

① Project Management Concepts :- Concept and characteristics of a Project, Importance of Project Management.

Ch-2 Project Scheduling : Importance of Project Scheduling, Types, Breakdown Structure and Organization Breakdown Structure - Scheduling Techniques - Gantt Chart and LOB, Network Analysis - CPM / PERT.

Ch-6 Project Life Cycle.

Ch-7 Project Cost - Capital & Operating Costs, Project Life Cycle Costing, Project Cost Reduction Methods.

Ch-8 Project Quality Management : Concept of Project Quality, TQM in Projects, Project Audit.

Process of ensuring that design, plan, implementation & are effective & efficient with purpose objective & its performance by an independent body! → official inspection of organization's accounts, typically by a project management committee.

↓  
Total Quality Management

→ Concept and Characteristics of a Project !.

① Right understanding of the definition and key characteristics of project is of significant information, importance.

② Any project is not just a way to make or do something but it's an opportunity to achieve some desired result by implementing a systematic management approach (for example, producing a product or sharing knowledge.)

③ An individual or organization involved in projects needs to understand how to solve complexity of problems through project management.

What is a Project?

Project is a great opportunity for organizations and individuals to achieve their business and non-business objectives more efficiently through implementing change. Projects help us make desired changes in an organized manner and with reduced probability of failure.

Projects differ from other types of work (e.g. process, task, procedure). Meanwhile in the broadest sense a project is

defined as a specific, finite activity that produces an observable and measurable result under certain preset requirements.

It is an attempt to implement desired change to an environment in a controlled way. By using projects we can plan and do our activities, for example : build a garage, organize a party etc.

A project is a temporary, unique and progressive attempt or endeavor made to produce some kind of a tangible or intangible result (a unique product, service, benefit, competitive advantage, etc). It usually includes a series of interrelated tasks that are planned for execution over a fixed period of time and within certain requirements and limitations such as cost, quality, performance, etc.

**Key Characteristics** :- A project can be characterized by these characteristics :-

→ or a fixed time & implementation:-

- Temporary :- The key characteristic means that every project has a finite start and a finite end. The start is the time when the project is initiated and its concept is developed. The end is reached when all objectives of the project have been met (or has reached a termination state).
- Unique Deliverable(s) :- Any project aims to produce some deliverables which can be a product, service, or some another result. Deliverables should address a problem or need analyzed before project start.
- Progressive Elaboration :- With the progress of a project, continuous investigation and improvement becomes available, and all this allows producing more accurate and comprehensive plans. This key characteristic means that the successive iterations of planning process result in developing more effective solutions to progress and develop projects.

In addition to the listed characteristics, a conventional project is:-

- Purposeful as it has rational and measurable purpose.
- Logical as it has a certain life-cycle.
- Structured as it has interdependencies between its tasks and activities.
- Conflict as it tries to solve a problem that creates some kind of conflict.
- Limited by available resources.
- Risk as it involves an element of risk.

Some examples of a project are:-

- Developing a new project or software.
- Constructing a building or facility.
- Renovating the kitchen.
- Organizing a meeting.
- Implementing a new business process.

## WORK BREAKDOWN : [Work Breakdown Structure - Ch-2]

In organizations, a project is defined as a piece of work that is planned for implementation within a given business environment. This definition lets make a distinction between other pieces of work such as:-

- Program :- A broad, long-term objective that is often decomposed into a series of projects and sub-projects.
- Task :- An identifiable and measurable activity that creates a small unit of work for a related project.
- Work Package :- Division of a project task.

• Work Unit :- Division of work Packages.

Projects along with programme, tasks, work packages and work units are the elements of work breakdown structure or WBS. After WBS is used to determine an activity-based hierarchy of projects, with reference to their deliverables and objectives.

A program includes several or more larger projects. A larger project can be broken down into smaller interrelated sub-projects. Each one can be divided into tasks which in turn are decomposed into interrelated activities or sub-tasks. A task includes a series of smaller goals which are monitored against milestones.

## MANAGING PROJECTS

Project Management is the art of planning, controlling and executing a project in a way that ensures successful delivery of the desired outcome. It is widely used in organizations as a complex of tools for delivering strategic goals and objectives.

The key advantages of using project management within a company's business environment can be described as:-

- Accelerating improvement and strengthening of the company's management through implementing the ideas of participatory management. Projects help involve employees in decision making.
- Adopting systems engineering approach that helps deal with risks effectively.
- Accomplishing specific changes that are linked to the company's strategies.

### Importance of Project Management:-

- (1) Defines a plan and organizes chaos:- Projects are naturally chaotic. The primary function of project management is organizing and planning projects to tame this chaos. A clear path mapped out from start to finish ensures the outcome meets the goals of your project.
- (2) Establishes a schedule and plan:- Without a schedule, a project has a higher probability of delays and cost overruns. A sound schedule is key to a successful project.
- (3) Enforces and encourages teamwork:- A project brings people together to share ideas and provide inspiration. Collaboration is the cornerstone to effective project planning and management.
- (4) Manages resources:- Resources, whether financial or human, are expensive. By enforcing project management disciplines such as project tracking and risk management, all resources are used efficiently and economically.
- (5) Manages Integration:- Projects don't happen in ~~a~~ vacuum. They need to be integrated with business processes, systems and organizations. Integration is often key to project value. Project management identifies and manages integration.
- (6) Controls cost:- Some projects can cost a significant amount of money so on budget performance is essential. Using project management strategies greatly reduces the risk of budget overruns.
- (7) Manages change:- Projects always happens in an environment in which nothing is constant except change. Managing change is a complex and daunting task. It is not optional. Project management manages change.
- (8) Managing Quality - Quality is the value of what we produce. Project management identifies, manages and controls quality. This

results in high quality product or service and a happy client.

⑨ Retain and use knowledge :- Projects generate knowledge & at least they should. Knowledge represents a significant asset for most businesses. Left unmanaged, knowledge tends to quickly fade. Project management ensures that knowledge is captured and managed.

⑩ Learning from failure :- Projects do fail. When they do it is important to learn from the process. Project management ensures that lessons are learnt from project success and failure.

Ch-3 Project Scheduling :- The project schedule is the tool that communicates what work needs to be performed, which resources of the organization will perform the work and the timeframes in which that work needs to be performed. The project schedule should reflect all the work associated with delivering the project on time.

• Importance of Project Scheduling :-

To organize and complete the projects in :-

① proper time ② quality ③ financially responsible manner.

We need to schedule projects carefully.

Effective project scheduling plays a crucial role in ensuring project success. To keep projects on track, we need to set realistic time frames, assign resources appropriately and manage quality to decrease product errors. This typically results in reduced costs and increased customer satisfaction. Important factors include financial, documentation, management and quality assurance.

Financial :- Project scheduling impacts the overall finances of a project. Time constraints require project managers to schedule resources effectively. This is particularly true when resources must have highly specialized skills or when costly materials are required. Completing a project in a short time frame typically costs more because additional resources are generally needed. With accurate project scheduling, realistic estimates and accurate projections prevent last minute orders which drive up costs.

Documentation :- Creating a comprehensive work breakdown structure allows you to create a chart, such as a Gantt chart, that lists the project tasks, shows dependencies and defines milestones. Management consultant Henry Gantt designed this type of chart to show or

graphic schedule of planned work. Its role in business projects is to record and report progress towards project completion. Our project schedule also allows us to assign human resources to the work and evaluate their allocation to ensure that we have the appropriate levels of utilization. We may also develop a program evaluation and review technique chart (PERT chart) to help us analyze project tasks.

Management :- Effective project managers conduct regular meetings to get status reports. They use project scheduling meetings to check in with their team members and prevent costly misunderstandings. These regular meetings ensure that work flows from one process to the next and that each team member knows that he needs to do to contribute the project's overall success.

Quality :- Project scheduling ensures one task gets completed in a quality manner before the next task in the process begins. By assuring that quality measures meet expectations at every step of the way we ensure that managers and team members address problems as they arise and don't wait until the end. No major issues should appear upon completion because you've established quality controls from the very beginning of the scheduling process. Effective project managers understand that ensuring quality control involves managing risks and exploiting opportunities to speed up the schedule when possible to beat the competition and achieve or maintain a competitive edge with a more reliable product.

### ORGANIZATION BREAKDOWN STRUCTURE :-

Organization breakdown structure or OBS is a hierarchical model describing the established organizational framework for project planning, resource management, time and expense tracking, cost allocation, revenue/profit reporting, and work management.

