Timely Completion of Project a Big Challange

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Abstract: Mega Projects are cost intensive and undergoes many uncertainties in its life cycle. Hence prudent planning of various resources such as timely availability of equipment, materials, skilled and un skilled manpower is evident. Further timely availability of required raw materials such as cement, sand, aggregates and reinforcement steel is also equally important. As projects are generally located in remote areas arrangement for construction power, water, approach roads for transport of materials also need to be made ready. Environment management taking into consideration of multi-cultural, multi lingual and multi religion stakeholders is also a task which demands lot of networking and people soft skills. After all this we have to proactively give proper thought to take care of various uncertainties and risks by proper identification and planning. The success of Project management lies with completion of project timely with estimated cost covering total scope of the project with specified quality and safety. Hence project management is more of an art than science. This paper covers all the above aspects in detail.

Keywords: Project Schedule ,Estimated cost, Prescribed Scope , stipulated quality, Resource planning, Risk Planning, People management, Networking, Stakeholder satisfaction.

PROJECT:

- A project is a group of unique, inter-related activities that are planned and executed in a certain sequence to create a unique product or service with in a specific timeframe, budget and the client's specification. The project Management process is based on the PMI (Project Management Institute) process& terminology as found in the PMBOK (Project Management Body of Management.

IMPORTANCE OF PROJECT MANAGEMENT

In today's competitive and chaotic global economy companies are turning to Project Management to consistently deliver business results. Companies are clearly seeing the payoff from investing time, money and resources to build organizational project management expertise: lower cost, lesser time, greater efficiency, improved customer and stake holder satisfaction and greater competitive advantage. Executives discovered that adhering PM methods and strategies has reduced risks, cut costs and improved success rates which are vital to survive the economic crisis. Keeping the project on track requires a strict management of metrics and project goals that extends across the project team and out to suppliers, contractors, the client and the stakeholders. With right resources, a clear time frame for delivery and senior leadership support, a strong and disciplined PM practices will drive an organization forward, says Mr M C Knight. "It's how we stay competitive in the market place.

Ten Characteristics of Project Management .

.1. Expert knowledge of Project Scope

- 2. Planning, Project scheduling &time management
- 3. Budgeting& cost management
- 4. Quality& Safety Management
- 5. Networking Boundary Management
- 6. Leadership, staff & Team management
- 7. Communication Management
- 8. Negotiation& conflict Management
- 9. Risk management
- 10. Environment& Stack holders Management

STAGES OF PROJECT EXECUTION

- Initiation
- Planning
- Execution
- Monitoring & Control
- Completion & Closure

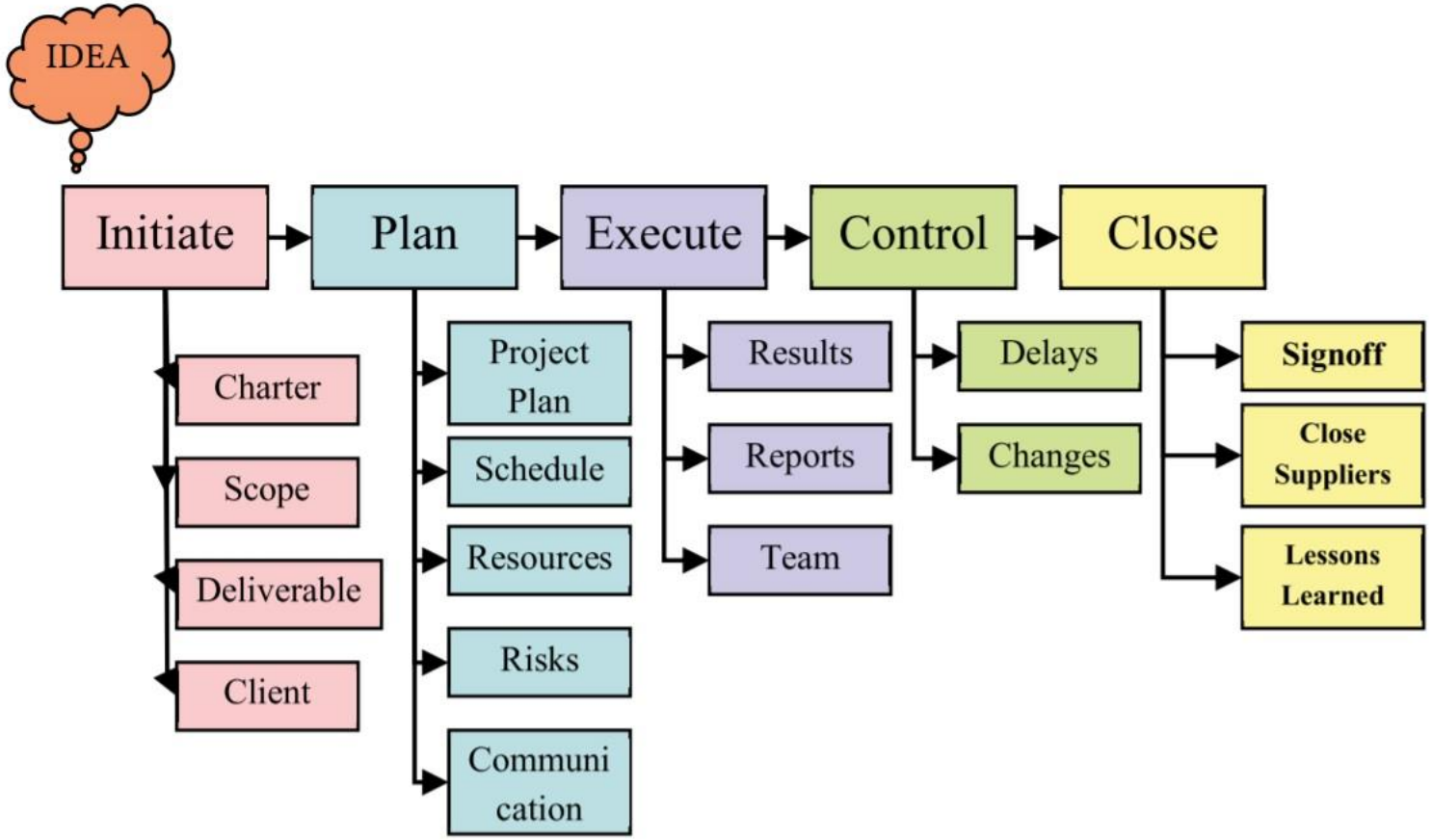


Figure 1: Project Management Process

- **INITIATION, PLANNING & EXECUTION:**

It Covers

a) **Charter: -**

It is a concise, easy to read and to the point document. It is a contract between owner/sponcer.It covers Project title and description, scope statement authority levels, Business case, Level of Risk , Stakeholders, goals &objectives, Approaches, Milestones, deliverables, assumptions.

b) **Scope:-**

It got answer for many questions generally people ask to know about a project such as what, why, when, who, how much, where etc. Further it should also clearly mention what is out of scope for this project to avoid scope creep at a later date.

c) **Deliverable:-**

It elaborates the project interim Milestones called deliverables in time and cost.

d) **Client:-**

Details about various Stack holders they can be identified on the basis of their power to contribute or withhold and/or to accept or reject outcomes and concern as they are affected by technical and social impacts and perceptions. Hence they can be Proponent/ Resistor.

Any one affected by activities or results of a project. Who can influence, support or resist the outcome and who can have a personal, financial or professional interest in the outcome of the project.

COMPETING CONSTRAINTS

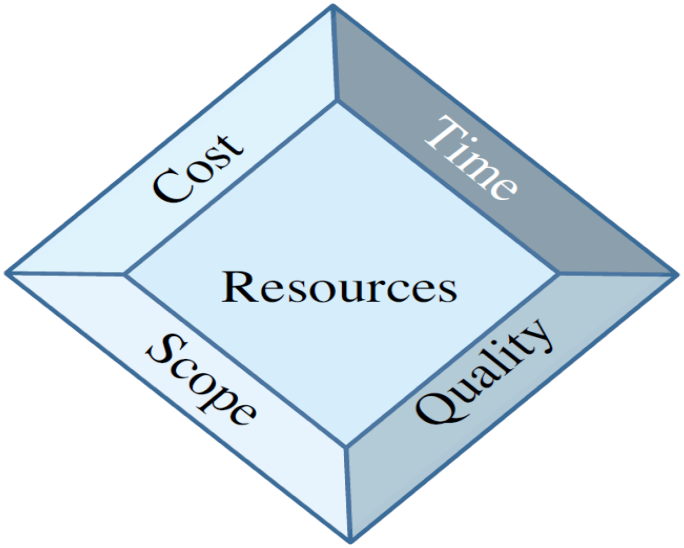


Figure 5: Competing Constraints

These are five major areas of concern (Competing Constraints) in Project Management.

