Session 3-4

Project/Portfolio Management – Evaluation and Selection

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What is a project?

What is a project management?

- Cement Project, Power project, Refinery project, Fertilizer project, etc.

- Term project is common - plants are not. In each case the project is for the plant but as soon as the plant is operational, the project is deemed to be completed.

- Project for method improvement.

- The explicit use of the term “project” is not always necessary - elections, admission process, road-dam-building construction.

- A project, therefore, is not a **physical object, nor it is the end result** – it has something to do with **the going - on in between**, which might be the same, whether we build a high technology process plant or merely hold an election, to deserve a common name and to be termed as a project.

A project is, thus, initiated to achieve the mission-whatever the mission may be. A project is completed as soon as the mission is fulfilled.

A combination of **human and non human recourses** polled together to in a **temporary organization** to serve **specific purpose**.

What Is a Project?

- A project is “a temporary endeavor undertaken to create a unique product, service, or result.”*
- Operations is work done to sustain the business/Service.
- A project ends when its objectives have been reached, or the project has been terminated.
- Projects can be large or small and take a short or long time to complete.

What is a project?

- A group of tasks (activities) performed within a definable time period (schedule) in order to meet a specific set of goals/objectives (performance) within a budget (cost plan)
- A project generally exhibits most of the following conditions:
  - It is ***unique***
  - A project is ***finite***
  - Usually ***complex***
  - A project is ***homogeneous/heterogeneous***
  - ***Repetitive***/***Non-repetitive***
  - Requires ***multiple resources*** from a finite resource pool
  - It has some ***novelty*** in some sense

It is a one shot, time limited, **goal directed**, major undertaking, requiring the commitment of **varied skills and resources**.

A project is defined to be a **task** which has a definite **beginning-definite end time** and which consists of several activities or jobs.

Examples of projects include, but are not limited to:

- Developing a **new product** or service
- Effecting a change in **structure**, staffing, or style of an **organization**
- Designing a new **transportation** vehicle
- Developing or acquiring a new or modified **information system**
- Constructing a **building** or facility
- Building a **water system** for a community
- Running a **campaign** for political office
- **Implementing** a new business procedure or process

Various elements of project:

Based on set of definitions

Projects are complex , one time processes

Projects **are limited by budget ,schedule, and resources**

Projects are developed to resolve a clear goal or set of goals

Projects are **customer focused**

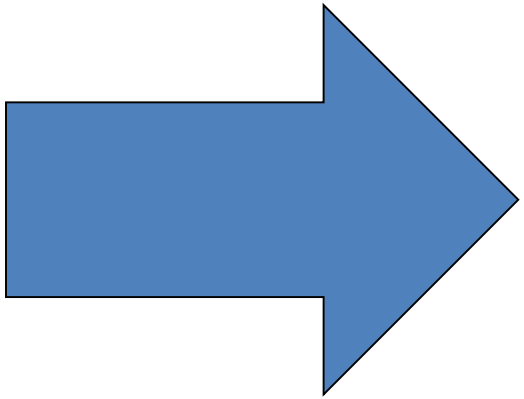
What is Project Management?

- **Project management** is "the application of knowledge, skills, tools and techniques to project activities to meet project requirements."*

*PMI, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide)* (2022)

Importance of PM

-Fast technological changes
-High uncertainty
-Short life cycle of products
-Globalization impact
-Large organizations



Customer focus

Portfolios and Portfolio Management

A portfolio is a **collection of projects** that are grouped together to facilitate effective management of that work to meet strategic business objectives.

The projects in the portfolio may not necessarily be **interdependent or directly** related.

Funding and support can be assigned on the basis of **risk/reward** categories, specific lines of business, or general types of projects, such as infrastructure and internal process improvement.

Subprojects

Projects are frequently divided into **more manageable components** or **subprojects**.

Subprojects are often contracted to an external enterprise or to another functional unit in the performing organization.

Examples include:

- Subprojects based on the project process, such as a single phase in the project life cycle

- Subprojects according to human resource skill requirements, such as **plumbers or electricians** needed on a construction project

- Subprojects involving **specialized technology**, such as the automated testing of computer programs on a software development project (IT Network, VLSI, etc..)

On very large projects, the subprojects can consist of a series of even smaller subprojects (GATI- SHAKTI Project, Ganga project-SAGARMALA, BHARATMALA, UDAN) .

Project Management Office: A project management office (PMO) is an organizational unit to **centralize and coordinate** the management of projects.
Other names are also prevalent in business

“program management office,”

“project office,” or

- Oversees the management **of projects.**
- Coordinated **planning, prioritization and execution** of projects and subprojects
- **Resource leveling and variance** reporting.
- **Central repository** of lesson learned.
- New **PM improvements** are first identified, tested refined and passed.
- **Training**, software, **standardized policies**, and procedures.

- **Shared and coordinated** resources across all projects administered by the PMO

- Identification and development of project management **methodology, best practices, and standards**

- **Clearinghouse** and management for project **policies, procedures, templates**, and other shared documentation

- Centralized repository and management for both **shared and unique risks for all projects**

- Central office for operation and **management of project tools**, such as enterprise-wide project management software

- Central coordination of **communication management across projects**

- A **mentoring** platform for project **managers**

- Central monitoring of all PMO project **timelines and budgets**, usually at the enterprise level

- Coordination of **overall project quality** standards between the project manager and any internal or external quality personnel or standards organization.

Differences between project managers and a PMO may include the following:

- Project managers and PMOs pursue **different objectives**

- A project manager is responsible for delivering **specific project objectives (**within constraints) , while a PMO is an organizational structure with specific mandates that can include an **enterprise-wide perspective**.

- The project manager focuses on the specified project objectives, while the PMO manages major program scope changes and can view them as potential opportunities to better achieve **business objectives**.

- The project manager controls the assigned **project resources** to best meet project objectives, while the PMO optimizes the use of **shared** organizational resources across all projects.

- The project manager manages **the scope, schedule, cost, and quality** of the products of the work packages, while the PMO manages **overall risk, overall opportunity, and the interdependencies among projects.**

- The project manager **reports** on project progress and other project specific information, while the PMO provides **consolidated reporting** and an enterprise view of projects under its purview.

PMO

Weather station:
(tracking and monitoring status)

-milestones achieved

-diff b/w plan and actual progress

-budget warning signal

-money paid

- status of major project risks

-update contingency plan

-Report to top mgt.

Control tower: (development of PM skills, find and resolve shortcomings, directly support to manager and team)

-establish **standards** for managing projects (uniform methodology-budget-risk mgt, etc)

-**consult** how to follow standards

-**Enforces** the standards-awards-refusal.

-**Improve** standards

Resource pool:
-to maintain and provide a cadre of trained and skilled professionals

Critics of PMO:

-all egg in one basket- one location of professionals.
-another layer of oversight and bureaucracy in organization

Types of projects

1. Personal : exam, vacation, writing book, getting dressed, wedding, etc.
2. Local: school function, cleanliness drives
3. Organizational : NPD, new highway, dam, etc.
4. National: Poverty, satellite, annual budget, census.etc.
5. Global: SDGs, environmental (UN).
6. High and low tech
7. Industrial and non industrial
8. Type of partnership

Types of projects

a)Based on duration: Long term 10 +, medium 5-10, short less than 5

b)Based on investment: High 20 crore, medium 5-20, low less than 5, cottage 50 lac

c)Based on ownership: Govt, public sector, corporate , cooperative, proprietorship, partnership.

d)Based on risk:

1.Greenfield project/grass root project- new venture by fresh entrepreneur/ promoter

2.Brown field projects- existing promoter company or existing projects goes for **addition of product/capacity**

Brown field projects

Expansion projects- add capacity through mkt intensification or mkt development

Vertical integration projects-degree to which a firm owns its **upstream suppliers** and **down stream customers** is called vertical integration .