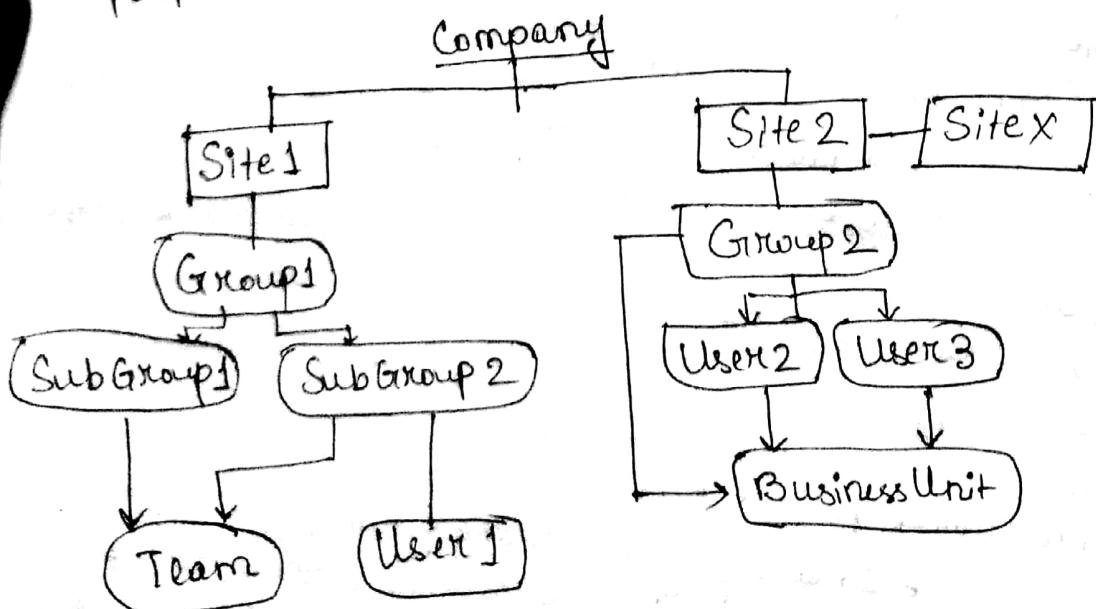
Work Breakdown Structure (WBS) captures all elements of projects in an organized fashion. Breaking down large, complex projects into smaller project pieces provides a better framework for organizing and managing current and future projects. WBS facilitates resource allocation, task assignment, measurement and control of project cost and billing. The WBS is utilized at the beginning of the project to define scope, identify cost centres

and is the starting point to developing project plans/Gantt charts.

- (a) The OBS groups together similar project activities or "work packages" and relates them to the organization's structure.
- (b) OBS is used to define the responsibilities for project management, cost reporting, billing, budgeting and project control.
- (c) The OBS provides an organizational perspective rather than a task-based perspective of the project.
- (d) The hierarchical structure of the OBS allows the aggregation of project information to higher levels.
- (e) When project responsibilities are defined and work is assigned, the OBS and WBS are connected providing the possibility for powerful analytics to measure project and workforce performance at a very high level (example business unit performance) or down to the details (example user work on a task).

### To develop an Organization Breakdown Structure :-

- ① Draw of the entire organization as a hierarchy,
- ② Specify functional (where cost for the work the user does fits allocated to) and approval (who approves the work the user performs and any leave time approvals) groups for every user,



Sample of OBS

## Scheduling Techniques:- (Gantt Chart and LOB)

Project scheduling is concerned with the techniques that can be employed to manage the activities that need to be undertaken during the development of a project.

Scheduling is carried out in advance of the project commencing and involves:-

- Identifying the tasks that need to be carried out.
- estimating how long they will take
- allocating resources (mainly personnel).
- scheduling when the tasks will occur.

Once the project is underway control needs to be exerted to ensure that the plan continues to represent the best prediction of what will occur in the future:-

- based on what occurs during the development,
- often necessitates revision of the plan.

Effective project planning will help to ensure that the systems are delivered:-

- within cost
- within the time constraint
- to a specific standard of quality

Two project scheduling techniques will be presented, the Milestone Chart (or Gantt Chart) and the Activity Network.

Milestone Charts:- Milestones mark significant events in the life of a project, usually critical activities which must be achieved on time to avoid delay in the project.

Milestones should be truly significant and be reasonable in terms of deadlines (avoid using intermediate stages):-

Examples:- installation of equipment, completion of phases, file conversion, cutover to the new system

Gantt Charts:- A Gantt chart is a horizontal bar or line chart which will commonly include the following features:-

- activities identified on the left hand side.

(a) activities identified on the left hand side.

(b) time scale is drawn on the top (or bottom) of the chart.

- (c) a horizontal open oblong or a line is drawn against any activity indicating estimated duration.
- (d) dependencies between activities are shown.
- (e) at a review point the oblongs are shaded to represent the actual time spent (an alternative is to represent actual and estimated by 2 separate lines).
- (f) a vertical cursor (such as a transparent ruler) placed at the review point makes it possible to establish activities which are behind or ahead of schedule.

### Activity Networks: [Network Analysis]: CPM/PERT)

The foundation of the approach came from the Special Projects office of the US Navy in 1958. It developed a technique for evaluating the performance of large development projects, which became known as PERT - Project Evaluation and Review Technique. Other variations of the same approach are known as the CPM (critical path method) or CPA (critical path analysis).

The heart of any PERT chart is a network of tasks needed to complete a project, showing the order in which the tasks need to be completed and the dependencies between them. This is represented graphically.

EXAMPLE OF ACTIVITY NETWORK: The diagram consists of a number of circles, representing events within the development lifecycle, such as the start or completion of a task, and lines, which represents the tasks themselves. Each task is additionally labelled by its time duration. Thus the task between events 4 and 5 is planned to take 3 time units. The primary benefit is the identification of the critical path.

The critical path = total time for activities on this path is greater than any other path through the network  
 (Tasks on the critical path needs to be monitored carefully).  
 (delay in any task on the critical path leads to a delay in the project).

The technique can be broken down into 3 stages:-

- (1) Planning:- (a) Identify tasks and estimate duration of times,  
 (b) arrange in feasible sequence,  
 (c) draw diagram.

## (2) Scheduling :-

(a) establish timetable of start and finish times.

## (3) Analysis:-

(a) establish float

(b) evaluate and revise as necessary.

extension of Gantt chart

Scheduling Techniques:- LOB (Line of Balance) [output can be graphically compared with project plan]

Line of Balance (LOB) is a management control process for collecting, measuring and presenting facts relating to Time, cost and accomplishment — all measured against a specific plan. It shows the process, status, background, timing and phasing of the project activities, thus providing management with measuring tools that help:-

1. Comparing actual progress with a formal objective plan.
2. Examining only the deviations from established plans, and gauging their degree of severity wrt the remainder of the project.
3. Receiving timely information concerning trouble areas and indicating areas where appropriate corrective action is required.
4. Forecasting future performance.

The LOB itself is a graphic device that enables a manager to see at a single glance which activities of an operation are "in balance" — i.e., whether those which should have been completed at the time of the review actually are completed and whether any activities scheduled for future completion are lagging behind schedule. The LOB chart comprises only one feature of the whole philosophy which includes numerous danger signal control for all the various levels of management concerned.

To do LOB, the following is needed:-

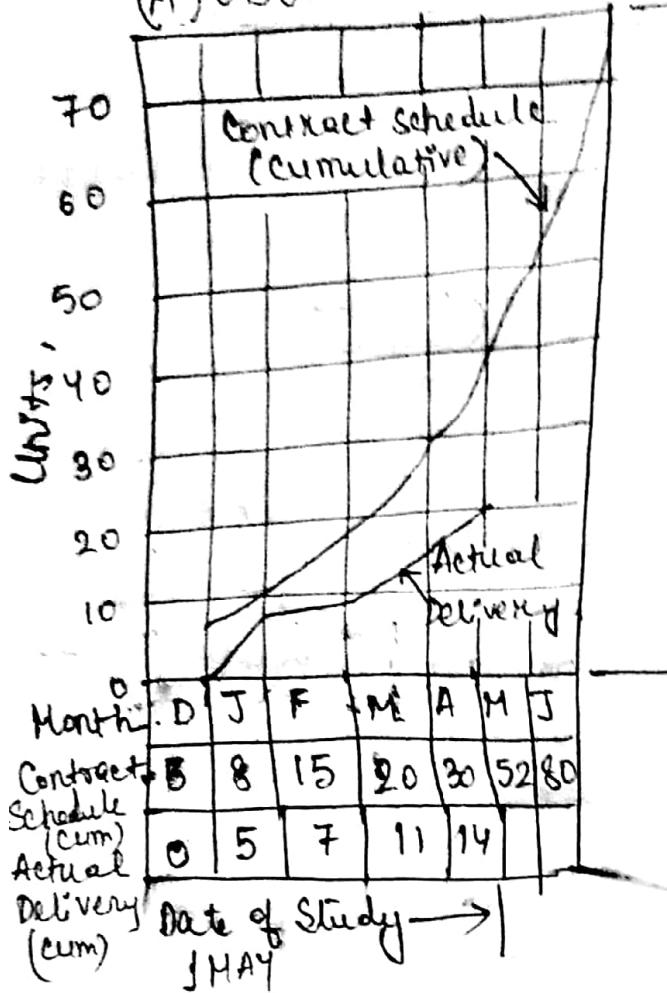
1. A contract schedule, or objective chart