1. SCOPE with SMART objectives (Specific, Measurable, Attainable, Relevant & Time bound)
2. COST
3. SCHEDULE or TIME
4. SAFETY& QUALITY
5. RESOURCES

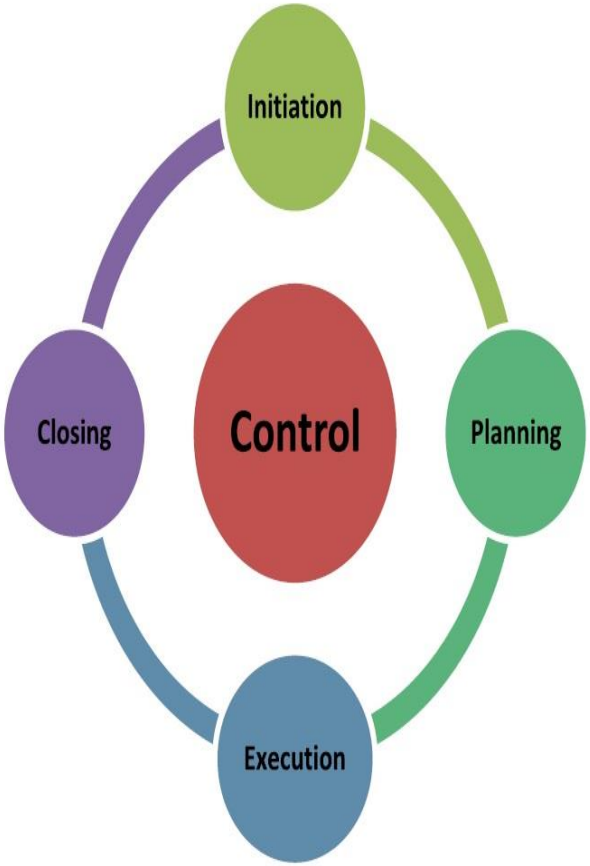


Figure 2: The Project Process

PROJECT PROCESS

In which Planning, Execution and Monitoring & control are continuous processes throughout the life cycle of the Project.

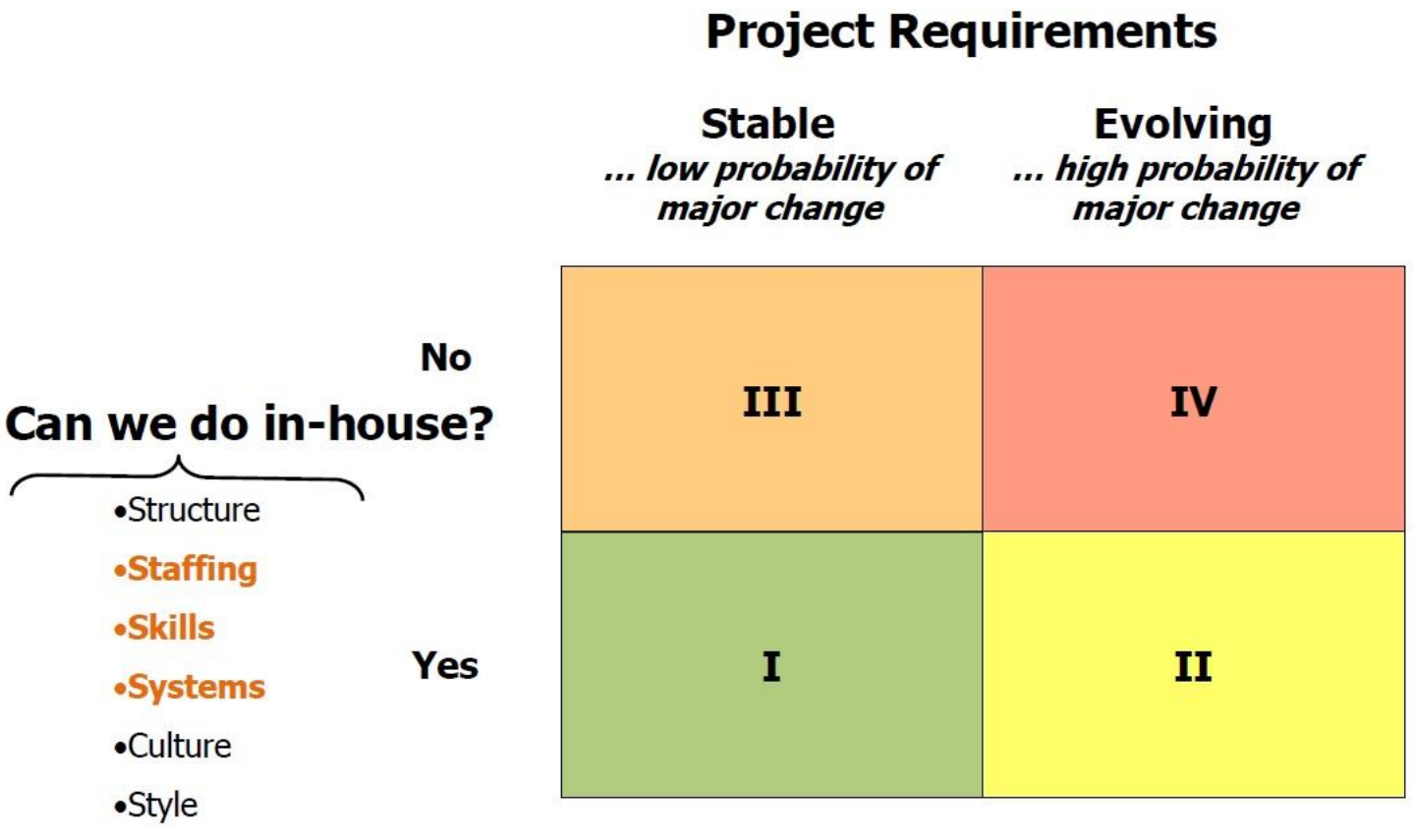


Figure 4: Project Type

McKinsey 7S model of PM:

The key elements are

1. Strategy,2. Structure, 3. System 4. Staff,5. Style,6. Skills 7. Super ordinate goal of Organ

It covers the followings:

A Work Breakdown Structure (WBS) is another of the key factors for project success.