Vertical integration

Forward integration :?????

Backward integration: ?????

Vertical integration

Forward integration : **downward** expansion is called forward integration, ex- steel industry moves for manufacturing of steel pipes

Backward integration: **upstream** expansion is called backward integration, pipe manufacturer makes its own steel

Diversification Project: Financial synergy may obtained by combining two firms – lower tech and high financial.

Concentric diversification project: firm adds related products: cars – scooter and bikes

Conglomerate diversification project: Unrelated areas

The Project Life Cycle

Project managers or the organization **can divide projects into phases** to provide **better management control** with appropriate links to the ongoing operations of the performing organization.

Collectively, **these phases are known as the project life cycle**. Many organizations identify a specific set of life cycles for use on all of their projects.

Project life cycles generally define:

• **What technical work** to do in each phase (for example, in which phase should the architect's work be performed?)

• **When** the **deliverables** are to be generated in each phase and how each deliverable is reviewed, verified, and validated

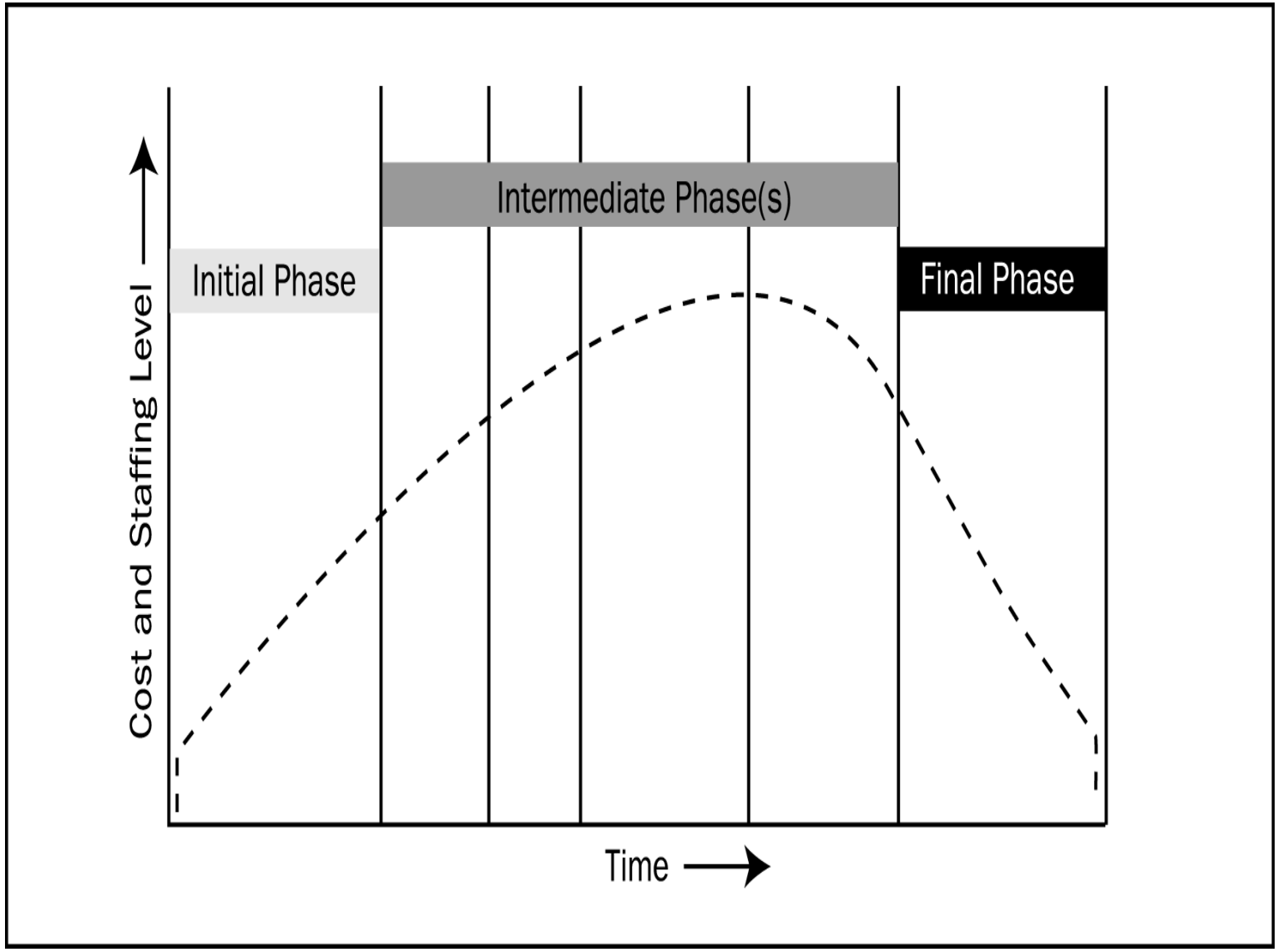
• **Who is** involved in each phase (for example, concurrent engineering requires that the implementers be involved with requirements and design)

• How to **control and approve** each phase.

Most project life cycles **share a number of common** characteristics:

• Phases are generally **sequential** and are usually defined by some form of technical information transfer or technical component handoff.

• **Cost and staffing levels are low at the start**, **peak during the intermediate phases, and drop rapidly as the project draws to a conclusion.**