2. A production plan or lead-time chart for the production process itself.

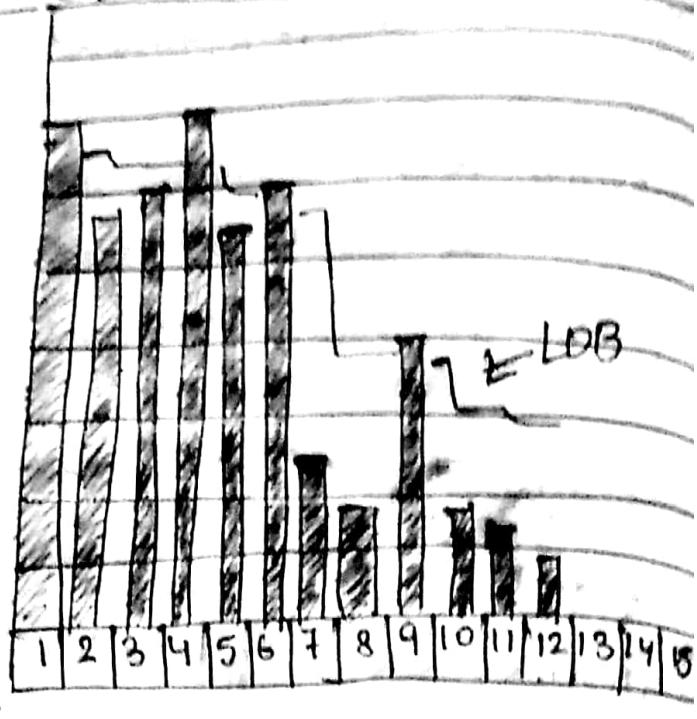
3. Control points cumulative inventories.

4. A program status chart on which to plot LOB and the cumulative quantities of units that have passed through the control points of the assembly / production process.

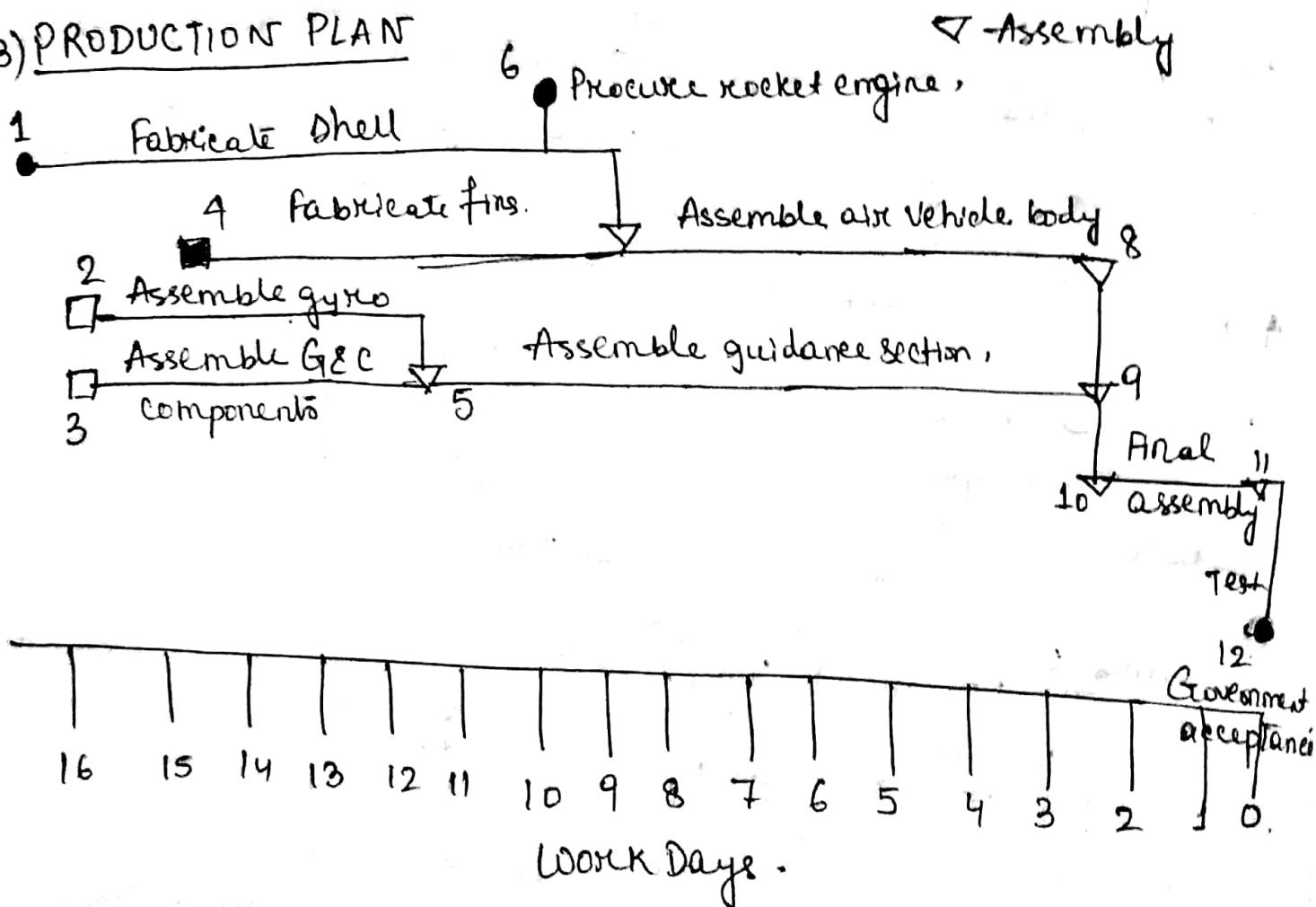
### (A) OBJECTIVE



### (C) PROGRAM STATUS



### (B) PRODUCTION PLAN



The Project Life Cycle is the standard process by which teams achieve project success. Lesser known but growing in popularity, the Professional Services Life Cycle exists because the standard project life cycle does not fit everyone's needs. The standard project life cycle works for some project managers, but professional services need more robust process. In professional services, unlike other businesses, their product is their people. That is, professional services lend their expertise to other companies in exchange for profit. Due to the constant involvement of clients, professional services require a unique project life cycle that involves a recurring feedback loop to ensure project success.

### "Standard" Project Life Cycle:-

According to the Project Management Institute, the project life cycle is critical for any managers hoping to deliver projects to clients successfully.

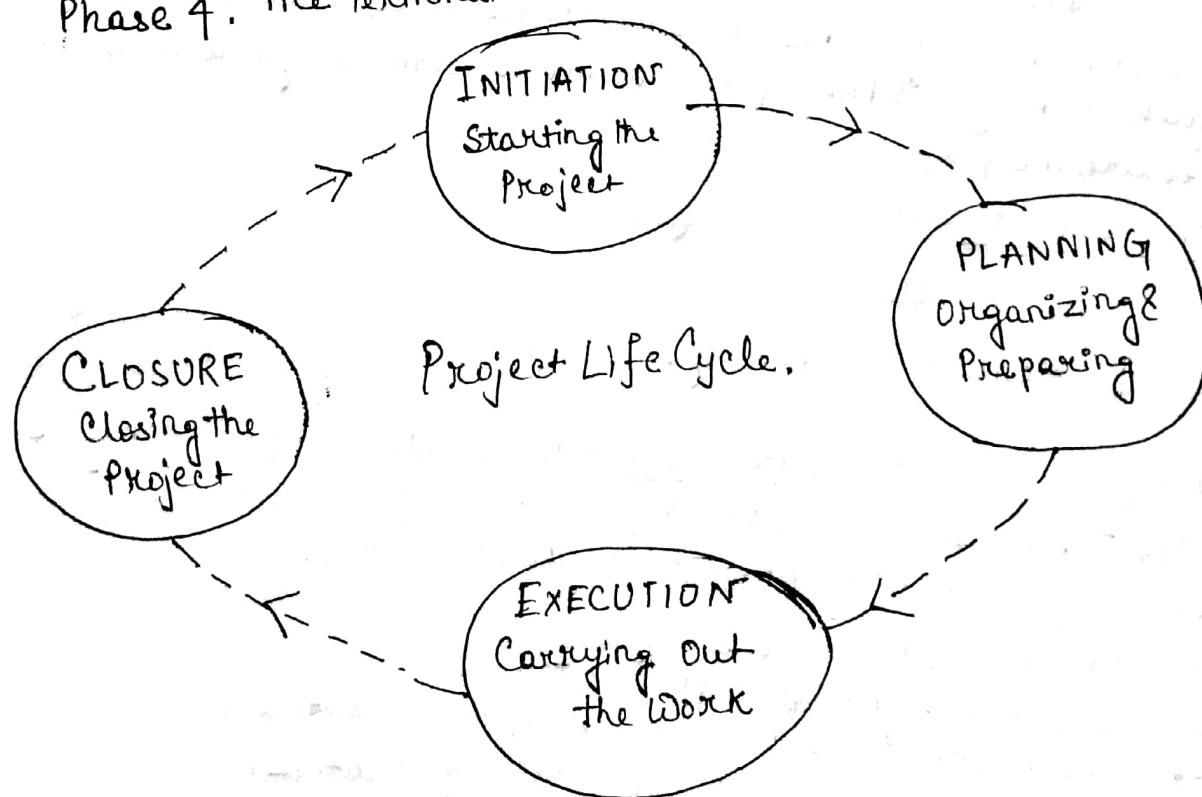
### The Project Phases Involved:-

Phase 1: The Conceptualization Phase

Phase 2: The Planning Phase

Phase 3: The Execution Phase

Phase 4: The Termination Phase



Phase 1: The Conceptualization Phase:- This can also be referred to as the 'Initiation Phase' and is the ~~start~~ starting point of any project or idea. For the Conceptualization Phase to begin, a strategic need for the project or service must be recognized by upper management.