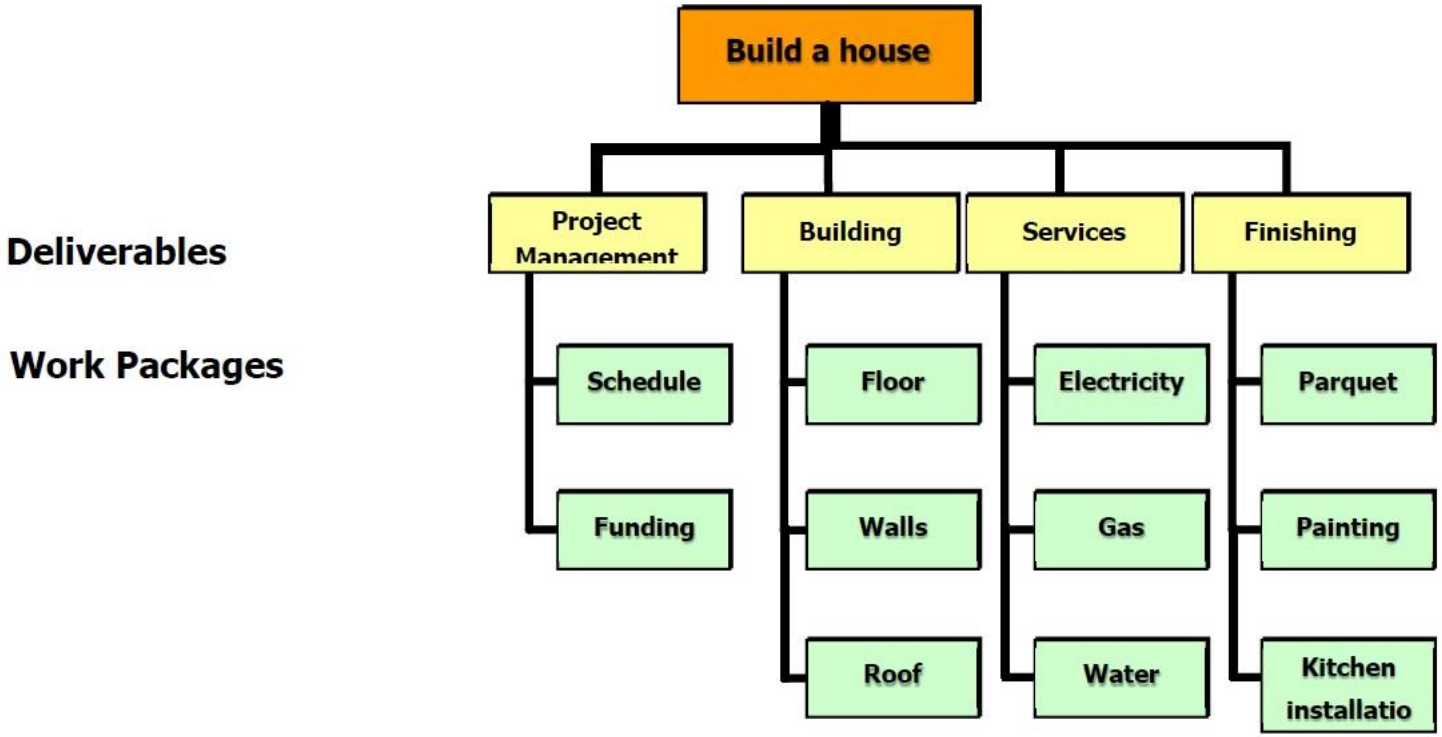


Figure 9: WBS Example

1. Sub dividing the Scope in to deliverables and activities

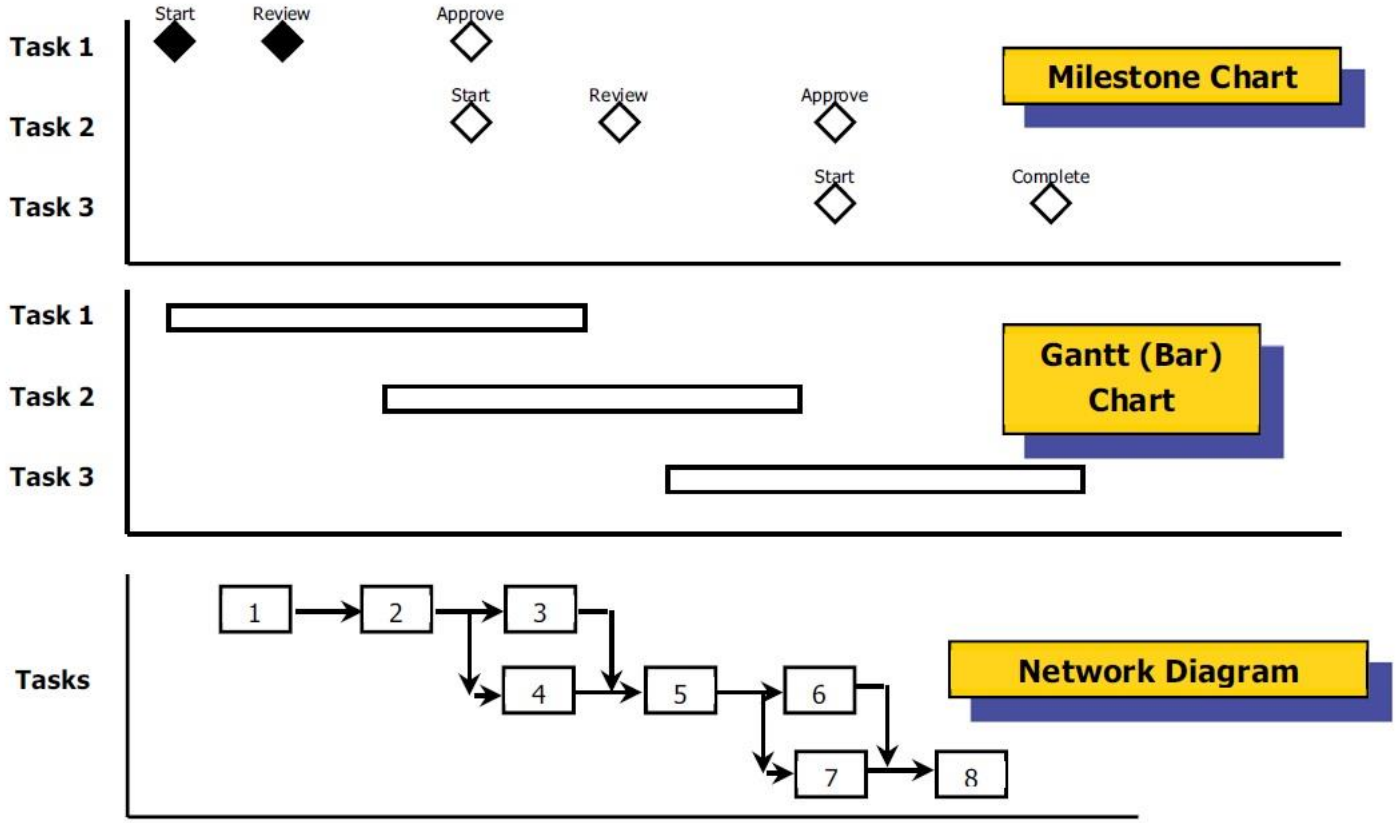


Figure 11: Project Visualisation Tools

(WBS)

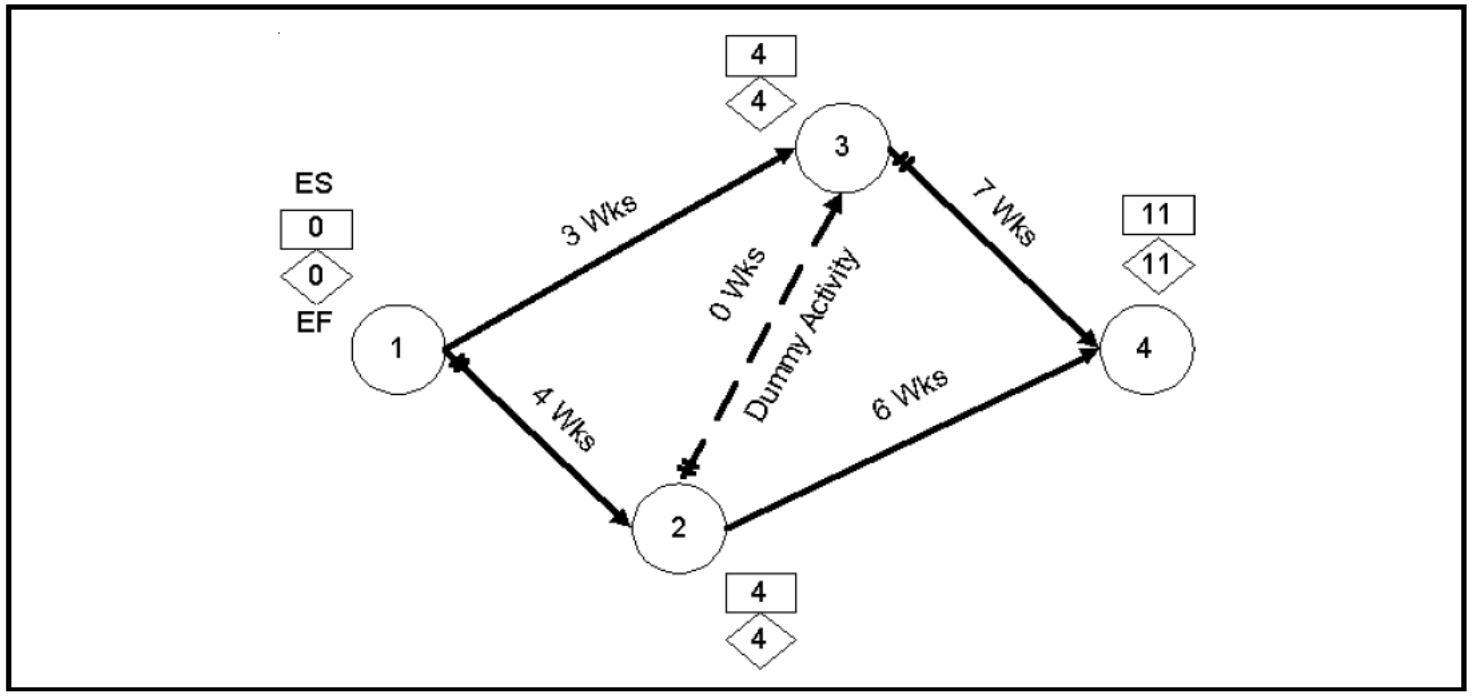
2.Identifying interdependencies between activities of Master Network

3. Estimating time for each activity and developing the project schedule.

Program Evaluation and review Technique(PERT) originally developed by U.S Navy and Critical Path Method (CPM) by Dupont PERT used for probabilistic(or uncertain)estimates of activity durations and CPM was used for deterministic (or Certain) estimate of activity duration but included both time and cost estimates to allow time/cost trade-o ffs to be used. Both methods employed to schedule and display task sequences.

FRAMEWORK FOR PERT&CPM

To make the Backward Pass, we begin at the sink or the final event and work backwards to the first event.



At Event 3 there is only one activity, Activity 3-4 in the backward pass, and we find that the value is 11–7 = 4 weeks. However at Event 2 we have to evaluate 2 activities, 2-3 and 2-4. We find that the backward pass through 2-4 gives us a value of 11–6 = 5 while 2-3 gives us 4–0 = 4. We take the smaller value of 4 on the backward pass.

7.5 Tabulation & Analysis of Activities

We are now ready to tabulate the various events and calculate the Earliest and Latest Start and Finish times. We are also now ready to compute the Slack or Total Float, which is defined as the difference between the Latest Start and Earliest Start.

Event	Duration (Weeks)	Earliest Start	Earliest Finish	Latest Start	Latest Finish	Total Float
1-2	4	0	4	0	4	0
2-3	0	4	4	4	4	0
3-4	7	4	11	4	11	0
1-3	3	0	3	1	4	1
2-4	6	4	10	5	11	1

1. The Earliest Start is the value in the rectangle near the tail of each activity
2. The Earliest Finish is = Earliest Start + Duration
3. The Latest Finish is the value in the diamond at the head of each activity
4. The Latest Start is = Latest Finish – Duration

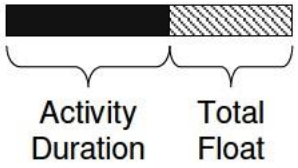
There are two important types of Float or Slack. These are Total Float and Free Float.

Total Float is the spare time available when all preceding activities occur at the earliest possible

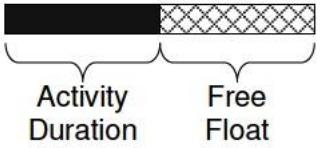
Float (Slack)

Float, or slack, is the amount of time a scheduled activity has that it can be delayed or extended without affecting the project end date or the next scheduled activity. Float can be further defined as:

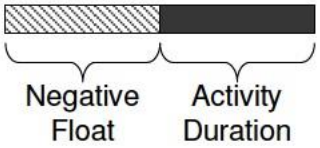
- Total Float – The total amount of time that a scheduled activity (or milestone) may be delayed or extended without delaying the project end date or violating a schedule constraint.



- Free Float – The amount of time that a scheduled activity (or milestone) can be delayed without delaying the start of the next activity in the network.



