967.2	6209.0
6	0.5646	4516.8	4516.8	5646.0

$$NPV =$$

## RISK EVALUATION

1. Project Risk - prevent the project from being completed successfully.
2. Business risk - delivered products are not profitable.

## RISK IDENTIFICATION & RANKING

- In project evaluation, identifying the risks & quantifying their effects are imp.
- One approach is to construct PROJECT RISK MATRIX utilizing a checklist of possible risks & classifying risks according to their relative imp. & likelihood.  
high (H), medium (M), low (L) exceedingly unlikely (-).

Tab: A fragment of a basic project/business risk matrix for an e-commerce application.

Risk	Importance	Likelihood
1. client rejects proposed look & feel of site	H	-
2. Competitors undercut prices.	H	M
3. Warehouse unable to deal with increased demand.	M	L
4. Online payment has security problems	M	M
5. Maintenance costs higher than estimated.	L	L
6. Response times deter purchases	M	M

## 2. RISK & NET PRESENT VALUE

- When a project is at risk, use a higher discount rate to calculate net present value.
- Projects are categorized as high, medium or low risk using a scoring method & risk premium (discount rate) is assigned to each category.
- Premium - provides a consistent way of taking risk into account.

## 3. COST-BENEFIT ANALYSIS

- Evaluation of the risk considers each possible outcome & estimate the probability of its occurring & the corresponding value of the outcome.
- A set of cash flow forecast, where each is associated with an probability of occurring.
- The value of the project is then obtained by summarizing the cost or benefit for each possible outcome weighted by its corresponding probability.
- When we need to evaluate a single major project, the cost-benefit approach, by "averaging out" the negative & positive outcomes of diff. scenarios often neglect "worst case scenarios".

#### 4. RISK PROFILE ANALYSIS

- An approach which attempts to overcome some of the objections to cost-benefit analysis averaging is the construction of risk profiles using sensitivity analysis → This involves varying each of the parameters that affect the project's cost or benefits to ascertain how sensitive the project's profitability is to each factor → helps to identify imp. parameter.

#### 5. USING DECISION TREES

- we can evaluate whether a risk is important & if it is, decide a suitable course of action.
- such decisions will limit or affect future options &, at any point, it is imp. to able to assess how a decision will affect the future profitability of the project.

FIG. A decision tree