The Conceptualization Phase typically involves:-

- Creation of the statement of work (SOW)
- Presenting the business case.
- Creation of a business contract.

Phase 2: The Planning Phase:- The second phase of the project management lifecycle is referred to as the Planning Phase.  
After Launch of the Project → formal set of plans are set → Initial goals are outlined → then its established.

The Planning Phase typically involves:-

- Determining resource availability.
- Creating a project budget.
- Beginning to allocate tasks to certain resources.

Phase 3: The Execution Phase:- The third phase is labelled Execution. This is when the actual work of the project is performed. Required materials, tools, and resources are transformed to reach the project goals. During this phase, performance is continually measured, to ensure the project is successful.

The Execution Phase typically involves:-

- Strategic Planning,
- Implementing planning.

Phase 4: The Termination Phase:- The fourth and final phase is called Termination Phase, also referred to as Project Closure. This phase begins once the project has been completed.

The Termination Phase typically involves:-

- The disbandment of the project team.
- Personnel and tools are reassigned to new duties.
- Resources released back to parent organization.
- Project transferred to intended users.

## Professional Services Project Life Cycle:-

- The key difference between the standard project life cycle and the Professional services project life cycle is that the standard life cycle lacks fluidity and feedback between projects.
- (1) The standard project life cycle model consists of four very distinct project phases that have deliberate start and end points. That is, once a project is completed, tools are set archived, resources are sent to new projects, the job is closed out, and then the entire process starts over.
  - (2) The standard linear life cycle is not adequate for the complexity of projects in professional ~~and~~ services. The reason this model is inadequate is because it fails to account for the human capital component that exists at professional service organizations.

Due to human capital component that exists at professional service organizations, there must be a holistic, infinite and cyclical life cycle that exists throughout the entirety of the project. Human capital refers to the fact that professional services rely on resource expertise ~~for~~ for profits. Therefore it is needed for clients and resources to sync and agree on goals, processes and deliverables throughout the ~~the~~ project. Trying to achieve project success without constant feedback or communication between client and resource would be impossible. This is why professional services require a life cycle that includes time to analyze, reflect, and forecast accordingly.

## Professional Services Life Cycle VS. Standard Project Life Cycle:-

The standard project life cycle has endured throughout the years despite the growing complexities surrounding project management. However, the complexities ~~involve~~ involved in PSO projects have reached a critical point where a new life cycle model is required for success. Someone who is part of a professional services team who follows the standard project life cycle runs the risk of making the same mistakes during the following project. This is because there is no feedback loop or learning from past mistakes between completion of one project and beginning of next. (Also resuming one project phase is also not available in standard version)

- Why does a Professional Services Organization require a new life cycle for project management?
- ① Professional services teams something more tailored to their needs.
  - ② Services organizations typically operate on a cycle.
  - ③ Human Capital.
  - ④ Constantly selling services.

What are the phases in the Professional Services Project Life Cycle?

The Project Phases are:-

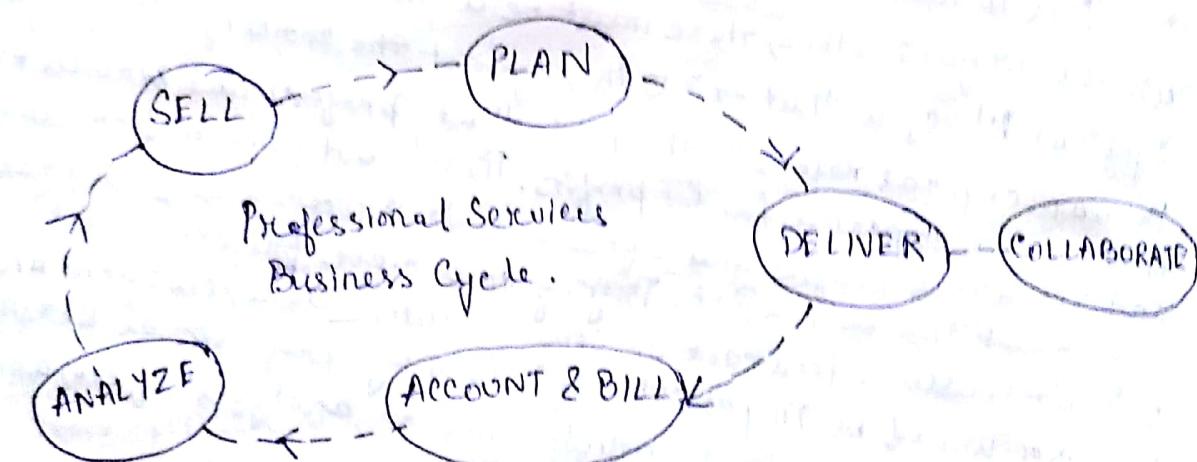
Phase 1: The Sell Phase

Phase 2: The Plan Phase

Phase 3: The Deliver Phase

Phase 4: The Account & Bill Phase

Phase 5: The Analyze Phase.



Phase 1: The Sell Phase → The Sell Phase begins when the professional services are first demanded by clients. Here the complexities associated with the projects are handled. Members need to be more forward-thinking.

Steps involved are:-

- ① Opportunity management
- ② Project Scoping
- ③ Bid management
- ④ Contract negotiations,
- ⑤ forecasting

Advantages :-

- ① Neatened visibility into project delivery.
- ② Increased and meaningful communication between teams.
- ③ Enhanced customer relations.
- ④ Ability to sell more services at a time.

Phase 2 : The Plan Phase :- It is focussed on scheduling and staffing projects at a professional services organization. The Phase is initiated once <sup>a</sup> project contract has been signed and resources are being allocated across tasks. It differs from the PLANNING PHASE of standard lifecycle. Here an extensive soft resource planning is needed before actual or proper allocation of tasks.

### Steps Involve

- ① Project plan definition
- ② Resource Planning
- ③ Resource scheduling
- ④ Task assignment.
- ⑤ Timeline development
- ⑥ Milestones
- ⑦ Capturing expectations
- ⑧ Measures of success.

### Advantages

- ① Increased accuracy with resource allocation, budgeting and timelines.
- ② Insights into past projects to learn from successes or failures.
- ③ Resource manager visibility into where resources are currently allocated.
- ④ Reduced wasted costs once associated with inaccurate resource and project planning.

Phase 3 : The Deliver Phase :- It is referred to as the Execution phase of the project depending upon the plan that was previously developed. Risk management should be involved that might be required while execution of the project, finally tasks are completed.

### Steps

- ① Executing the Plan
- ② Completing the tasks.
- ③ Managing risk.

### Advantages

- ① By managing risk during the project, costs associated with conflicts are greatly reduced.
- ② The visibility into a project's status allows quicker delivery times, resulting in more satisfied clients and customers.
- ③ Having the ability to manage change while the project is being executed reduces the risk of a failed, over budget, or late project.

- ④ The team is more efficient when they know all the potential variables associated with any given project.

Phase 4 : Account & Bill :- This phase is dedicated to recognizing revenue and financial opportunities. This unique phase does not exist in standard lifecycle.

The Standard Life Cycle It goes directly from execution to termination phase. In Professional services Life Cycle the profit and investment amounts must be taken care of.

### Steps

- ① Project Accounting
- ② Contract management
- ③ Invoicing
- ④ Collection

### Advantages

- ① Ability to constantly monitor the status of the project's budget.
- ② Ample time to identify areas of financial opportunities or extra profit.
- ③ Invoices are accurate, timely, and are based upon actual hours worked rather than guessimates.

### Phase 5: The Analyze Phase

This is the client feedback phase where any further betterment of the project can be included. After this phase the project may terminate.

### Steps

- ① Analyzing key metrics
- ② Calculating margins.
- ③ Measuring utilization
- ④ Forecasting people, resources, tools
- ⑤ Forecasting trends and future needs.