Typical Project Cost and Staffing Level Across the Project Life Cycle

Project life cycle phases

1a.Conception phase

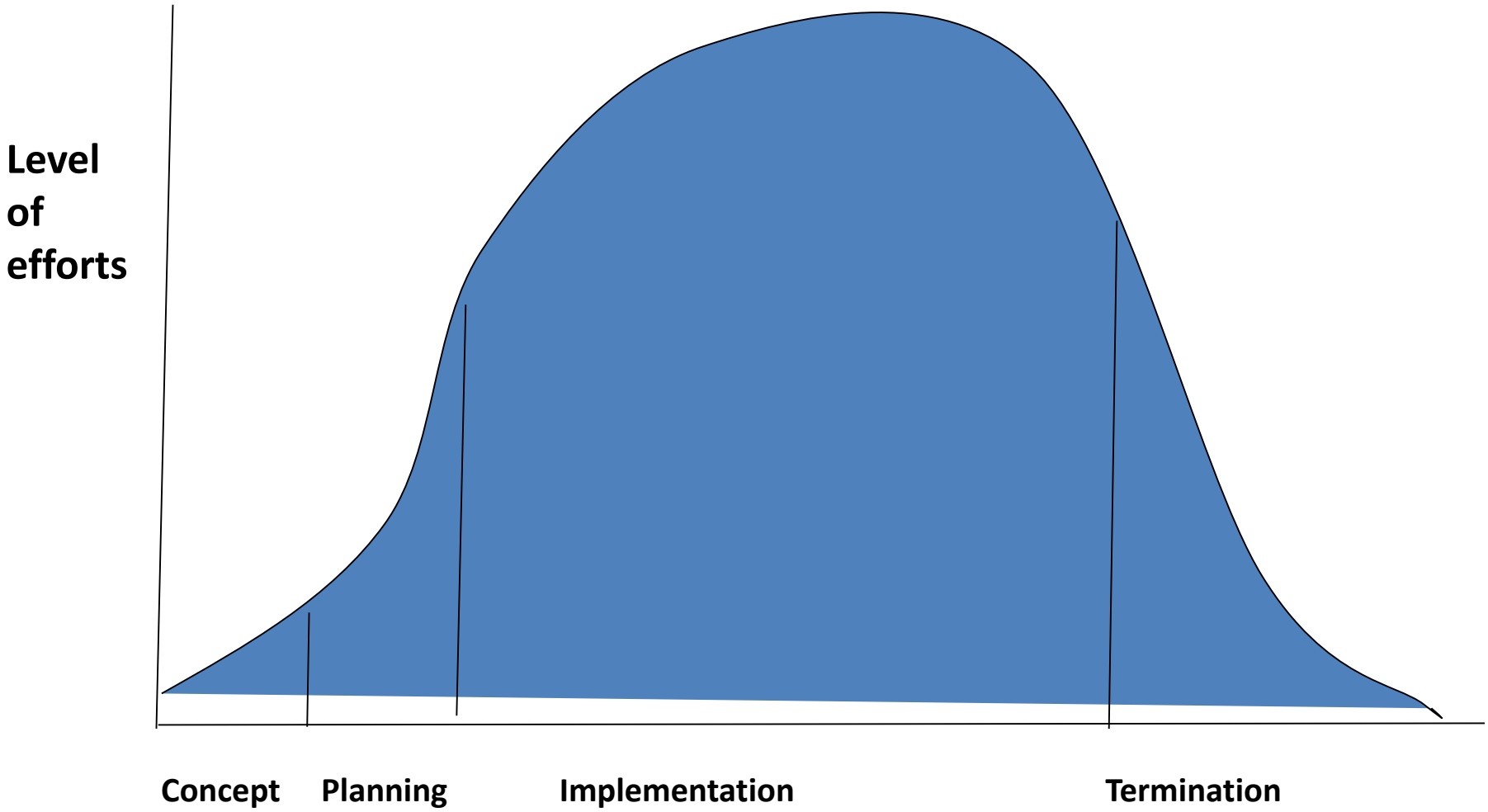
1b.Definition phase

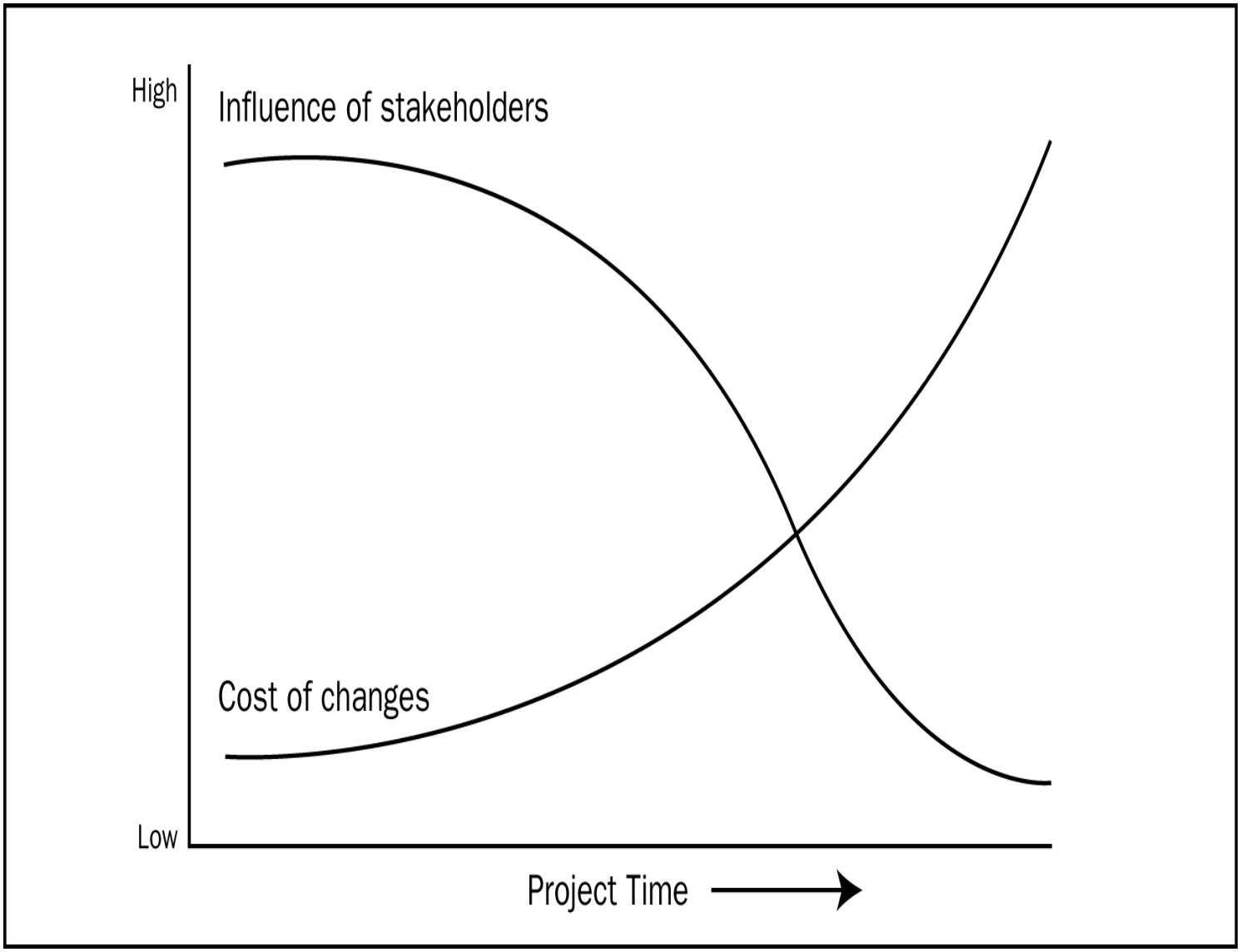
2. Planning and organizing

3. Implementation

4.Project clean-up phase

Initiation phase or Selection of a project


Level of efforts
Concept
Planning
Implementation
Termination



Stakeholders' Influence Over Time

1. **<u>Project selection :</u>** Major decision of top mgt. **(How to select a project ??????).** Project selection can be divided into three major activities:

Project identification

Project appraisal

Project selection

Project identification: Brainstorming (structured – sequential, 20-30 ideas,) and unstructured.

Ways to create new product development through brainstorming

-Run pizza: Kodak/HP- informal sessions- engineer and designer with customers - problems -need.

-Allow time off: scouting time- for technical people to putter in their own, pet projects

-Survey your customers

- Use iterative models: customers group discussing problems- technical people in another room listening and solving

-Set up an idea vault

- **Interaction** b/w technical people and supplier - through visits

Forces fighting new ideas

I have got great idea

Forces fighting new ideas

It wont work here

Forces fighting new ideas

We have tried it before

Forces fighting new ideas

This is not the right time

Forces fighting new ideas

It can’t be done

Forces fighting new ideas

It’s not the way we do things

Forces fighting new ideas

We have done all right without it

Forces fighting new ideas

It will cost too much

Forces fighting new ideas

Let us discuss in our next meeting

During brainstorming activity: management has to be

-Receptive

-Vision for future growth

-Keep long term objectives in mind

-SWOT

-Perform preliminary project analysis to assess whether a project proposal is worthwhile or not.

-Documents like: **project / product documents** (characteristics of project), **feasibility document** (constraints), **project concept** document (what, how, why – is to be done), **project charter** (it formally communicates the initiation of the project, scope, authority, KSF)

Ex : Reduce vehicular pollution in Rohtak

1.
2.
3.
.
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.
N

Criteria for screening ideas

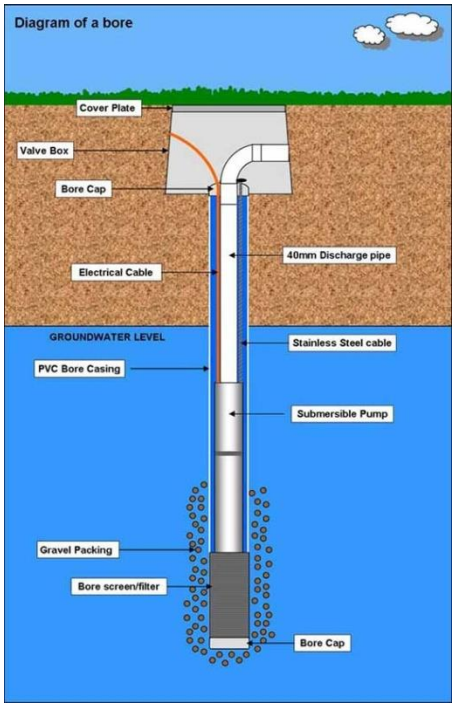
Effectiveness to achieve objectives
Cost of the proposal
Ease of implementation
Time needed

Project appraisal

Market appraisal: customer (who- needs) , mkt share, current and future competitors- their mkt share , aggregate demand , possible pricing options.