- Negative Float – The amount of time that by which a critical activity (or milestone) misses a required date.



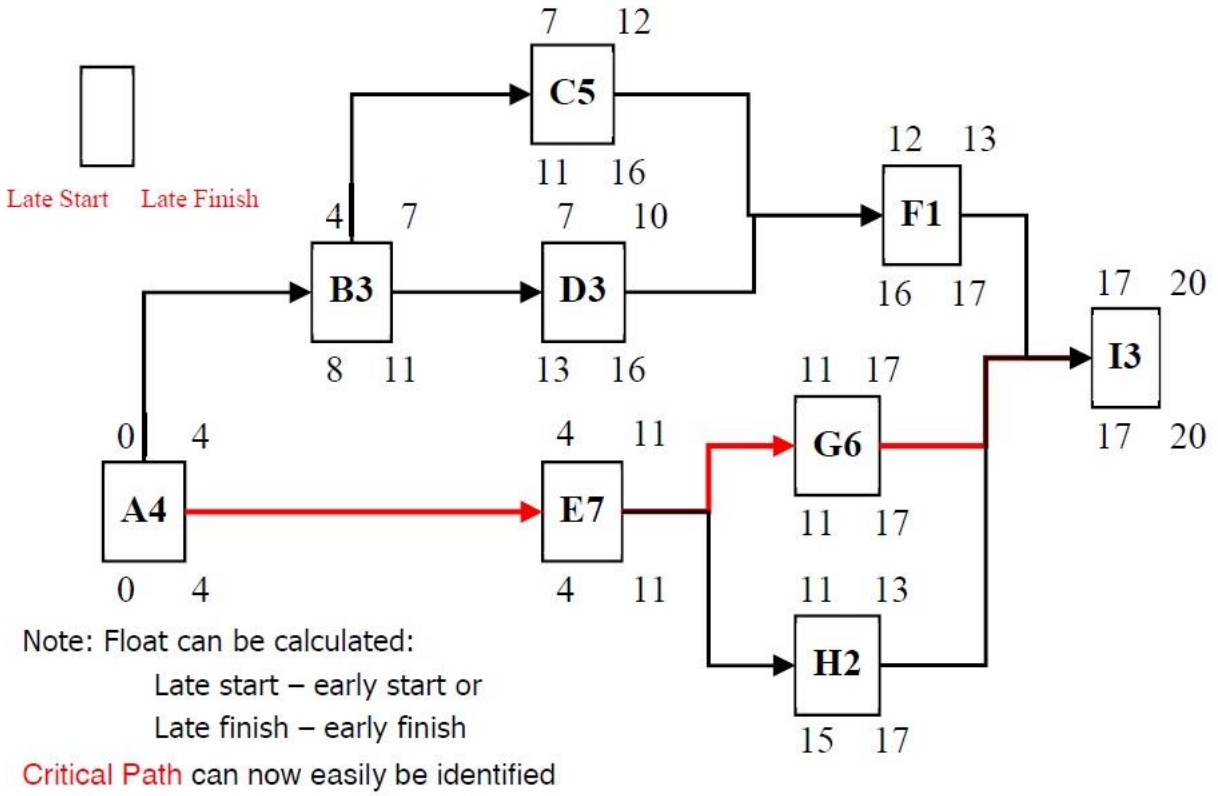


Figure 12: Backward Pass Example

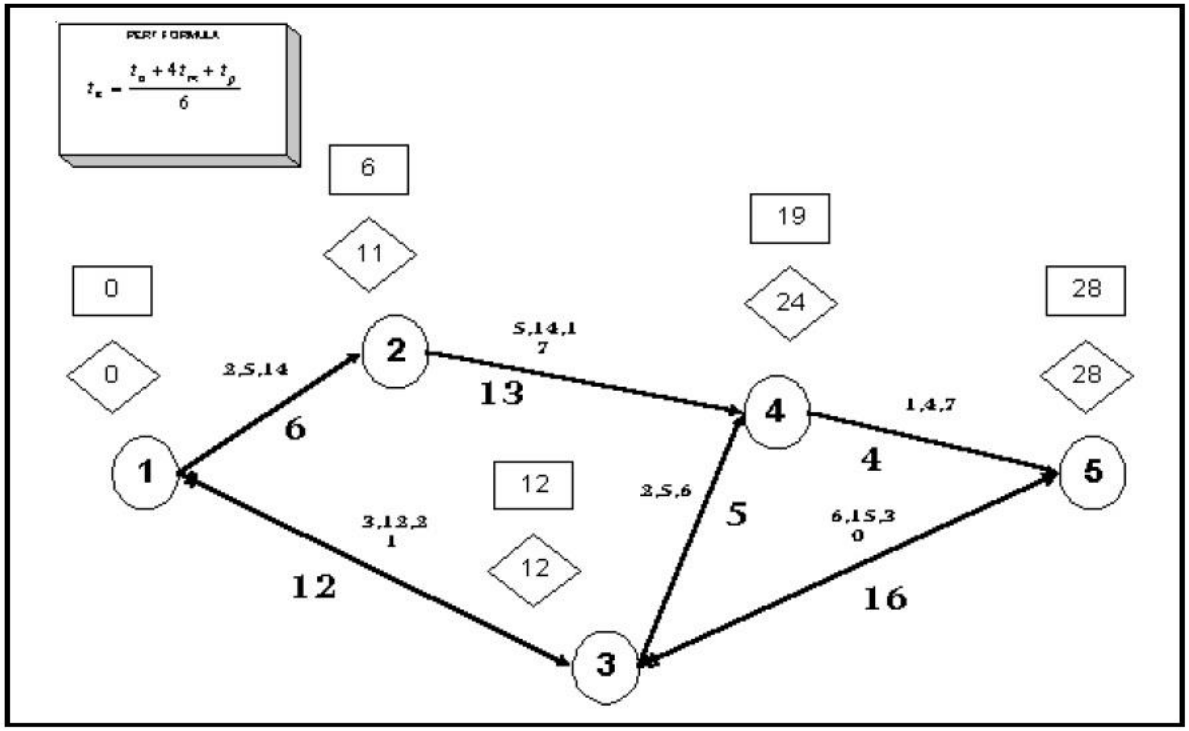
Essentially there are 05 steps which are common to both the techniques. The Procedure is listed below:

1. Define the project and its significant activities or tasks. The project should have a single start activity and a single finish activity.
2. Develop the relationship among the activities. Decide which activities must precede and which activities must follow others.
3. Draw the Network connecting all activities. Each activity should have a unique event number. Dummy arrows are used where required to avoid giving the same numbering to two different activities.
4. Assign time and/or cost to each activity.

5. Compute longest time path through the network. This is called CRITICAL PATH. The project cannot be completed less than this time duration without investing additional cost. Resources are to be optimally used by concentrating on these few activities as the same determine the fate of entire project.
6. Tabulation and analysis of activities are done to find out ES, EF LS, LF Total float taking duration of time for each activity. Some of the terminologies are as detailed below:
   ES (Earliest start) is the starting time of activity, EF (Earliest Finish) =ES+ duration of time LF (Latest finish Time) & LS is LF-duration.Hence Total Float =Latest start time of activity -Earliest Time of same OR Latest Finish time -Earliest Finish time.
   Activities with zero total float are in CRITICAL PATH. Total float is same as Float and also as slack.

PERT Calculations for the Social Project

In our Social Project, the Project Manager is now not so certain that each activity will be completed on the basis of the single estimate he gave. There are many assumptions involved in each estimate, and these assumptions are illustrated in the three-time estimate he would prefer to give to each activity.



We calculate the PERT event times and other details as below for each activity:

Event	t_o	t_m	t_p	t_e	ES	EF	LS	LF	TF	s.d.	Var.
1-3	3	12	21	12	0	12	0	12	0	3	9
3-5	6	15	30	16	12	28	12	28	0	4	16
1-2	2	5	14	6	0	6	5	11	5	2	4
2-4	5	14	17	13	6	19	11	24	5	2	4
3-4	2	5	8	5	12	17	19	24	7	1	1
4-5	1	4	7	4	19	23	24	28	5	1	1

Estimating Risk

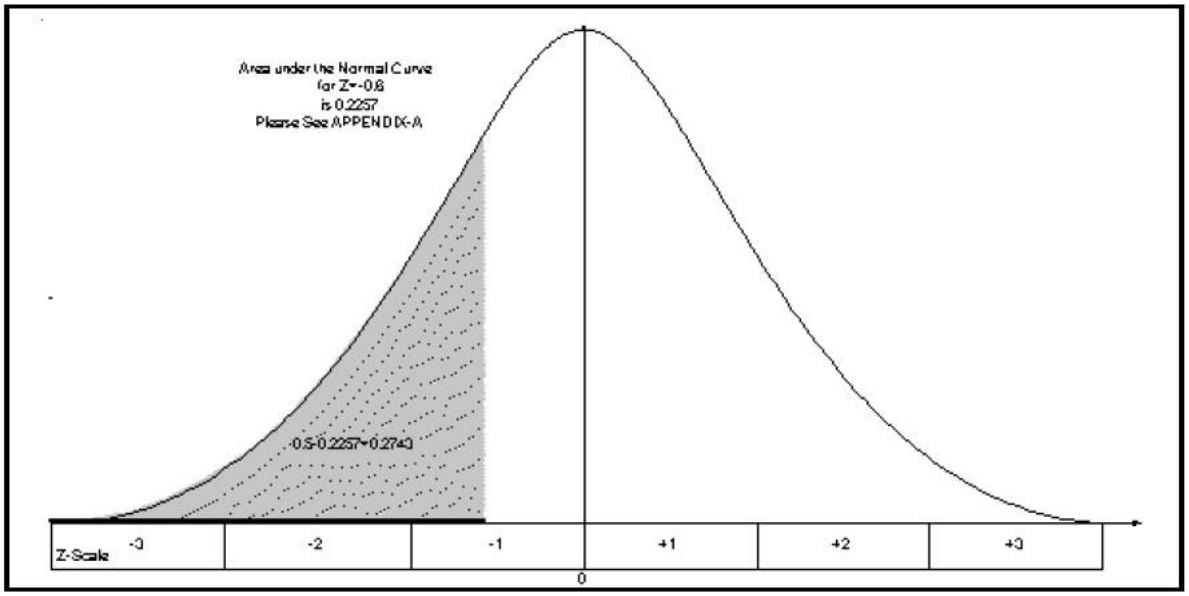
Having calculated the S D. and the Variance, we are ready to do some risk analysis. Before that we should be aware of two of the most important assumptions made by PERT.