### Advantages

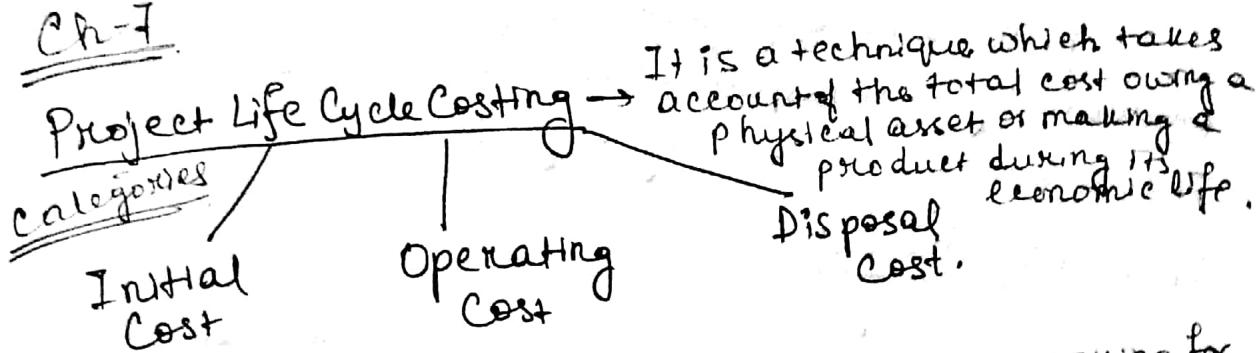
- ① Ample time to reflect on project success and failures and better plan for future clients and projects
- ② Ability to use key performance metrics to track resource efficiency from the project inception to completion
- ③ Using metrics to enhance process & practice
- ④ Visibility into utilization rates and ability to adjust for cost-efficiency.

### Advantages of Professional Services Life Cycle:-

- ① Helps professional services teams be more efficient and more profitable.
- ② Helps with organization.
- ③ forces communication
- ④ Emphasizes reporting and analyzing past projects.

Used By:- Project Managers & Resource Managers,

Ch-7



It includes cost associated with acquiring, using, caring for and disposing of physical asset include studies, research design, development, production, maintenance, replacement and disposal as well as support + training and operating cost generated by acquisition, use, maintenance & replacement of permanent physical asset.

Initial Cost The cost which is incurred initially for a particular project i.e. if asset is purchased by a supplier then the following initial costs are:-

- (i) - acquisition
- installation
- commission
- obtain + hire
- obtaining spec.

- (ii) - recruitment and training of operation staff and maintenance engineers.
- (iii) - purchase of ancillary maintenance equipments.

Operating Cost: The operating cost for an item of capital equipment includes not just operator cost and also maintenance cost to

support services such as:-

- material handling; - quality control; - continued training

- recruitment for new staff and so on.

Disposal Costing :- Disposal costing is significant for a fixed asset because the asset must be demolished and removed and the site made good for another use. These cost may be upset by the disposal value of the asset.

Example → A machine was bought for Rs 5000/- now it depreciated at a cost of Rs 500/- each year. When sold after 5 years its price was  $\text{Rs } [5000 - (500 \times 5)] / - = \text{Rs } 2500 ..$

Initial Cost

Disposal Cost (low)

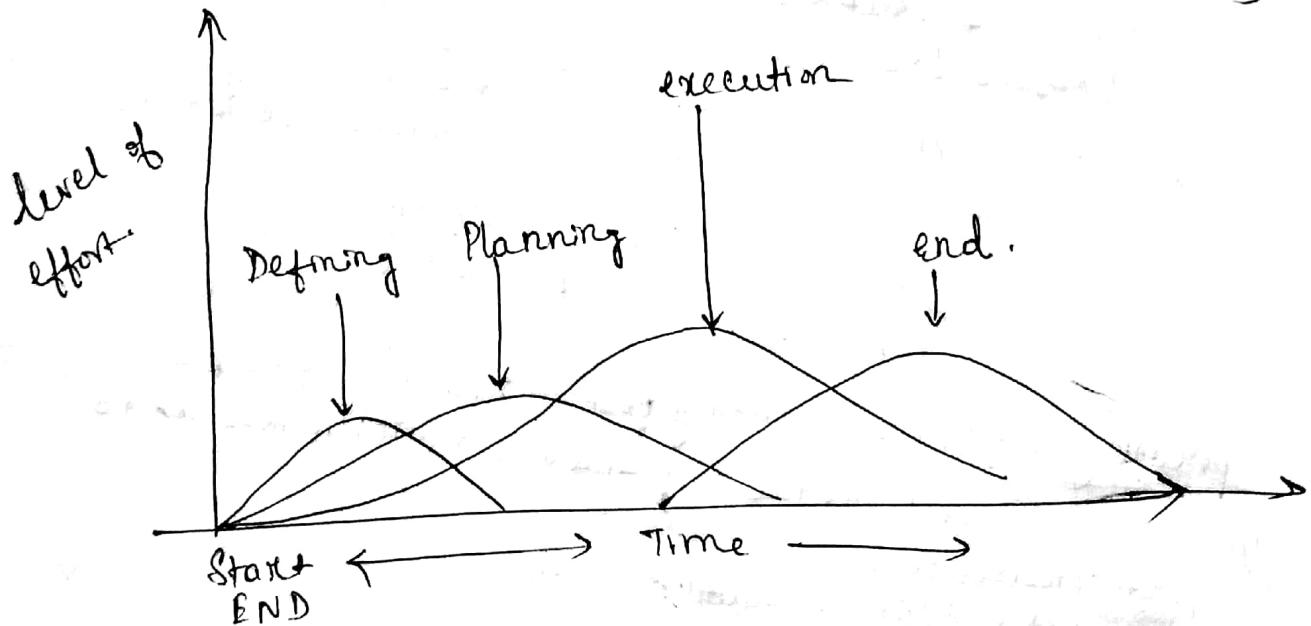
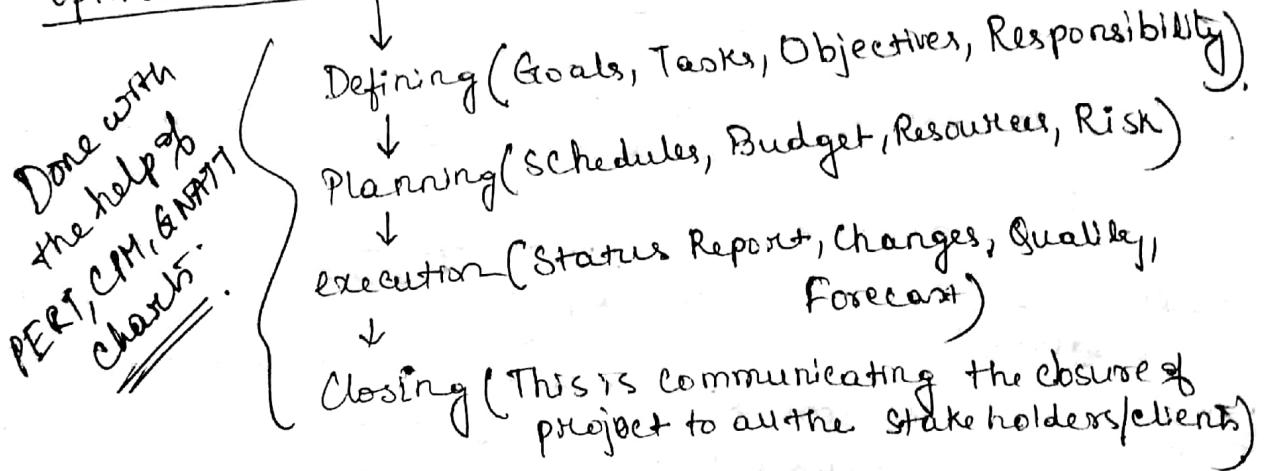
OR A building is bought

Maintenance cost needed to keep the machine at 9000 state -

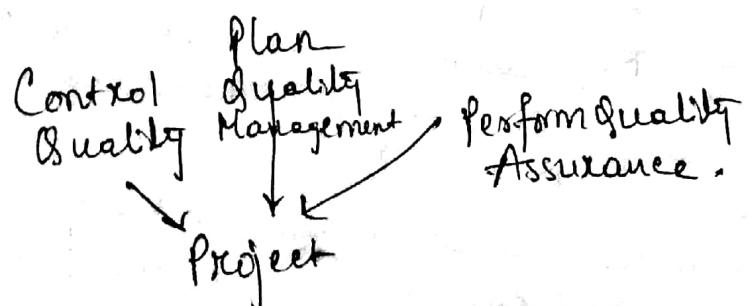
## Project Cost Reduction (Optimization) Methods:-

Optimization of project life cycle cost is to manage the productivity with respect to the costs, resources, situation. This is through the following stages :-

### Optimization Process:-



## Ch-8 Project Quality Management



Intern

Short

- (a) Stat
- (b) Disc
- (c) Busi
- (d) T&T
- (e) Def
- (d) Net

② Differ

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## Internal Questions:- UNIT-I

### Short Questions :- (5 marks)

- (a) State differences between PERT and CPM.
- (b) Discuss the role of project audit.
- (c) What are limitations of Gantt chart [G.N. or Gantt Chart].
- (d) TQM - def, essential elements, benefits.
- (e) Def → free float, slack, critical path.
- (f) Network diagram.