Project appraisal

Technical : engineering aspects, location , size, process, etc. (bore well)



Financial factor?????

Project appraisal

-**Financial appraisal:** cost of project and means of sources, impact on financial position of the firm, working capital, cash flows over time, profitability, BEP, net present worth, NPV, PBP, Risk. Will be doing later…..

Project appraisal

-**Economic:** Impacts of project on society. Benefits and costs (in shadow price), distribution of income in society, level of saving and investments, employment, etc.

-**Ecological:** Environmental damage (air, water, noise) restoration measures

-**Economic????????**

Project appraisal

Production factors: Time to complete project, availability of resources, flexibility of operations, connection with existing production line, energy requirements and its sources. Expected quality of product.

Personal factors:??????

Legal factors???????

Model for project selection: Methods for selection run on continuum, from highly **qualitative or judgmental to quantitative**. The screening models should have:

Model for project selection: Methods for selection run on continuum, from highly qualitative or judgmental to quantitative. The screening models should have:

1. **Realism**: organization's objectives, constraints on money and resources.

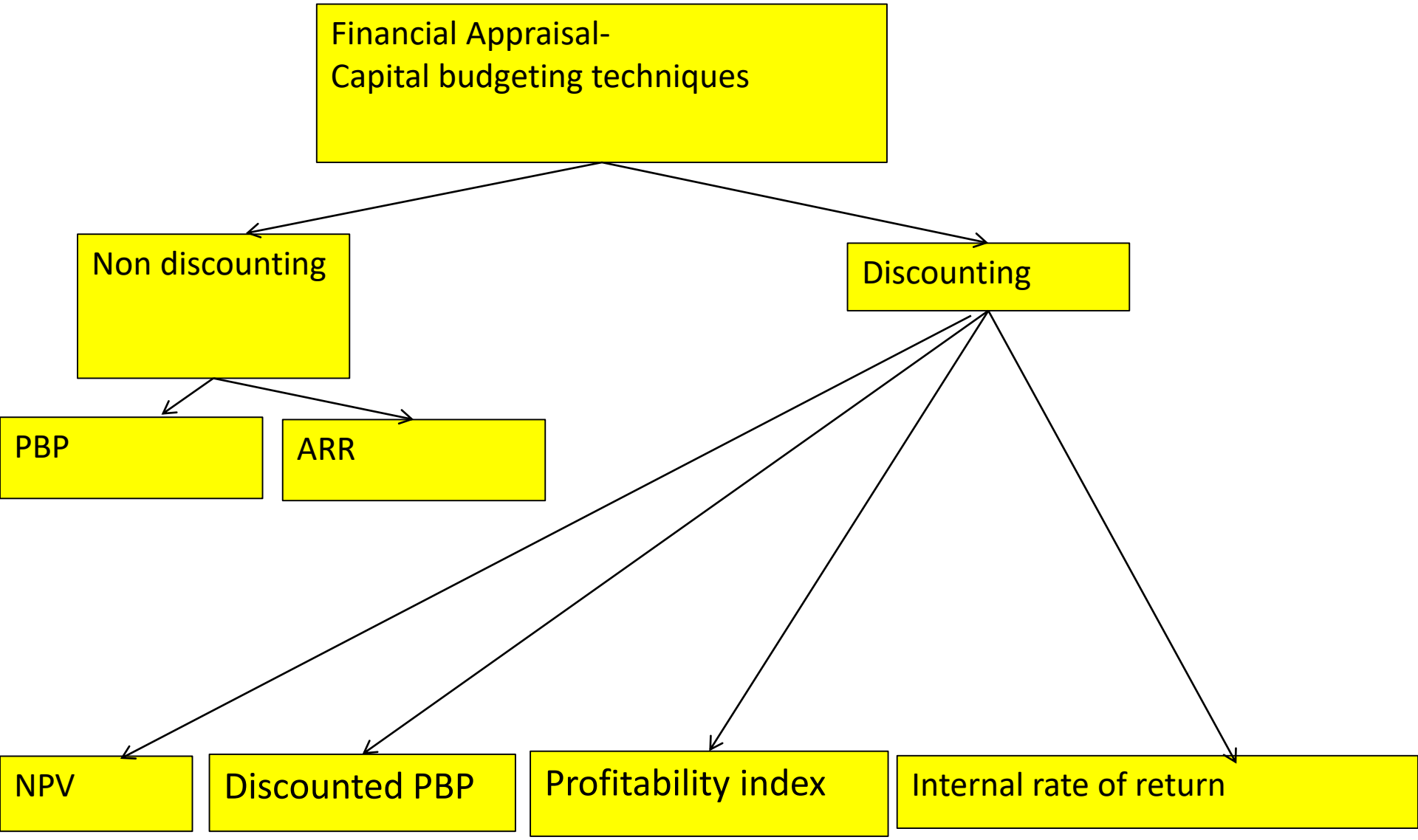
2. **Capability**: flexible enough to respond to changes in conditions under which projects are carried out. Comparison of projects should be there (time, technology, commercial aspects).

3. **Flexibility**: model should allow tax rate and tax laws, building codes.

4. **Ease of project**: simple enough, help people involved in project roles and functional roles

5. **Cost**: model should be cost effective

6. **Comparability: broad enough (????) to be applied to multiple projects**


Financial Appraisal-
Capital budgeting techniques
Non discounting
Discounting
PBP
ARR
NPV
Discounted PBP
Profitability index
Internal rate of return

PBP = time period in which investor gets back his invested money in fixed assets from the project

Initial investment	300000
Annual cost of operation	20000
Expected annaul revenues	
first two years	100000
next three years	200000
Planning horizone	5 yrs

Find : PBP ??

What are the drawbacks of PBP ?

PBP = time period in which investor gets back his invested money in fixed assets from the project

PBP= Y0 - (CuCF0)/(CF1)

Y0 = is the year just before the pay back period is attained

CuCF0= cumulative cash flow of Y0

CF1= cash flow of pay back year

1. does not consider WC and Salvage value
2. does not considerter cash flows after the PBP
3. does not consider time value of money
4. no consideration for risk
5. ignores cost of capital

PBP = time period in which investor gets back his invested money in fixed assets from the project

Initial investment	300000
Annual cost of operation	20000
Expected annaul revenues	
first two years	100000
next three years	200000
Planning horizone	5 yrs

investment, yearley cost and revenues gross cash flows undiscounted CFBT

Year	Cash flow(1000)	Cum CF
0	-300	-300
1	80	-220
2	80	-140
3	180	40
4	180	220
5	180	400

PBP= (interpolated as the year when CCF becomes zero)
= 2+ (140/180)=2.78 yrs

Example: Projected cash flow 30 lac in first year, CF is going to increase by 10 lac for next 3 years, and then decreases by 15 lac and closes in 5 year. Initial investment 140 lac, working capital requirement is 20 lac. The company foresees to fetch a net salvage value of 35 lac after 5 years. **Find PBP??**

Example: Projected cash flow 30 lac in first year, CF going to increase by 10 lac for next 3 years, and then decreases by 15 lac and closes in 5 year. Initial investment 140 lac, working capital requirement is 20 lac. The company foresees to fetch a net salvage value of 35 lac after 5 years. **Find PBP??**

Year	Cash flow	Cum CF
0	-140	-140
1	30	-110
2	40	-70
3	50	-20
4	60	40
5	45	

PBP= Y0 + (CuCF0)/(CF1)

3+(20/60)=3.33

Year	Project A	Project B	Project C
0	-110	-110	-110
1	20	20	0
2	30	30	0
3	40	40	90
4	30	30	30
5	20	20	20
6	20	10	20

Which is the best project and why???