1. The Beta distribution is appropriate for calculation of activity durations.
2. Activities are independent, and the time required to complete one activity has no bearing on the completion times of it's successor activities in the network. The validity of this assumption is questionable when we consider that in practice, many activities have

3.SD Standard Deviation=(tp+to)/6, Variance=(SD)2. Te for critical Path=28 days, Variance for critical Path=25
Hence SD for network =5days. Hence project completion is expected at 28+/- 5= 23 to 33 days.

By looking at the following extract from a standard normal table, we see that the probability associated with a Z of -0.6 is 0.274. This means that the chance of the project being completed within 25 weeks, instead of the expected 28 weeks is about 2 out of 7. Not very encouraging.

$$Z = \frac{D - t_e}{S_t} = \frac{25 - 28}{5} = \frac{-3}{5} = -0.6$$



On the other hand, the probability that the project will be completed within 33 weeks is calculated as follows:

$$Z = \frac{D - t_e}{S_t} = \frac{33 - 28}{5} = \frac{5}{5} = 1$$

2. STAFF & TEAM BUILDING

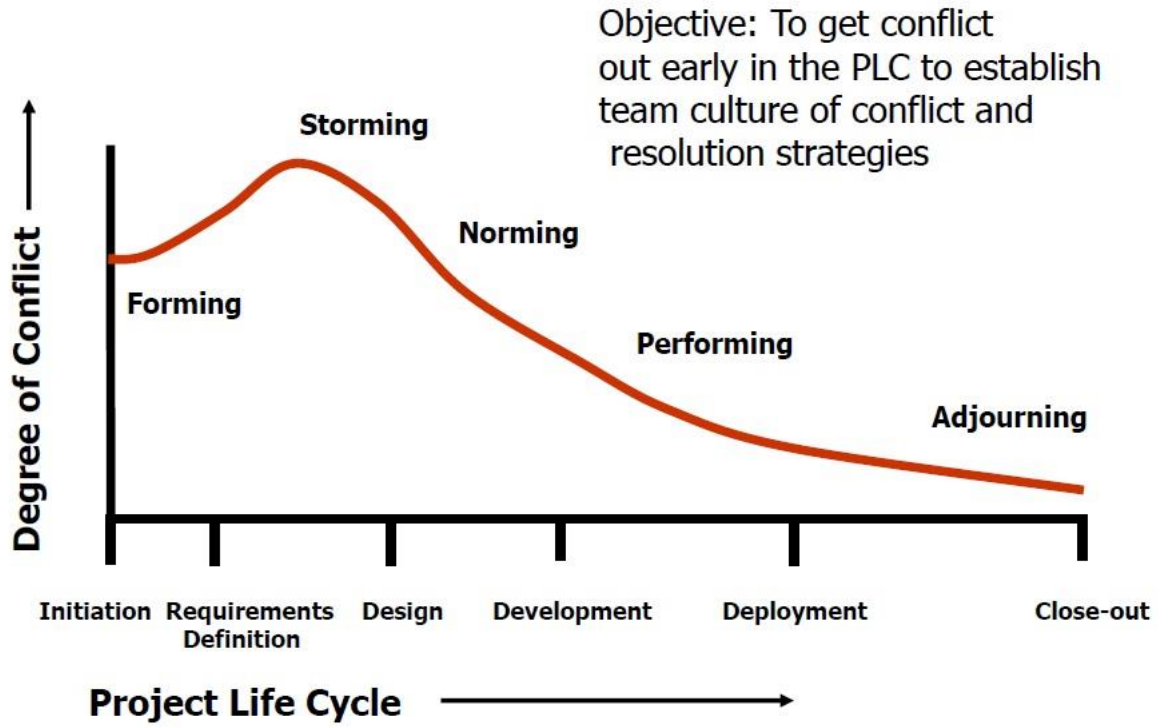


Figure 16: Team Life Cycle

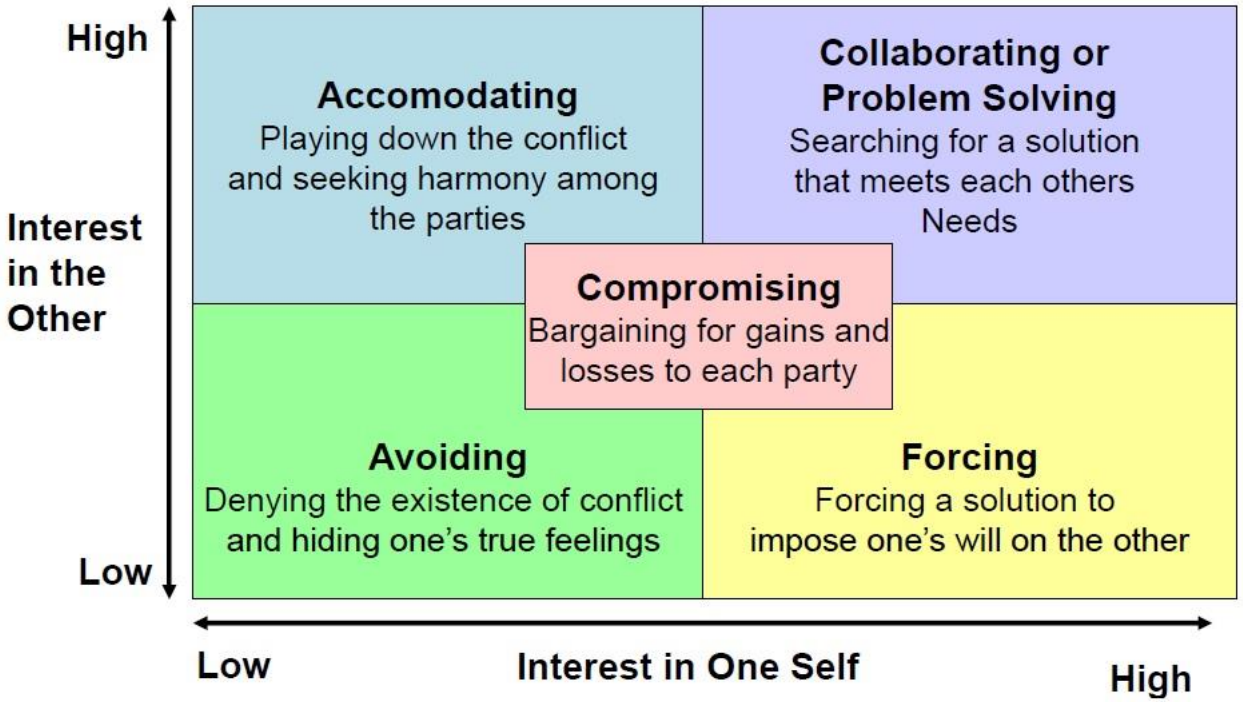


Figure 17: Responsibility Assignment Matrix Example

Team Life cycle such as forming, storming, norming, performing and adjourning is to be tuned with respect to project life cycle from initiation to close out. The responsibilities to various team members need to be assigned by assessing their interest in themselves with respect to their interest in others. The project success shall depend upon their nature in dealing conflict situations during project execution. Their natures can be of Avoiding, Accommodating, Forcing, compromising or collaborating/ problem solving type.