### ② Difference between PERT and CPM

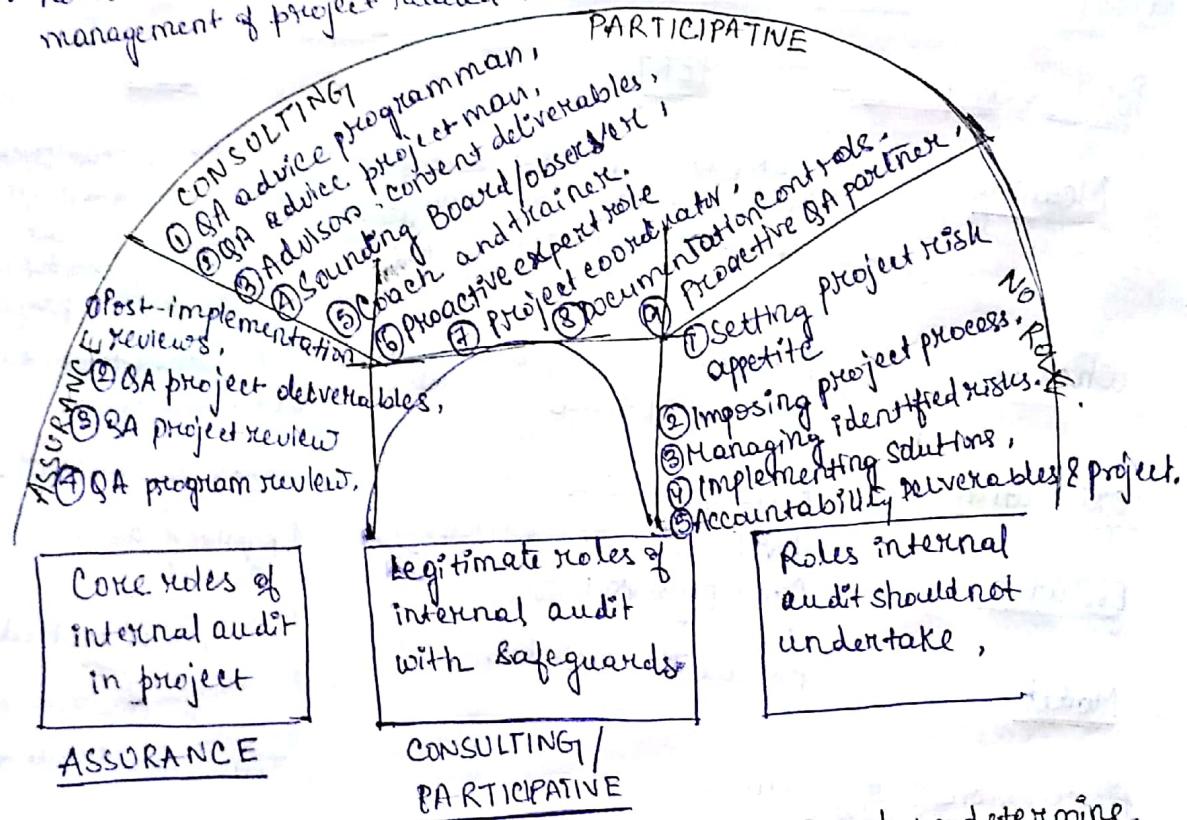
<u>Points of Comparison</u>	<u>PERT</u>	<u>CPM</u>
<u>Meaning</u>	PERT is a project management technique, used to manage uncertain activities of a project.	CPM is a statistical technique of a project management that manages well defined activities of a project.
<u>What is it?</u>	A technique of planning and control of time.	A method to control cost and time.
<u>Orientation</u>	Event-Oriented Evolved as Research & Development Project.	Activity-oriented Evolved as Construction Project
<u>Evolution</u>	Probabilistic Model.	Deterministic Model.
<u>Model</u>	Time	Time-cost trade-off.
<u>Focuses on</u>	Three time estimates	One time estimate.
<u>Estimates</u>	High precision time estimate	Reasonable time estimate.
<u>Appropriate for</u>	Unpredictable activities	Predictable Activities.
<u>Management of</u>	Non-repetitive nature	Repetitive nature.
<u>Nature of jobs</u>	No differentiation	Differentiated.
<u>Critical and non-critical activities</u>	Research and Development Project.	Non-Research projects like civil construction, ship building etc.
<u>Suitable for</u>	also Non-linear.	non-linear.

## Role(s) of an auditor in project :-

In order to gain more insight into the potential roles that the auditor can play in projects → the roles can be divided into 3 groups:-

- ① Assurance roles
- ② Consulting roles
- ③ Participative Roles.

- The core roles of internal audit:- traditional assurance roles such as project reviews.
- Legitimate roles with safeguard:- consulting and participative project roles that can be performed by the internal auditor if certain preconditions are met.
- Roles that should not be undertaken by internal audit such as the management of project related risks.



(1) A project management audit is an examination designed to determine the true status of work performed on a project and its conformance with the project statement of work, including schedule and budget constraints.

(2) It is an independent structured assessment conducted by a competent examiner.

(3) It provides insight into the work needed to meet project objectives and the adequacy of the schedule and budget to do so. In addition, it can illuminate mistakes that can cause project failure and thus can trigger timely corrective action.

Project management audits are compared and contrasted with normal supervision of project management, with reviews conducted for the customer and with financial audits.

## Gantt Charts:-

Def:- A Gantt chart is a type of bar chart that illustrates a project schedule. Modern Gantt charts show dependency relationships between activities and current schedule status.

In a progress Gantt chart, tasks are shaded in proportion to the degree of completion - e.g. task which is 60% complete would be 60% shaded, starting from the left. A vertical line is drawn at the time index when the progress Gantt chart is created, and this line can be compared with shaded tasks. If everything is on schedule, all task portions left of the line will be shaded, and all task portions right of the line will not be shaded. This provides a visual representation of all the project tasks.

linked Gantt charts: Linked Gantt charts contain lines indicating the dependencies between tasks. However, linked Gantt charts quickly become cluttered in all but the simplest cases. Critical path network diagrams are superior to visually communicate the relationships between tasks, however, Gantt charts are often preferred over network diagrams because Gantt charts are easily interpreted without training whereas critical path diagrams require training to interpret.

Gantt charts have been long used by project managers in order to visualize the project schedules and task dependencies. Every action item and milestone are visually represented in a Gantt chart. The start times and end times of each task are represented on the chart, and a box runs between the two dates depicting the duration of each time.

Benefits of Gantt Charts include:-

- Clarity, communication, motivation, time management and more.
- Because Gantt charts are considerably used, not many questions arise.

Gantt Chart Limitations:-

As much as Gantt charts have benefits to project management, they are limited.

(b) The first limitation of a Gantt chart is that it relies upon the work breakdown structure to have already been constructed - and for it to be complete. Should there be major tasks missing from the WBS, or should a major milestone be missing, the Gantt chart will not tell us. In fact, if we are attempting to create the WBS at the same time we are constructing the Gantt chart, we run the risk of having to recreate the entire project schedule if someone is left out, a

duration is mis-estimated, or another mistake has been missing.

(b) Second a limitation of the Gantt chart is that it only works well with smaller projects, once the durations and tasks stretch past one page the Gantt chart begins to lose its functionality, part of the reason this is understandable is that if the chart is more than one page, it will become difficult to view the chart on a computer screen. Moreover the Gantt chart does not do well to depict complexities. For example, if a milestone has multiple tasks required for its completion, and each of those tasks has sub-tasks, the Gantt chart cannot depict this well. For this reason project managers should not rely solely upon the Gantt chart for project management needs.

(c) Finally, Gantt charts do not do well with dealing with project triple constraints. The triple constraints are; time, cost and scope. The cost of a project is not depicted on a Gantt chart. Also, the full scope of a project cannot be depicted in a Gantt chart. No matter how detailed the Gantt chart is, the full complexity is not depicted. This is because the main focus of the Gantt chart is time.

### Functional Disadvantages :-

Because of these limitations, Gantt charts are a disadvantage whenever a project manager and her team rely too heavily upon the Gantt chart for their project management needs. The Gantt chart should be used as tool along with other methods including cost management software and a formal project plan. By seeing a Gantt chart as just one of the tools used with proper project planning, the limitations are balanced by the strengths of other tools.

Gantt charts are also a disadvantage whenever they are seen as immutable. Because project requirements may change over time and because project managers must be able to adapt to the situation and circumstance, the Gantt chart should be seen only as an outline that can be changed as project needs change. For example, if during the project completion phase, an issue is brought to attention that requires problem-solving, flexible project managers can add it to the project timeline and update the Gantt chart.

Finally, Gantt charts are a disadvantage whenever much information needs to be depicted for a complex project. Gantt charts do not show well what resource has been assigned to which project task. Nor do they depict multiple scheduling possibilities or indicate intricate task-dependencies. Any time there is a complex project, the Gantt chart will showcase its disadvantages strongly.

## ② Definitions:-

(i) Free float:- The term float is used to express the flexibility. The flexibility can be at the project level or at the activity level.

(1) During a schedule network diagram:- activity can be either predecessor or successor activity corresponding to the dependent activity we refer to

- Predecessor - An activity that logically comes before a dependent activity in a schedule.

- Successor - A dependent activity that logically comes after another activity on a schedule.

(2) Critical Path:- The critical path is the sequence of activities that represents the longest path through a project, which determines the shortest possible project duration.

- All activities on the critical path are called CRITICAL PATH ACTIVITIES.

(3) Schedule Network Diagram - is a graphical representation of the logical relationships, also referred to as dependencies, among the project schedule activities.

(4) PDM (Precedence Diagramming Method) - A technique used for constructing a schedule model in which activities are represented by nodes and are graphically linked by one or more logical relationships to show the sequence in which the activities are to be performed.