Project A

Year	Cash flow	Cum CF
0	-110	-110
1	20	-90
2	30	-60
3	40	-20
4	30	10
5	20	30
6	20	50

Project B

Year	Cash flow	Cum CF
0	-110	-110
1	20	-90
2	30	-60
3	40	-20
4	30	10
5	20	30
6	10	40

Project C

Year	Cash flow	Cum CF
0	-110	-110
1	0	-110
2	0	-110
3	90	-20
4	30	10
5	20	30
6	20	50

A better than B, additional 10 lac,
A better than C, early recovery

Average rate of return (ARR) : Considers cash flows after PBP , working capital and salvage value

ARR = average return/ average investment

Average return= Sum of all CFs/n,

Average investment= 1/2 (initial investment+ terminal cash flow)

= 1/2((fixed investment +WC) +(WC+SV))

= 1/2(fixed investment - SV) +(WC+SV))

FI= fixed invest., WC =working capital, SV =salvage value

Ex. Projected cash flow 30 lac in first year, CF is going to increase by 10 lac for next 3 years, and then decreases by 15 lac and closes in 5 year. Initial investment 140 lac, working capital requirement is 20 lac. The company foresees to fetch a net salvage value of 35 lac after 5 years

Find :ARR

Ex. Projected cash flow 30 lac in first year, CF is going to increase by 10 lac for 4 years, and then decreases by 15 lac and closes in 5 year. Initial investment 140 lac, working capital requirement is 20 lac. The company foresees to fetch a net salvage value of 35 lac after 5 years

Find :ARR

Sol.

Year	Cash flow	Cum CF	
0	-140	-140	
1	30	-110	
2	40	-70	
3	50	-20	
4	60	40	
5	45		**PBP=3-(-20/60)= 3.33n yrs**

Average return= Sum of all CFs/n,= 225/5= 45

Average investment= 1/2 [(140+20)+(20+35)] =107.5 lac

ARR=45/107.5=.418

Example:- Let us determine the ARR for the following 2 alternative investments:

		Machine A:	Machine B:
Cost		56,125	58,125
Annual estimated income after depreciation & tax			
	Year 1	3,375	11,375
	Year 2	5,375	9,375
	Year 3	7,375	7,375
	Year 4	9,375	5,375
	Year 5	11,375	3,375
Total earnings		36,875	36,875
Estimated life		5 years	5 years
Estimated salvage value		3,000	3,000

Which investment is better????

		Machine A:	Machine B:
Cost		56,125	58,125
Annual estimated income after depreciation & tax			
	Year 1	3,375	11,375
	Year 2	5,375	9,375
	Year 3	7,375	7,375
	Year 4	9,375	5,375
	Year 5	11,375	3,375
Total earnings		36,875	36,875
Estimated life		5 years	5 years
Estimated salvage value		3,000	3,000

ARR = Annual average net earnings after taxes X 100
Average investment over the life of the project

Average earnings = Total earnings / Estimated life in years

For machines A:- 36,875 / 5 = 7,375
For machines B:- 36,875 / 5 = 7,375

Average investment = (Initial investment - Salvage Value) / 2 + Working capital + Salvage value.

For Machine A: (56,125 - 3000) / 2 + 0 + 3000 = 29,562.50
For Machine B: (58,125 - 3000) / 2 + 0 + 3000 = 30,562.50

ARR for Machine A : 7375/29562.50 * 100 = 24.95% or 25%
ARR for Machine B : 7375/30,562.50 * 100 = 24.13% or 24%.

Machine A would be preferred as ARR is higher.

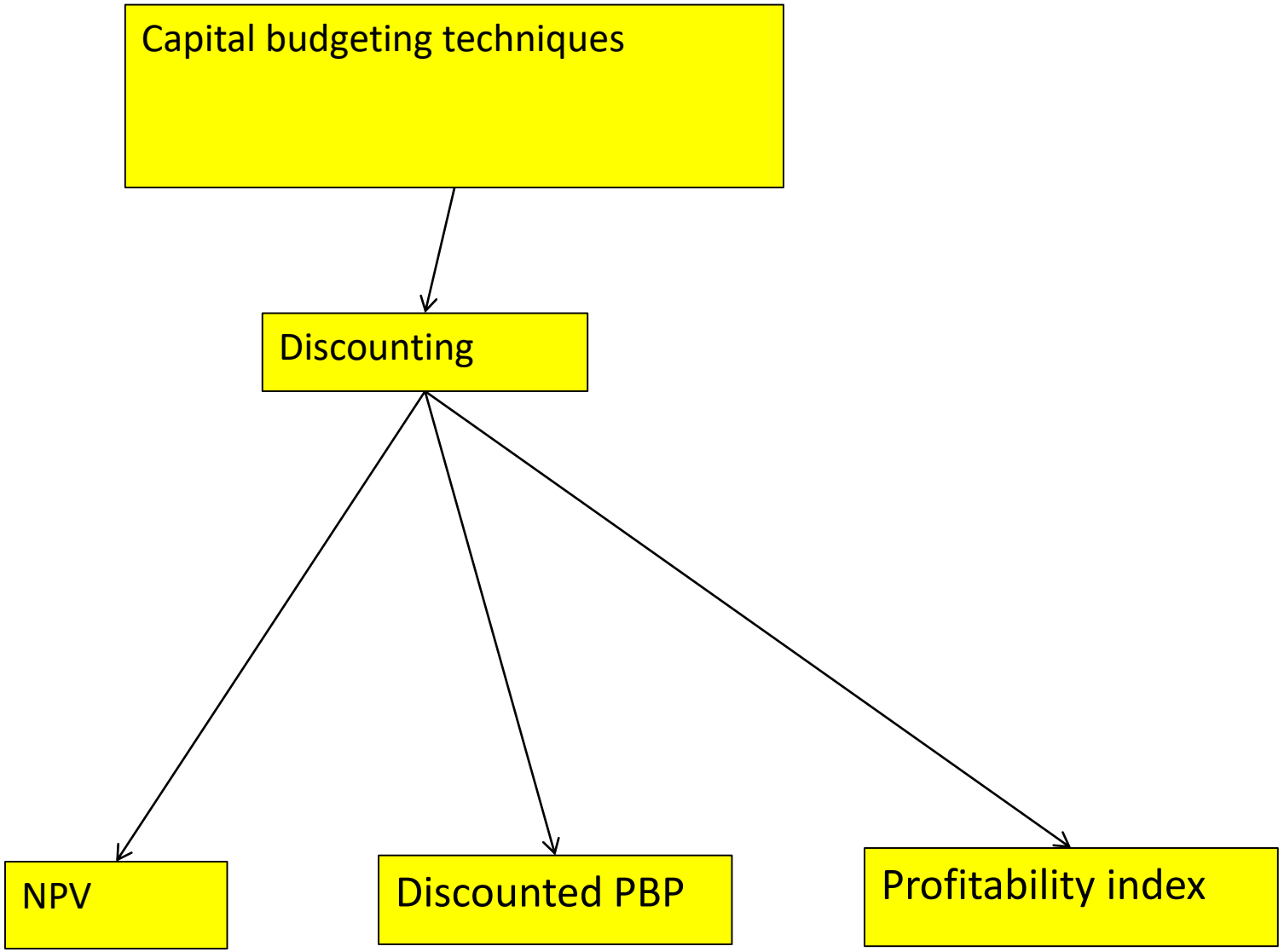
De-merits of ARR method:

Like the pay-back period method, this method ignores the **time value of money.**

This method takes into account the accounting profits rather than the cash inflows and hence **ignores the fact that the actual cash flows can be re-invested.**

It is the discretion of the management to choose the **arbitrary cut-off rate of return** in choosing the projects. This may not always ensure the right selection.