PEOPLE MANAGEMENT

Excellent influencing skills require a healthy combination of interpersonal, communication, presentation and assertiveness techniques. The various principles are Liking, exhibiting authority, posing scarcity (more desirable if less accessible) Hence an effective Principle of consistency, reciprocity and social proof. (what others in similar situation has done)

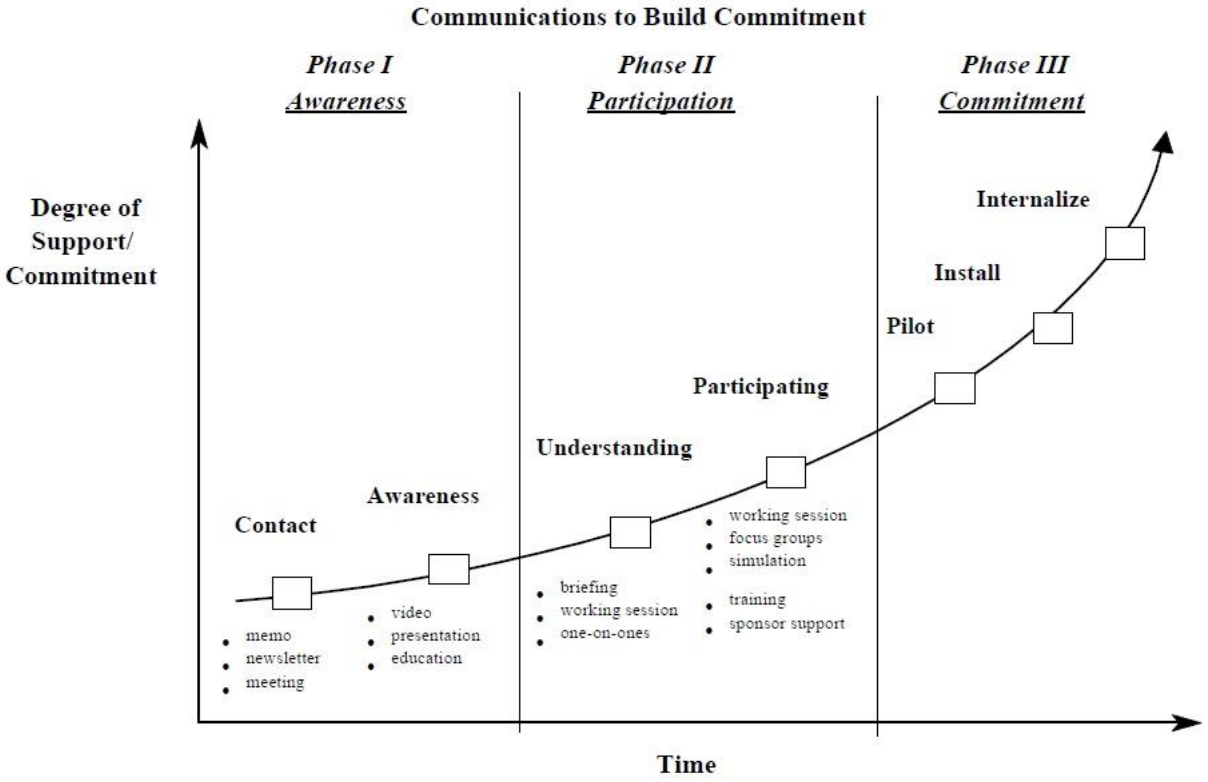


Figure 22: The Typical Commitment Curve

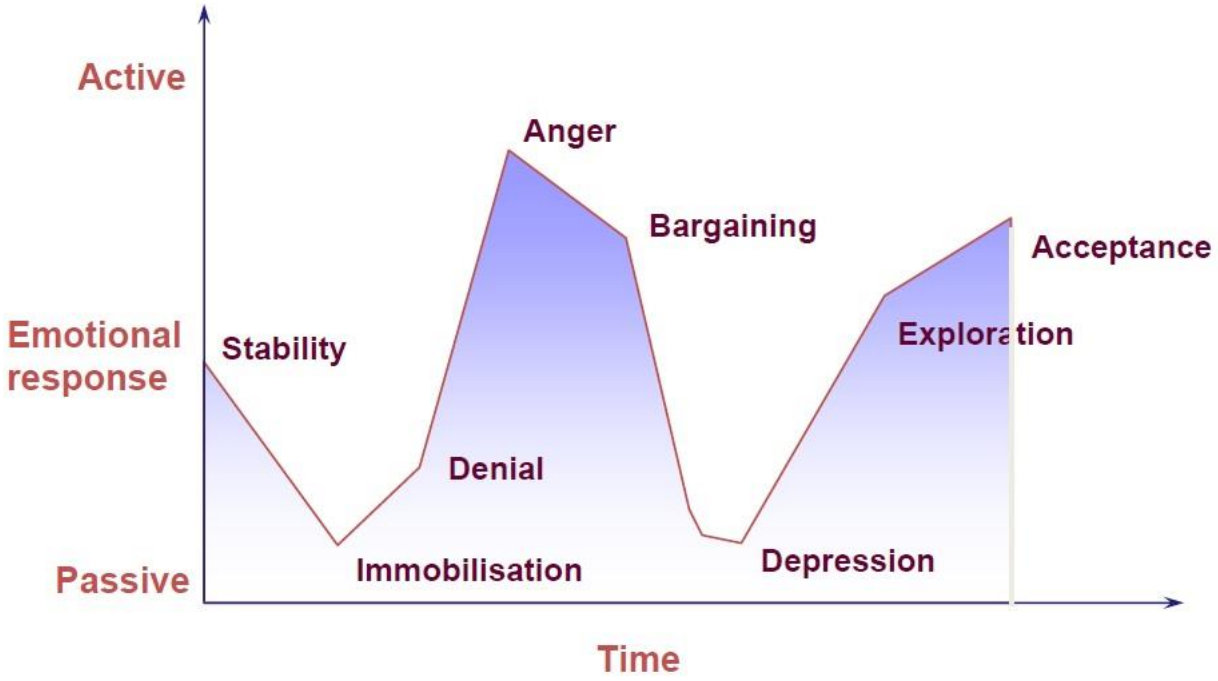


Figure 20: Emotional Responses to Change Over Time

Managing Change in Project:

For any change there will be resistance first and the emotion level passive to active with respect to time duration the responses can be initially from stability, immobilisation, denial, anger, bargaining, depression Exploration and lastly it shall reach to acceptance.

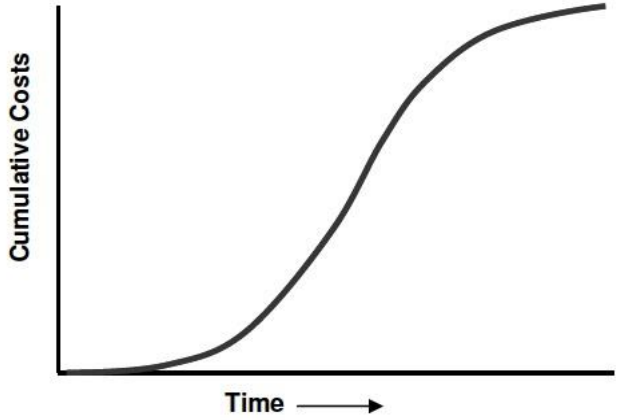
6.Estimating cost of project and also at each milestone and Project Budgeting and utilisation. Budget is an organization plan stated in monetary terms. It reflects the actual financial operation of the business. Financial position at different milestones/stages of project as forecasted or estimated and as actual executed needs to be planned monitored to have overall control on total cost of the project after completion of same.

Cost Budgeting

Cost budgeting is a planning process that involves aggregating the estimated costs of individual schedule activities to establish a total cost baseline for measuring project performance. The output from cost budgeting is called the Cost Baseline.

Cost Baseline

The cost baseline is the time-phased budgets that are used as a basis against which to measure, monitor, and control overall cost performance on the project. It is developed by summing the estimated costs for a period of time (based on the scheduled dates for the activities) and is typically displayed in a spreadsheet or an S-curve graphic.



This cost baseline also represents Planned Value, which is used for Earned Value Management (discussed later).

Cost Control

Cost control is the process of influencing factors that create variances, and controlling changes to the project budget.

Planned Value (PV)

What are the budgeted costs of the work scheduled?

- Time phased based on baseline budget.
- Only changes when baseline is changed.
- Also referred to as "BCWS".
- Budget at Completion "BAC" is used for the planned value of the overall project.

Actual Costs (AC)

What are the actual costs of the work performed?

- Based on the actual completion of the work packages.
- Actual costs for reported work.
- Also referred to as "ACWP".

Earned Value (EV)

What are the budgeted costs of the work performed?

- Based on the actual completion of the work packages.
- Baseline value of the reported work.
- Also referred to as "BCWP"

EVM Formulas

Once the project manager has the PV, EV, & AC values for the project, some EVM calculations can be done to measure the progress of the project and help identify trends, forecast costs, and identify ways to correct/mitigate project pitfalls.

Cost Variance (CV)

CV = EV – AC

CV is the difference between the Earned Value and the Actual Costs. If this value is positive, then the project is currently under budget (spending less than what was planned). If this value is negative, then the project is currently over budget (spending more than what was planned).

Cost Performance Index (CPI)

CPI = EV/AC

The CPI is a factor that indicates the budget efficiency. If this value is greater or equal to 1.0, the project cost trend is under or at planned budget. If this value is less than 1.0, the project cost trend is over planned budget.

Cost Variance Percentage (CV%)

CV% = CV/EV

The cost variance percentage indicates the percentage difference that a project is over or under spending the planned budget. A positive percentage indicates that the project is currently under budget by the percent calculated. A negative percentage indicates that the project is currently overspending by the percent calculated.

Schedule Variance (SV)

SV = EV – PV

SV is the difference between the Earned Value and the Planned Value. If this value is positive, then the project is currently ahead of schedule. If this value is negative, then the project is currently behind schedule.

Schedule Performance Index (SPI)

SPI = EV/PV

The SPI is a factor that indicates schedule efficiency. If this value is greater or equal to 1.0, the project schedule trend is ahead of or on schedule. If this value is less than 1.0, the project schedule trend is behind schedule.

Schedule Variance Percentage (SV%)

SV% = SV/PV

The cost variance percentage indicates the percentage difference that a project is over or under spending the planned budget. A positive percentage indicates that the project is currently under budget by the percent calculated. A negative percentage indicates that the project is currently overspending by the percent calculated.