Note, floats are of 2 types → Total float  
→ Free float.

Total float:- The total amount of time that a schedule activity can be delayed or extended from its early start date.

without delaying the project finish date or violating a schedule constraint.

Thus it is talking about flexibility we have at project level. Now in a network diagram, we can have multiple paths to reach the end. So this float talks about flexibility one path has as compared to others.

Simple formula to calculate total float is our usual formula i.e.

$$[LS(\text{late start}) - ES(\text{early start})] \text{ or } [LF(\text{Late finish}) - EF(\text{Early Finish})]$$

Free float :- The amount of time that a schedule activity can be delayed without delaying the early start date of any successor on violating a schedule constraint.

Simple formula of Free float

$$ES(\text{of successor}) - EF(\text{current activity})$$

Total float :-

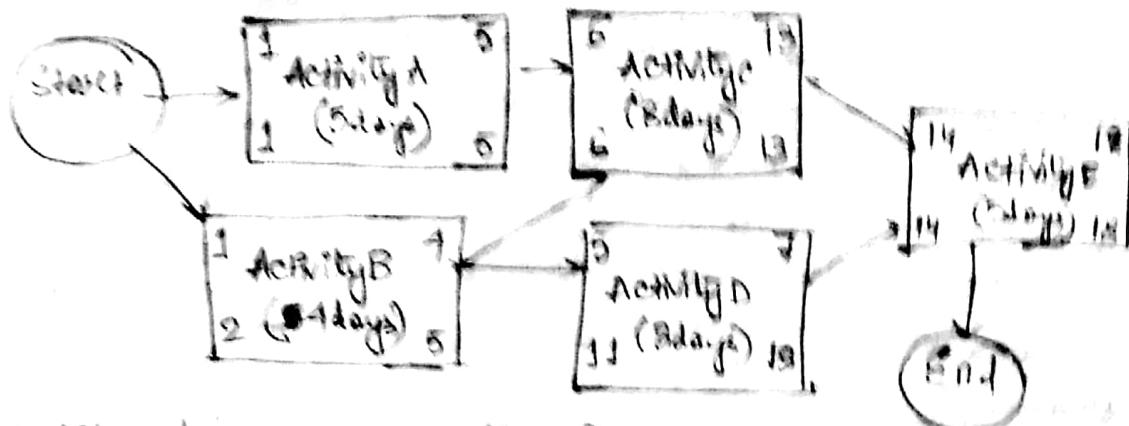
- (a) Calculated at path level of activities.
- (b) Defines flexibility of a path wrt. project end date.
- (c) formula  $LS - ES$  or  
 $LF - EF$ .
- (d) Can come into existence if network diagram has multiple path and there are activities which are not there on Critical Path.

Free float :-

- (a) Calculated at activity level.
- (b) Defines flexibility of activity wrt. its successor state.
- (c) Formula  $ES(\text{of successors}) - EF(\text{of current activity}) - 1$ .
- (d) Can come into existence if successor is having more than one activity converging on it or the successor activity converging on is having a constraint applied.

Independent float :- That portion of total float within which an activity can be delayed for the preceding activities. It is computed for an activity by subtracting the tail event slack from its total float.

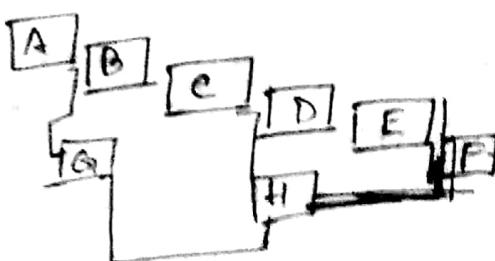
### Example:



- What does the diagram depict?

- ① There are 3 paths ACE, BCE & BDE. ACE will be the critical path with total float 0 and the critical path length 18.
- ② Activities A, C & E will be having even free float 0 (no kind of float/flexibility for critical path activities)
- ③ Total float for B is 1 (LF-EF OR LS-FS) & activity D is 6.
- ④ Out of B & D which activity can have free float? Activity B is not satisfying free float definition i.e. B can be delayed w.r.t. C ( $6-4-1=1$ ) but not w.r.t D ( $5-4-1=0$ ). So if "ANY" part of the definition is not satisfying i.e. B can't be delayed without impacting ANY successor of it.
- ⑤ Free float for activity D is  $14 - 7 - 1 = 6$ . This activity satisfies the definition along with point 4 and also there is no dependency/constraint in example which can hinder activity D having flexibility!

• SLACK:- In project management, float or slack is the amount of time that a task in a project network can be delayed without causing a delay to subsequent tasks ("free float"), project completion date ("total float").



## TQM : Total Quality Management.

Total Quality management (TQM) consists of organization-wide efforts to install and make permanent a climate in which an organization continuously improves its ability to deliver high-quality products and services to customers. While there is no widely agreed upon approach, TQM efforts typically draw heavily on the previously developed tools and techniques of quality control. [TQM enjoyed widespread attention during the late 1980s and early 1990s before being overshadowed by ISO 9000, Lean manufacturing and Six Sigma].

### Features :-

The key concepts in the TQM effort undertaken by ~~to~~ include;

- (a) Quality is defined by customer requirements.
- (b) Top management has direct responsibility for quality improvement.
- (c) Increased quality comes from systematic analysis and improvement of work processes.
- (d) Quality improvement is a continuous effort and conducted throughout the organization.

### Elements of TQM

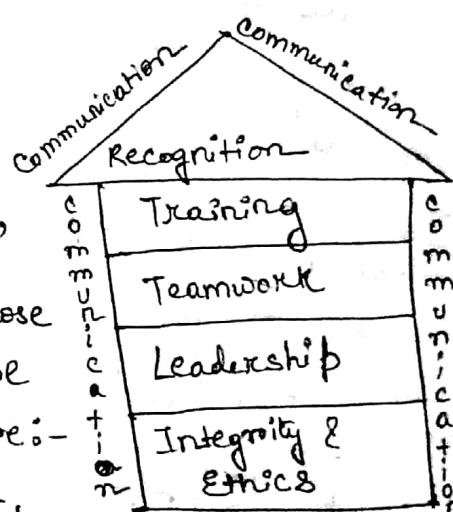
#### ~~Objectives~~ (b) Integrity

There are eight key elements comprising TQM → ethics, integrity, trust, training, teamwork, leadership, recognition, communication.

#### Key Elements :-

TQM has been coined to describe a philosophy that makes quality the driving force behind leadership, design, planning, and improvement initiatives.

For this, TQM requires the help of these eight key elements. These elements can be divided into 4 groups. The groups are:-



- ① Foundation → Ethics, Integrity, Trust, Communication.
- ② Building Bricks → Training, Teamwork, Leadership, Communication.
- ③ Binding Mortar → Communication,
- ④ Roof → Recognition,

(I) Foundation: - TQM is built on a foundation of ethics, integrity and trust. It fosters openness, fairness and sincerity and allows involvement by everyone. This is the key to unlocking the ultimate potential of TQM. These three elements move together, however, each element offers something different to the TQM concept.

(a) Ethics: - Ethics is the discipline concerned with good and bad in any situation. It is a two-faceted subject represented by organizational and individual ethics. Organization of ethics establish a business code of ethics that outlines guidelines that all employees are to adhere to in the performance of their work. Individual ethics include personal rights or wrongs.

(b) Integrity: - Integrity implies honesty, morals, values, fairness and adherence to the facts and sincerity. The characteristic is what customers (internal or external) expect and deserve to receive. People see the opposite of integrity as duplicity. TQM will not work in an atmosphere of duplicity.

(c) Trust: - Trust is a by-product of integrity and ethical conduct. Without trust, the framework of TQM cannot be built. Trust fosters full participation of all members. It allows empowerment that encourages pride ownership and it encourages commitment. It allows decision making at appropriate levels in the organization, fosters individual risk-taking for continuous improvement and helps to ensure that measurements focus on improvements of process and are not used to contend people. Trust is essential to ensure customer satisfaction, so, trust builds the cooperative environment essential for TQM.

(II) Bricks: - Basing on the strong foundation of trust, ethics and integrity, bricks are placed to reach the roof of recognition. It includes:-

(a) Training: - Training is very important for ~~new~~ employees to be highly productive. Supervisors are solely responsible for implementing TQM within their departments, and teaching those employees the philosophies of TQM. Training that employees require are interpersonal skills, the ability to function within teams, problem solving, decision making, job management, performance analysis and improvement, business economics and technical skills. During the creation and formation of TQM, employees are trained so that they can become effective employees for the company.

⑤ Teamwork :- To become successful in business, teamwork is also a key element of TQM. With the use of teams, the business will receive quicker and better solutions to problems. Teams also provide more permanent improvements in processes and operations. In teams, people feel more comfortable bringing up problems that may occur, and can get help from other workers to find a solution and put it into place. There are mainly three types of teams that TQM organizations adopt :-

### ① Quality Improvement Teams or Excellence Teams (QITS) :-

These are temporary teams with the purpose of dealing with specific problems that often recur. These teams are set up for a period of three to twelve months.