The concept of average investment and average earnings **differ widely** and hence may produce different results


Capital budgeting techniques
Discounting
NPV
Discounted PBP
Profitability index

Time value of money: Money available today is more than tomorrow.

Compound amount= Principal $(1+r)^n$

or , principal = Compound amont / $(1+r)^n$

or , present value of money = future value * present value factor

where PVF = $1/(1+r)^n$

R= discount factor,

N= No of periods

Present value: Any **value that occurs at the beginning of the problem** is a present value. As zero is good baseline, **all cash flows are converted into their present value for analysis**. PVF is the ratio of PV and future value and is available in the form of table.

Future value: ???????????

Future value: The **last cash flow** is generally called future value, it can be understood the **cash transaction taking place after certain duration of time**. If the **same amount is transacted after a regular interval,** it is termed annuity.

Annuity payment: ??????????????????

Annuity payment: As per literary meaning, an annuity payment means the **yearly payment that occurs every year for more than one year.** But in financial terms, the duration may not be yearly, it may be less as well, say quarterly, monthly, weekly etc., but the **duration b/w two successive payments remains constant**. Each **payment, if taken alone, is a future value**, but together they make an annuity.

Discount factor: DF is the **expected returns per unit of period over the life of the project or investment**. It is necessary to understand that **if annuity is for quarterly payment or transactions**, the **annual expected return should be reduced to one quarter** for computational purpose, similarly 1/12, if it is monthly.

Discounted PBP: while evaluating projects with DPBP method, **present values of cash flow are considered instead of cash flow itself** as in the case of PBP method. DPBP is **length of time required to recover the initial cash outflow** from the discounted future cash flow.

DPBP= Y0- (Cu.PV0)/(CF1),

Y0 = is the year just before the pay back period is attained
CuPV0 = cumulative present value of Y0
CF1= cash flow of pay back year

Ex: Find DPBP, if discount factor is 10%

Year	Cash flow
0	-140
1	30
2	40
3	50
4	60
5	45

DPBP= Y0- (Cu.PV0)/(CF1),

Y0 = is the year just before the pay back period is attained
CuPV0 = cumulative present value of Y0
CF1= cash flow of pay back year

Ex: FIND DPBP, if discount factor is 10%

Year	Cash flow	PVF	PV	CuPV
0	-140	1	-140	-140
1	30	1/1.10= 0.909	27	-113
2	40	$1/(1.10)^2$=0.826	33.04	-79.96
3	50	0.751	37.55	-42.41
4	60	0.683	40.98	-1.43
5	45	0.621	27.945	26.515

DPBP = 4+ (1.43/27.94) = 4.05 yrs

Present Value of $1

Periods	2%	4%	6%	8%	10%	12%	14%	16%	18%	20%	22%	24%	26%	28%	30%
1	0.980	0.962	0.943	0.926	0.909	0.893	0.877	0.862	0.847	0.833	0.820	0.806	0.794	0.781	0.769
2	0.961	0.925	0.890	0.857	0.826	0.797	0.769	0.743	0.718	0.694	0.672	0.650	0.630	0.610	0.592
3	0.942	0.889	0.840	0.794	0.751	0.712	0.675	0.641	0.609	0.579	0.551	0.524	0.500	0.477	0.455
4	0.924	0.855	0.792	0.735	0.683	0.636	0.592	0.552	0.516	0.482	0.451	0.423	0.397	0.373	0.350
5	0.906	0.822	0.747	0.681	0.621	0.567	0.519	0.476	0.437	0.402	0.370	0.341	0.315	0.291	0.269
6	0.888	0.790	0.705	0.630	0.564	0.507	0.456	0.410	0.370	0.335	0.303	0.275	0.250	0.227	0.207
7	0.871	0.760	0.665	0.583	0.513	0.452	0.400	0.354	0.314	0.279	0.249	0.222	0.198	0.178	0.159
8	0.853	0.731	0.627	0.540	0.467	0.404	0.351	0.305	0.266	0.233	0.204	0.179	0.157	0.139	0.123
9	0.837	0.703	0.592	0.500	0.424	0.361	0.308	0.263	0.225	0.194	0.167	0.144	0.125	0.108	0.094
10	0.820	0.676	0.558	0.463	0.386	0.322	0.270	0.227	0.191	0.162	0.137	0.116	0.099	0.085	0.073
11	0.804	0.650	0.527	0.429	0.350	0.287	0.237	0.195	0.162	0.135	0.112	0.094	0.079	0.066	0.056
12	0.788	0.625	0.497	0.397	0.319	0.257	0.208	0.168	0.137	0.112	0.092	0.076	0.062	0.052	0.043
13	0.773	0.601	0.469	0.368	0.290	0.229	0.182	0.145	0.116	0.093	0.075	0.061	0.050	0.040	0.033
14	0.758	0.577	0.442	0.340	0.263	0.205	0.160	0.125	0.099	0.078	0.062	0.049	0.039	0.032	0.025
15	0.743	0.555	0.417	0.315	0.239	0.183	0.140	0.108	0.084	0.065	0.051	0.040	0.031	0.025	0.020
16	0.728	0.534	0.394	0.292	0.218	0.163	0.123	0.093	0.071	0.054	0.042	0.032	0.025	0.019	0.015
17	0.714	0.513	0.371	0.270	0.198	0.146	0.108	0.080	0.060	0.045	0.034	0.026	0.020	0.015	0.012
18	0.700	0.494	0.350	0.250	0.180	0.130	0.095	0.069	0.051	0.038	0.028	0.021	0.016	0.012	0.009
19	0.686	0.475	0.331	0.232	0.164	0.116	0.083	0.060	0.043	0.031	0.023	0.017	0.012	0.009	0.007

Ex: Find DPBP, if DF=10%

Year	Cash flow	PVF	PV	CuPV
0	-300	1	-300	-300
1	80	0.909	72.72	-227.28
2	80	0.826	66.08	-161.2
3	180	0.751	135.18	-26.02
4	180	0.683	122.94	96.92
5	180	0.621	111.78	208.7

DPBP = 3+ (26.02/180) = 3.21yrs

Profitability index and NPV

Profitability index (PI) : PI is the **ratio of sum of cash inflows to sum of cash outflow,** a necessary condition for project to be feasible is that the PI should be more than 1.

PI= (sum of cash inflows)/(sum of cash outflow)

Net profitability index= PI-1

NPV: NPV is the most common approach used in the filed of financial investment analysis. It is very simple to use and evaluates on the basis of **wealth maximization objective**. It is defined as the **difference b/w the present value of cash inflows and present value of cash out flows .**

PI : is ratio of cash inflows and outflows whereas NPV is the difference b/w them

Advantages of NPV

1. Considers all cash flows
2. Considers time value of money
3. Computes contribution towards wealth creation
4. Allows expected changes in cost of capital

The limitation of NPV ????- pre determination of DF

Determine PI and NPV, assuming DF as 10%, should we accept project?????????

Year	Cash flow
0	-160
1	30
2	40
3	50
4	60
5	100

Determine PI and NPV, assuming DF as 10%

Year	Cash flow	PVF (10%)	PV
0	-160	1	-160
1	30	0.9091	27.27
2	40	0.826	33.06
3	50	0.751	37.57
4	60	0.683	40.57
5	100	0.621	62.09
		Total	**40.97**

PI = 200.97/160 = 1.256

Should we accept project????