Risk Definitions

Risk Management

Risk management is the act or practice of dealing with project risk. It includes planning for risk, assessing risk (identification and analyzing), developing risk response strategies, and monitoring risks to determine how risk changes during the project life.

Risk

Project risk in an uncertain event or condition that, if it occurs, has a positive or negative effect on at least one of the project objectives (scope, schedule, budget, quality)

Threat

A project risk that has a negative effect is referred to as a threat. A project manager will proactively manage threats to the project and look for ways to reduce the probability or impact of the threat or eliminate the threat all together.

Opportunity

A project risk that has a positive effect is referred to as an opportunity. A project manager will proactively manage opportunities to the project and look for ways to exploit, enhance, or share the opportunity.

7. Risk Planning. To identify risks by SWOT, Brain storming Cause and Effect Diagram. Evaluate probability of occurrence and its impact Risk Matrix, Risk response planning. (Risk Strategies avoid, transfer, Mitigate & accept) In avoiding risk we are to eliminate threat. To identify risks by SWOT, Brain storming Cause and Effect Diagram.

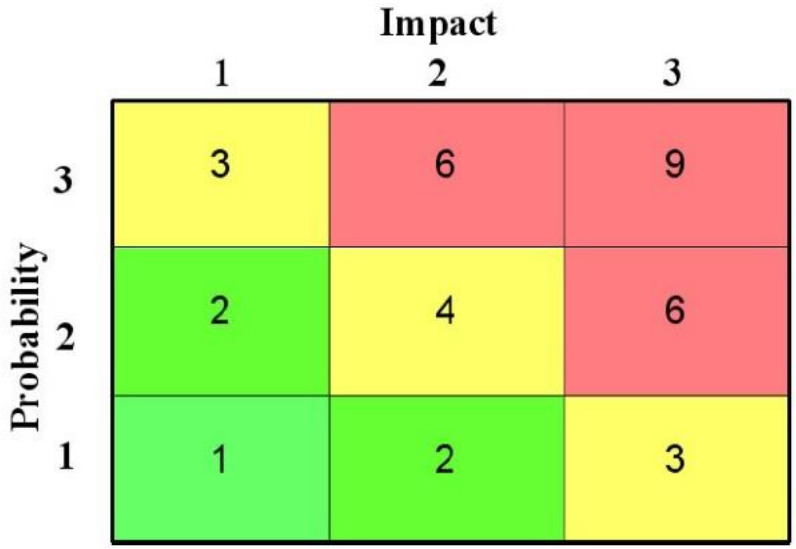


Figure 14: Risk Management Matrix

If you have many risks, you can add a third dimension: **Time**

This means how soon the risk may happen:

1 – Long Term
2 – Medium Term
3 – Short Term
4 – Critical

Monte Carlo Simulation

A project simulation uses a model that translates the uncertainties specified at the detailed level of the project into their potential impact on project objectives (time and cost). In a Monte Carlo simulation, the project model is computed many times (iterated), with the input values randomly selected based on the probability distribution for the project element or schedule activity. A probability distribution is calculated.

For a cost risk analysis, a simulation can use the project WBS or a cost breakdown as its model. For schedule risk analysis, the precedence diagramming method (PDM) is used. *(PDM is further discuss in Module 4 – Schedule Management)*

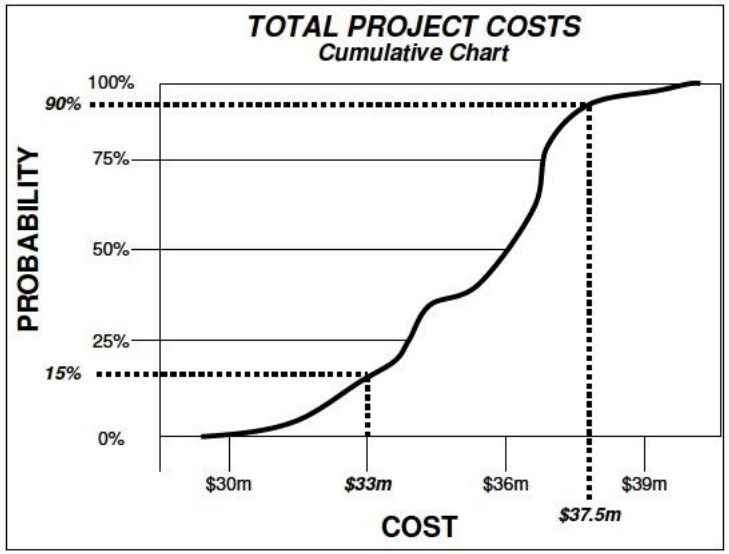


Figure 3-3

In the Figure 3-3 above, assume that the project has a programmed budget of $33 million dollars. Risk events are identified, qualitatively analyzed, and quantitatively analyzed and tied to the project WBS. Using the Monte Carlo simulation technique, a Total Project Cost graph is generated reflecting the probability of achieving certain cost values. In the graph above, the project has a 15% probability of achieving a $33 million cost or less. Depending on the risk tolerance of the organization, this chart can be used to look for contingency values needed to meet the probability for success.

- PROJECT MILESTONES FOR 500MW & 660 MW UNITS

O	Activities	Mile Stone Duration In Months
1	Main Plant award	0
2	Boiler Erection	10
3	Drum Lifting	16
4	Hydro test	26
5	BLU	36
6	Steam Blowing	38
7	Rolling and Synchronization	40
8	Commercial Generation	46

SL NO	Activities	Mile Stone Duration In Months
1	Main Plant award	0
2	Boiler Erection	12
3	Hydro test	36
4	BLU	42
5	Steam Blowing	43
6	Rolling and Synchronization	45
7	Commercial Generation	48

LAND ACQUISATION

1. Land acquisition & front H/O to various Agencies for main plant, Township, Ash Dyke and Railway siding.
    a. Support of State Authorities.
    b. Involvement of Experienced Project Team.
    c. Preferably Posting of Employees of same state.
    d. Deployment of facilities such as vehicles & extension of accommodation and other minimum facilities.
    e. Correctness of Documentations.
2. Development of infrastructure facilities:
    a. Construction of boundary wall.
    b. Construction of roads, drains and culverts from nearest villages/ towns.
    c. Gate and security arrangements.
3. Site Levelling:
    a. Proper documentation Wrt various levels and various types of soils encountered.
    b. Correctly Documentation Wrt volume of various types of soils encountered.
    c. Cutting & filling volume Wrt quantity quality of soils to take care royalty issues.
4. Arrangement for construction water & construction power.
    a. Construction of required number of tube wells in plant, township and Ash dyke areas.
    b. Construction of Power supply network for plant & township.
    c. Construction of Temporary Project office, canteen & Public information Centre and First Aid centre.
5. Enabling facilities inside plant & township.
    a. Sites for Lighting Mast undisturbed during construction period.
    b. Routing for construction power Network.
    c. Location of Temporary canteens.
    d. Location of lay down & Fabrication yards.
    e. Watch Towers
    f. Labour Colony with facilities (roads, drains, power, toilets, drinking water etc.)
    g. Green belt
    h. Disposal/ Stacking facilities for over burden.

6. Type Tests

   a. Type test issues need to be given due thought.

   b. Extended warranty/ additional BG/Payment withheld in lie of TT

   c. Type test for imported equipments/Materials.

7. Quality assurance & Inspection.

   a. FQPs to be released on priority

   b. Due thought in finalizing FQP with practical approach.

   c. ambiguity in FQP delays site work Execution(Hydro/RT/UT)

   d. Clarity in specification (Fabrication at site/factory, Welding or threading in GI pipes)

   e. MQP finalisation with clarity wrt standards/specifications.

   f. PDI /Non PDI/Stage or final Inspection.

STAKEHOLDER MANAGEMENT:

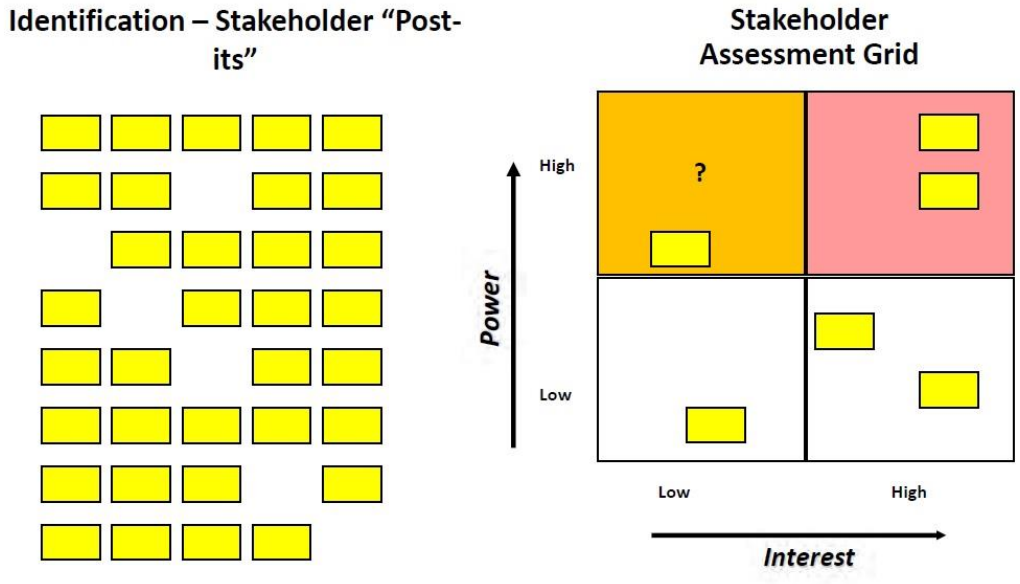


Figure 7: Stakeholder Analysis

8. Erection of Equipment

   a. Sequence of erection of Structures, equipment etc to be studied and finalised.

   b. Priority for civil works over Mechanical& electrical works.

c. If blasting is involved it is to be given priority for safe erection and construction works.

d. Certain foundations to be completed first and back filled to carry out assembly of equipment.

e. At multi activity areas work and resource planning to be done suiting to site.