Selection method: Check list (un-weighted)/ Dominance

Project	Criteria	Performance on criteria		
		High	Medium	Low
Alpha	Cost	x		
	Profit potential			x
	Time to market		x	
	Development risk			x
Beta	Cost		x	
	Profit potential		x	
	Time to market	x		
	Development risk		x	
Gamma	Cost	x		
	Profit potential	x		
	Time to market		x	
	Development risk	x		
Delta	Cost			x
	Profit potential			x
	Time to market	x		
	Development risk		x	

Maximize : which is the best project based on maximizing all the criteria?

Simplified scoring model (weighted)

Project	Criteria	Performance on criteria		
		High	Medium	Low
Alpha	Cost	x		
	Profit potential			x
	Time to market		x	
	Development risk			x
Beta	Cost		x	
	Profit potential		x	
	Time to market	x		
	Development risk		x	
Gamma	Cost	x		
	Profit potential	x		
	Time to market		x	
	Development risk	x		
Delta	Cost			x
	Profit potential			x
	Time to market	x		
	Development risk		x	

	Weight
Cost	1
Profit potential	2
Time to market	3
Development risk	2

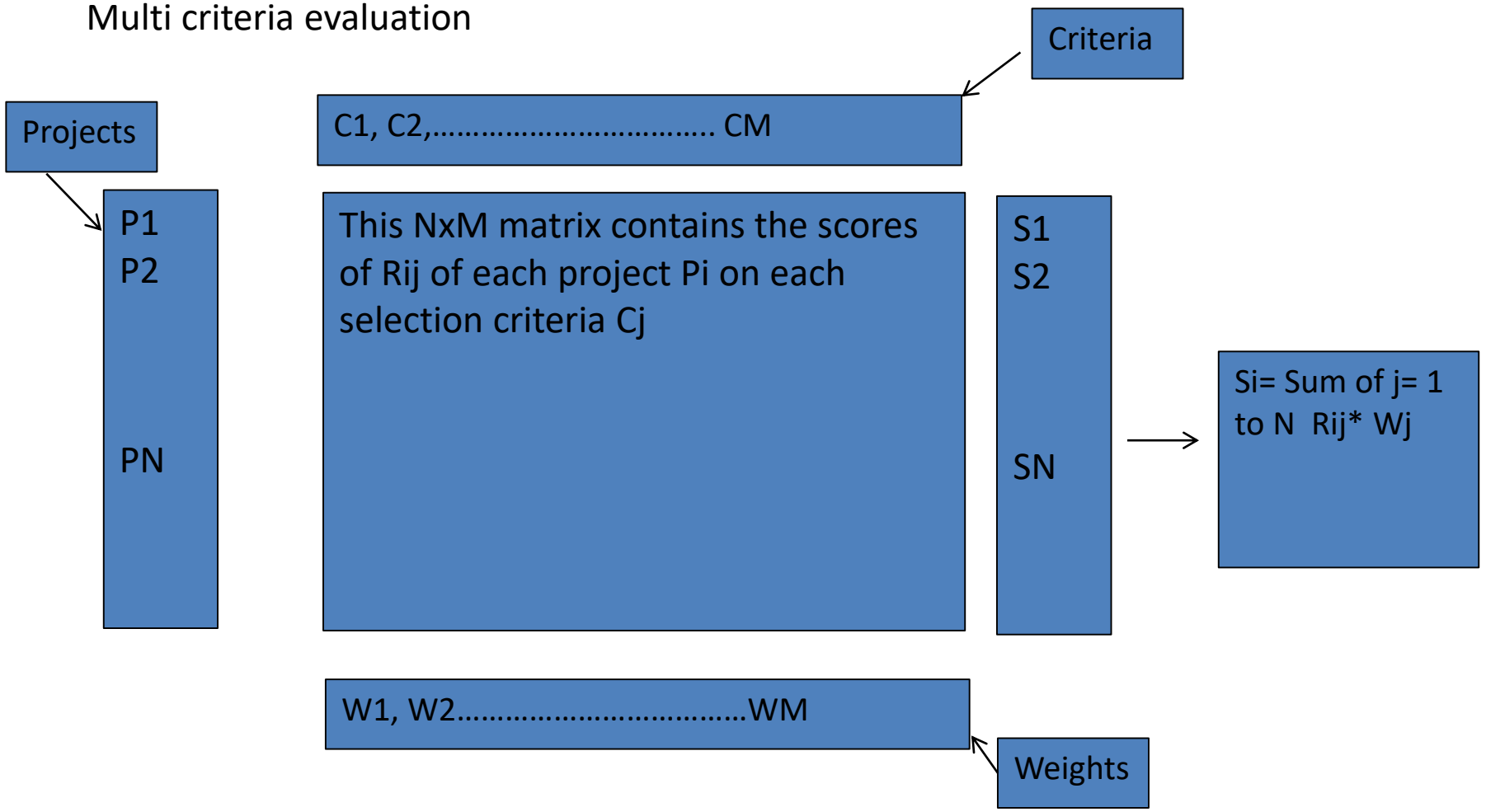
Low-1 Medium-2 High-3

Limitations

- A scale from 1 to 3 may be intuitively appealing and easy to apply and understand, but it is not very accurate.
- From a managerial perspective, another drawback of scoring models is the fact that they depend on the relevance of the selected criteria and the accuracy of the weight given them. In other words, they do not ensure that there is a reasonable link between the selected and weighted criteria and the business objectives that prompted the project in the first place.

Project selection: no of criteria????????

Multi criteria evaluation



Research Methodology

Analytic Hierarchy Process (AHP)

- Analytic Hierarchy Process is a multi-criteria decision making (MCDM) technique was developed by Saaty in 2000 year.
- The analytic hierarchy process (AHP) is also a structured technique for helping people deal with organizing and analyzing complex decisions.
- AHP is also a measurement theory that priorities the hierarchy and consistency of judgmental data provided by a group of decision makers.
- The AHP provides a comprehensive and rational framework for structuring a problem, for representing and quantifying its elements, for relating those elements to overall goals, and for evaluating alternative solutions

i. Establish the hierarchy structure

ii. Various hierarchies' elements weight computation

✓ Establishment of pair-wise comparison matrix

- ✓ The relative importance of two elements is rated using a scale with the values 1, 3, 5, 7, and 9.

Equally Preferred	Moderately Preferred	Strongly Preferred	Extremely Preferred	Absolutely Preferred
1	3	5	7	9

- ✓ 2, 4, 6, and 8 indicate intermediate value.

$$A = [a_{ij}] = \begin{array}{c} \\ C_1 \\ C_2 \\ \vdots \\ C_n \end{array} \begin{array}{c} \begin{array}{cccc} C_1 & C_2 & & C_n \end{array} \\ \begin{bmatrix} 1 & a_{12} & \cdots & a_{1n} \\ 1/a_{12} & 1 & \cdots & a_{2n} \\ \vdots & \vdots & & \vdots \\ 1/a_{1n} & 1/a_{2n} & \cdots & 1 \end{bmatrix} \end{array}$$

Where $a_{ij} = 1$ and $a_{ij} = 1/a_{ji} = 1, 2, ...n.$

$$A = [a_{ij}] = \begin{array}{c} \\ C_1 \\ C_2 \\ \vdots \\ C_n \end{array} \begin{array}{c} \begin{array}{cccc} C_1 & C_2 & & C_n \end{array} \\ \begin{bmatrix} w_1/w_1 & w_1/w_2 & \cdots & w_1/w_n \\ w_2/w_1 & w_2/w_2 & \cdots & w_2/w_1 \\ \vdots & \vdots & & \vdots \\ w_n/w_1 & w_n/w_2 & \cdots & w_n/w_n \end{bmatrix} \end{array}$$

Where $W_i / W_j = a_{ij}$

- Eigen value and eigen vector calculation

$$\lambda_{max} = \sum_{j=1}^{n} a_{ij} \frac{W_j}{W_i}$$

- Consistency test

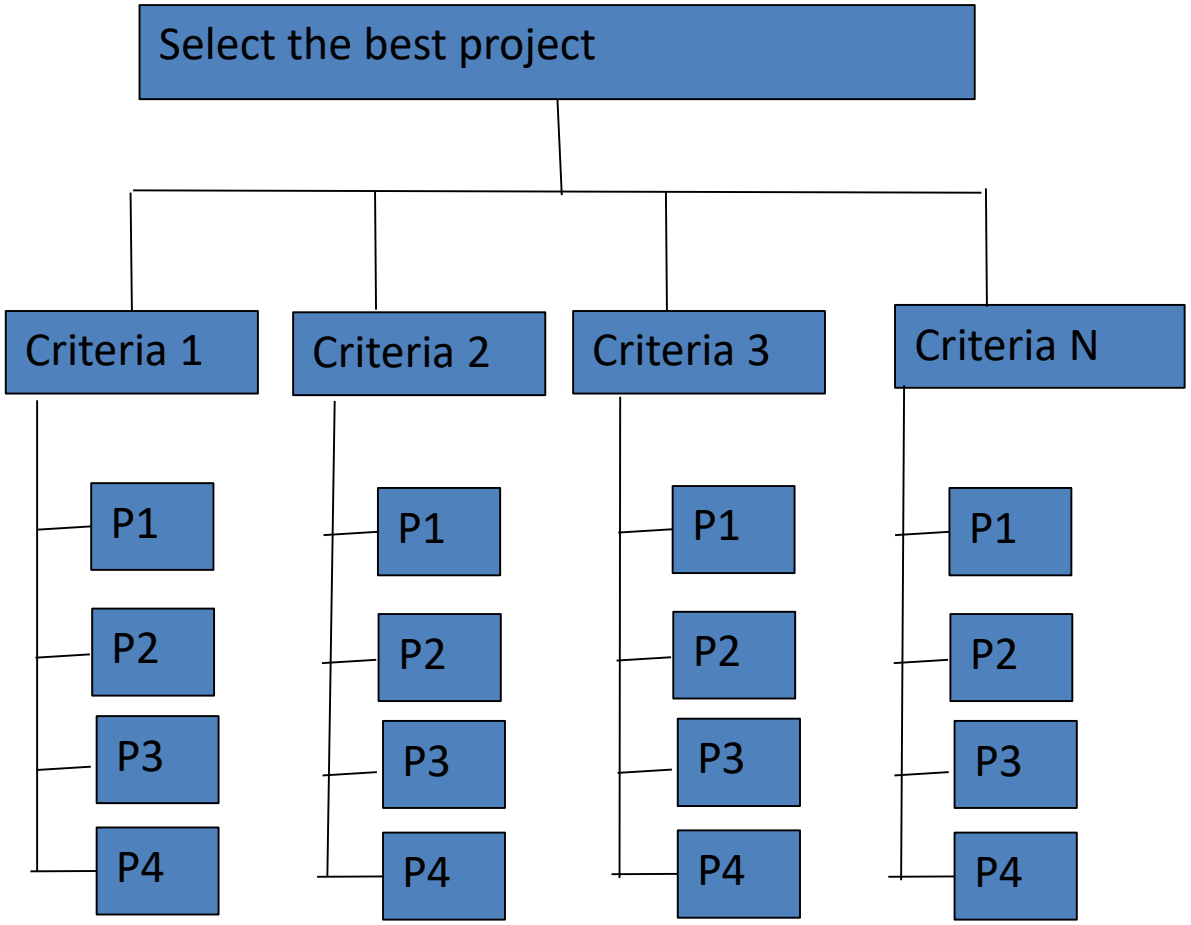
CI (Consistency Index) = $\frac{\lambda max - n}{n - 1}$

CR (Consistency Ratio) = $\frac{CI}{RI}$

✓ Random index values were already given by Saaty where

n=1	n=2	n=3	n=4	n=5	n=6	n=7	n=8
RI=0	RI=0	RI=0.52	RI=0.89	RI=1.11	RI=1.25	RI=1.35	RI=1.4

iii. Overall hierarchy weight computation


Select the best project
Criteria 1
Criteria 2
Criteria 3
Criteria N
P1
P2
P3
P4
P1
P2
P3
P4
P1
P2
P3
P4
P1
P2
P3
P4

Case Study
Project Selection at Nova Western, Inc.

Project Selection at Nova Western, Inc.

Phyllis Henry, vice president of new product development, sat at her desk, trying to make sense of the latest new project proposals she had just received from her staff. Nova Western, Inc., a large developer of business software and application programs, had been experiencing a downturn in operating revenues over the past three quarters. The senior management team was feeling pressure from the board of directors to take steps to correct this downward drift in revenues and profitability. Their consensus opinion was that Nova Western needed some new product ideas, and fast.

The report Phyllis was reading contained the results of a project screening conducted by two independent groups within the new product development department. After several weeks of analysis, it appeared that two top contenders had emerged as the optimal new project opportunities. One project, code-named Janus, was championed by the head of software development. The other project idea, Gemini, had the support of the business applications organization. Phyllis's original charge to her staff was to prepare an evaluation of both projects in order to decide which one Nova Western should support. Because of budget restrictions, there was no way that both projects could be funded.

The first evaluation team used a scoring model, based on the key strategic categories at Nova Western, to evaluate the two projects. The categories they employed were: (1) strategic fit, (2) probability of technical success, (3) financial risk, (4) potential profit, and (5) strategic leverage (ability of the project to employ and enhance company resources and technical capabilities). Using these categories, the team evaluated the two projects as shown here. Scores were based on: 1 = low, 2 = medium, and 3 = high.

Project Janus

Category	Importance	Score	Weighted Score
1. Strategic Fit	3	2	6
2. Probability of technical success	2	2	4
3. Financial risk	2	1	2
4. Potential profit	3	3	9
5. Strategic leverage	1	1	1
			Score = 22

Project Gemini

Category	Importance	Score	Weighted Score
1. Strategic Fit	3	3	9
2. Probability of technical success	2	2	4
3. Financial risk	2	2	4
4. Potential profit	3	3	9
5. Strategic leverage	1	2	2
			Score = 28

The above results seem to suggest that Project Gemini is the choice for the next new project. However, Phyllis was also presented with an NPV analysis of the two projects by her second team of evaluators. Assuming a required rate of return of 15% and anticipated inflation

(*continued*)

rate of 3% over the lives of the two projects, their findings are shown as follows:

Project Janus

Initial investment	= $250,000
Life of the project	= 5 years
Anticipated stream of future cash flows:	
Year 1	= $50,000
Year 2	= 100,000
Year 3	= 100,000
Year 4	= 200,000
Year 5	= 75,000
Calculated NPV	= $60,995

Project Gemini

Initial investment	= $400,000
Life of the project	= 3 years
Anticipated stream of future cash flows:	
Year 1	= 75,000
Year 2	= 250,000
Year 3	= 300,000
Calculated NPV	= $25,695

The analyses of the two projects by different means had yielded different findings. The scoring model indicated that Project Gemini was the best alternative, and the financial screening favored the higher project NPV of Project Janus. Phyllis was due to present her recommendations to the full top management team this afternoon, seemingly armed with more questions than answers.

Questions for Discussion

1. Phyllis has called you into her office to help her make sense of the contradictions in project evaluation. How would you explain the reasons for this divergence of opinion from one technique to the next? What are the strengths and weaknesses of each screening method?
2. Choose the project that you feel, based on the above analysis, Nova Western should select. Defend your choice.
3. What does the above case suggest to you about the use of project selection methods in organizations? How would you resolve the contradictions found in this example?