9. Safety

a. Safety at work place highly essential.

b. Required Qty PPEs supply& Use.

c. Deployment of required nos of Experienced& Qualified safety officers and safety stewards. (1/50)

d. Proper make and rating of cranes, Hydra, chain pulley blocks winch machines etc.

e. Periodic check and certification of lifting equipments by authorised agencies.

f. Qualified and experienced Operators and drivers with license.

g. periodic Training and awareness for operators, drivers and workers.

h. Labour canteen, drinking water, Toilet, worker rest room etc.

i. Proper illumination.

j. Staircase, gratings, temporary platforms, toe guards, handrails etc.

k. Qualified and experienced Operators and drivers with license.

l. periodic Training and awareness for operators, drivers and workers.

m. Labour canteen, drinking water, Toilet, worker rest room etc.

n. Barricading of areas.

o. HIRA, JSA

p. Earthlings, ELCB

q. Fire extinguisher &portable hose

r. House keeping

s. Workers movement around moving equipments.

t. CLIMS

u. Workers induction Training and medical checking.

v. Vehicle speed control, back horn

w. Pep talk or Tool talk.

x. Involvement of Line managers top to bottom.

y. First aid centre, ambulance.

z. safety camera &Safety control room

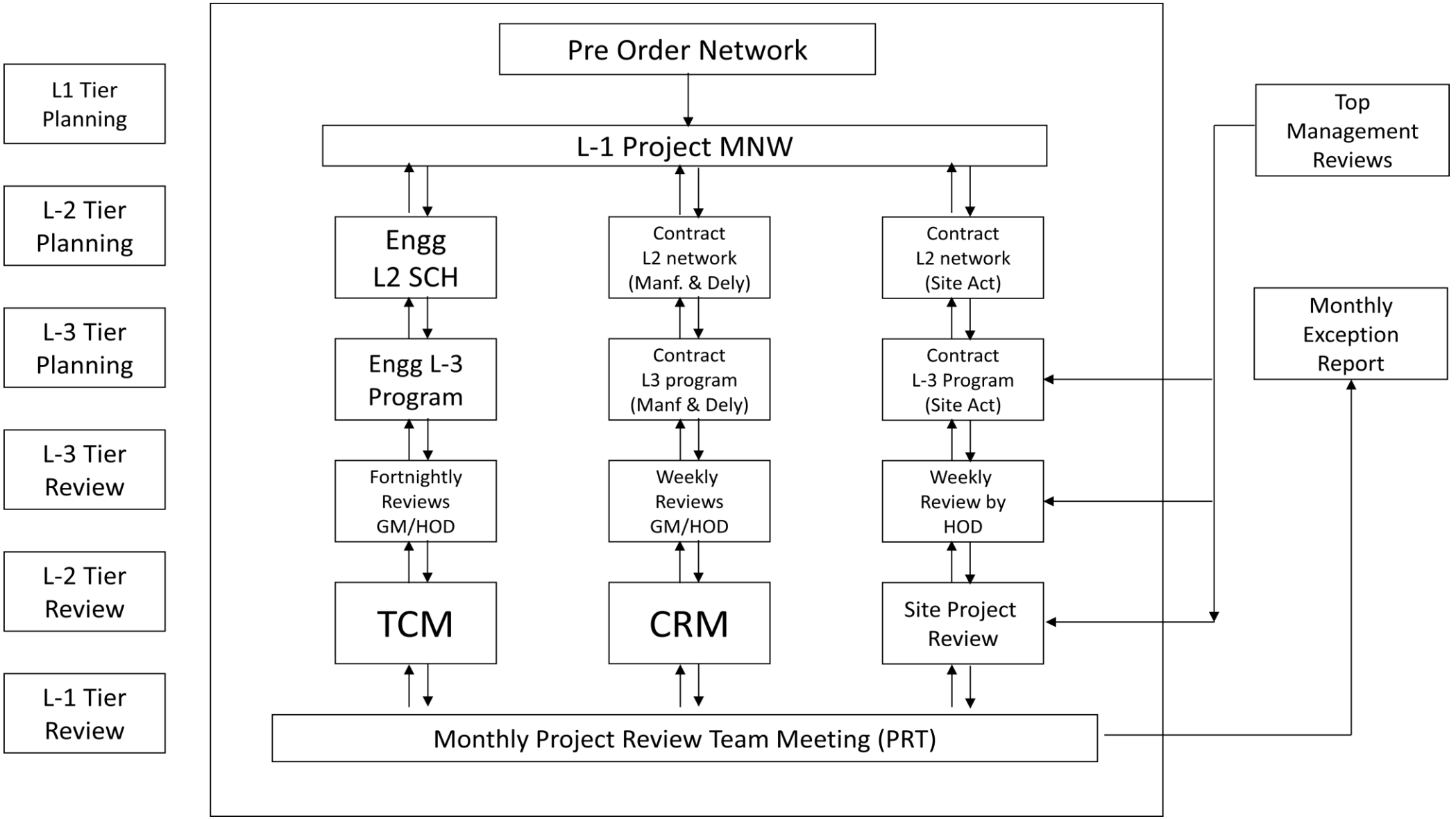
PROJECT MONOTORING &CONTROL REVIEW:

Monitoring is the collection, recoding and reporting of project execution information to PM and other relevant stake holders. Control uses the monitored data and information to bring actual performance into agreement with the plan.

1.Schedule: Is the project is moving on time? Or how long it is going to take and what actions are being taken to bring on time?

2.COST: Whether the Project is going to be completed at budgeted cost? How much did we spent at this stage of project against the target pl

3.. Functionality/SCOPE: Do the project deliverables covering all the Scope of the project? Any change / deviation?


L1 Tier Planning
L-2 Tier Planning
L-3 Tier Planning
L-3 Tier Review
L-2 Tier Review
L-1 Tier Review
Pre Order Network
L-1 Project MNW
Engg L2 SCH
Engg L-3 Program
Fortnightly Reviews GM/HOD
TCM
Contract L2 network (Manf. & Dely)
Contract L3 program (Manf & Dely)
Weekly Reviews GM/HOD
CRM
Contract L2 network (Site Act)
Contract L-3 Program (Site Act)
Weekly Review by HOD
Site Project Review
Monthly Project Review Team Meeting (PRT)
Top Management Reviews
Monthly Exception Report

Monitoring & Control.

Stage authorities in line with approved Planning & monitoring of Engineering, Contracts, Quality and Inspection, dispatch of equipments, Erection and Commissioning activities continuously at various stages and timely feedback to L-2 or agreed L-3 is corner stone for project success. In this regard following steps can be followed.

- Review of engineering issues weekly and monthly by project engineering.
- Review of engineering issues by Project Engineering, associates and site (EIC&TS) every month through TCM (Technical Committee Meetings).
- Review of engineering issues at project site by EIC and associates for site requirements.
- Review of readiness of equipments & materials by corporate contracts weekly for various packages.
- Reviewing readiness of equipments & materials by corporate contract, site EIC & associates every month through CRM.
- Review of site works by EIC with associates during every week
- Review & monitoring of site works by EIC, associates & Project Head every month.
- Review of inspection & clearance of material & equipment at corporate, regional & site project levels.
- Site quality audits during months for each package with EIC, FQA & associates.
- Review of exception reports of FQA, RIO, by Project Head, and Regional Head & Corporate Quality Assurance.
- Monthly review of engineering, contracts, quality & inspection issues and progress of site works by project head in association with EIC, TS, corporate engineering, corporate & site quality, corporate & site contracts & forwarding exception & critical issues to regional & corporate heads.
- Review & monitoring of critical issues of the package by corporate HODs in association with Project & regional representatives & associates.
- Review of critical issues/packages by corporate head along with regional and project heads in association with associates.

- Timely projection and decision of critical issues at various levels is the crux of sound project management.
- Forecasting of budget package wise for a period of two years and planning the same up to micro level of monthly/weekly in tune with approved L-2/L-3 network.
- Monthly monitoring of utilization of package budgets by project head along with EIC & finance is essential.
- The Integrated project monitoring network which covers above mentioned inter and intra level progress monitoring is as detailed below.

EVALUATION AND CLOSING OF PROJECT:

The purpose of evaluation is to learn lessons that can help the project team to avoid doing things that cause undesired outcomes and to continue which is helping already. Project auditing is required to have self-control and also satisfaction. At the end of execution phase all required deliverables are constructed and commissioned and operated in a sustained way as stipulated in project Charter or business case and accepted by the customer/owner. The project have achieved the objectives and delivered the business benefits described in business case. Then the project can be formally closed by undertaking the activities.

References:

1. My Practical & Professional Experience" of last 35 years in Project Execution Management with National Thermal Power Corporation (NTPC LTD)
2. Internet
3. Book on The Practical Guide to Project Management. By Christine Petersen, PMP
4. Advanced Project Management by Washington State Department of Transportation.
5. Fundamentals of Project management, Lovely Professional University, Punjab.