② Problem solving teams (PSTs) :- These are temporary teams to solve certain problems and also to identify and overcome causes of problems. They generally last from one week to three months.

③ Natural work teams (NWTs) :- These teams consist of small groups of skilled workers who share tasks and responsibilities. These teams use concepts such as employee involvement teams, self-managing teams and quality circles. These teams generally work for one to two hours a week.

⑥ Leadership → It is possibly the most important element of TQM. It appears everywhere in organization. Leadership in TQM requires the manager to provide an inspiring vision, make strategic directions that are understood by all and to instill values that guide subordinates. For TQM to be successful in the business, the supervisor must be committed in leading his employees. A supervisor must understand TQM, believe in it and then demonstrate their belief and commitment through their daily practices of TQM. Commitment and personal involvement is required from top management in creating and deploying clear quality values and goals consistent with the objectives of the company and in creating & deploying well defined systems, methods and performance measures for achieving those goals.

### ⑦ Bridging Mortar :-

ⓐ Communication :- It binds everything together. Starting from foundation to roof of the TQM house, everything is bound by strong communication. It acts as a vital link between all elements of TQM. Communication means a common understanding of ideas

between the sender and the receiver. The success of TQM demands communication with and among all the organization members, suppliers and customers. Supervisors must keep open airways where employees can send and receive information about the TQM process. Communication means a common understanding of ideas between the sender and the receiver. Coupled with sharing of correct information is vital.

There are different ways of communication such as:-

(a) Downward Communication :- This is the dominant form of communication in any organization. Presentations and discussions basically do it. By this the supervisors are able to make the employees clear about TQM.

(b) Upward Communication :- By this the lower level of employees are able to provide suggestions to upper management of the affects of TQM. As employees provide insight and constructive criticism, supervisors must listen effectively to correct the situation that comes about through the use of TQM. This forms a level of trust between supervisors and employees. This also empowers the communication.

(c) Sideways communication :-

This type of communication is important because it breaks down barriers between departments. It also allows dealing with customers and suppliers in a more professional manner.

(N) Roof

(d) Recognition :- Recognition is the last and final element in the entire system. It should be provided for both suggestions and achievements for teams as well as individuals. Employees strive to receive recognition for themselves and their teams. Detecting and recognizing contributors is the most important job of a supervisor. As people are recognized, there can be huge changes in self-esteem, productivity, quality and the amount of effort exerted to the task at hand.

Recognition comes in its best form when it is immediately following an action that an employee has performed. Recognition comes in different ways, place and time such as:-

- Ways :- It can be by way of personal letter from top management.

- Also by award banquets, plaques, trophies etc.

- Places :- Good performers can be recognized in front of departments on performance boards and also in front of top management.

• Time: Recognition can be given at any time like in staff meeting, annual award banquets etc.

Benefits → overall project successful → organization, team, leaders, successful maintenance → good reputation of organization and approach of new events to the organization.

gold clients These 8 elements are key in ensuring the success of TQM in an organization and that the supervisor is a huge part in developing these elements in the work place. Without these 8 elements, the business entities cannot be successful. TQM implementation without integrity, ethics and trust would be ~~a great~~ incomplete. Training is the key by which the organization creates TQM environment. Leadership and teamwork go hand in hand.

Lack of communication between departments, supervisors and employees create a burden on the whole TQM process, finally, recognition should be given to people who contributed to the overall completed task.

Q How do you classify Projects? Discuss the different criteria.

A project is a planned set of interrelated and sometimes dependent tasks that must be executed over a certain period of time taking into consideration certain costs, resources and other limitations. The task must be completed in order to reach a specific goal.

CRITERIA for Projects :-

Classification of Projects :-

The factors/criteria that differ project among themselves must be taken into consideration so that projects can be managed efficiently and effectively regarding each project type:-

- Project Scope :- This describes the reach and scale of the project. A project scope varies depending upon the amount of people involved and the scale of impact of its outcomes. Projects can be big or small depending on the scope.
- Time frame :- A project's time frame is defined from its initiation or conception until result evaluation. A project's time frame can also be divided into smaller blocks which in themselves have their own timeframe.
- Organisation :- The organisation of a project refers to how tasks and activities are organized and prioritised.
- Tools :- The project workflow is calculated in each individual project to reach objectives. Sirmsaps project management and planning tools uses technologies such as PERT and CPM to calculate the workflows.

of each project and find its most optimised work path using many different types of project management tools.

• Cost: Projects can be expensive or relatively cheap depending on their overall cost needs.

• Communication: Communication is the cornerstone of every project. Among different types of projects, communication, its frequency and its format can vary. However, without effective communication, the project will fail.

• Stakeholder Management: Projects can vary depending on the number of stakeholders involved. Sometimes, the only stakeholders involved in a project is the team and project manager, but more often a wider group of stakeholders can be involved. More the stakeholders, more the complexity of the management.

• Task Assignment: Within a different project, there are different tasks and activities. Project can vary depending upon the tasks assigned to the team members - whether they will be completed by individual members or groups and how responsibilities will be defined.

• Quality of results:

Results of the project differ depending upon the clients requests. It's important to maintain the required quality of each project.

## CLASSIFICATION OF PROJECT:

### [Types of Project]

Every project is different. Projects can be classified on several different points. The classification of projects in project management varies according to the number of factors such as - complexity, source of capital, its content, those involved and its purpose.

① According to complexity :-

• EASY: A project is classified as easy when the relationships between tasks are basic and detailed planning on organization are not required. A small work team and few external stakeholders and collaborations collaborations are common in this case.

• COMPLICATED: The project network is broad and complicated.

There are many task interdependencies. With these projects, simplification where possible is everything. Cloud-based apps can immensely help to simplify complicated projects by automatically calculating the projects best work path and updating any changes introduced through its use of different types of project management tools.

## ② According to Source of capital :-

- Public → financing comes from Governmental institutions.
- Private → financing comes from businesses or private investors.
- Mixed → financing comes from a mixed source of both public and private funding.

## ③ According to project content :-

- Construction :- These are projects that have anything to do with the construction of a civil or architectural work. Predictive methods are used along with agile techniques which will be explained later on.
- IT :- Any project to do with software development, IT systems etc. The types of project management information systems vary across the board, but in today's world are very common.
- Business :- These projects are involved with the development of a business, management of work team, cost management, etc, and usually follow a commercial strategy.
- Service or product production :- Projects that involve themselves with the development of an innovative product or service, design of a new product, etc. They are often used in the R&D department.

## ④ According to those involved :-

- Departmental → When a certain department or area of an organization is involved.
- Internal → When a whole company itself is involved in the project development.
- Matriarchal → When there is a combination of departments involved.
- External → When a company outsources external project manager or teams to execute the project. This is common in digital transformation, process improvements and strategy changes for e.g:-

## ⑤ According to its objective :-

- Production :- Oriented at the production of a product or service taking into consideration a certain determined objective.
- Social :- Oriented at the improvement of the quality of life of people.

## Educational → Oriented at the education of others,

- Community → Oriented at people too, however with their involvement.
- Research → Oriented at innovation and the gaining of knowledge..

# → Types of Project Management Approaches

## Types of managers

- ① The Prophet
- ② The Gambler

- ③ The Expert
- ④ The Executors,

→ CPM

→ CCPM

Kanban ←

PMI / PMBOK

Six Sigma ←

Agile

## Types of Reports

- ① Status Reports
- ② Risk Reports
- ③ Board / Execution Reports
- ④ Resource Reports.

## Types of

## Types of meetings

- ① Kickoff meetings
- ② Status update meetings
- ③ Information Sharing meetings
- ④ Decision making meetings
- ⑤ Problem Solving meetings
- ⑥ Innovative meetings

## Short Notes:-

8b Dummy Activity :- A dummy activity is a simulated activity of zero duration and is created for the sole purpose of demonstrating a specific relationship and path of action on the arrow diagramming method. Dummy activities are useful tool to implement when the specific logical relationship between two particular activities on the arrow diagramming method cannot specifically be linked or conceptualized through simple use of arrows going from one activity to another. In this case, the creation of a dummy activity, which serves essentially as a form of a placeholder, can provide exceedingly valuable. Dummy activities should in no case be allocated any duration of time, in the planning and/or scheduling of project activities and components. When they are illustrated in a graphical format, dummy activities should be represented by the use of a dashed line with ~~with~~ an arrow head on one end, and may in some cases be represented by a unique colour. (Dummy activities can be used to maintain ~~more important prior~~ precedence relationships only when actually required. Their use should be minimised in network diagram).  $O \dashrightarrow O$  [Used to avoid ambiguity].

## 8c Different methods of project appraisal (evaluation)

Project appraisal methodologies are methods used to access a proposed project's potential success and viability. These methods check the appropriateness of a project considering things such as available funds and the economic climate. A good project will service debt and maximize shareholder's wealth. Few of the methods determining which the project appraisal can be done are:-

① Net Present Value ② Payback Method ③ Internal Rate of Return  
④ Profitability Index (difference between cash available at the beginning and cash available at the end)

→ Net Present Value :- A project's net present value is determined by summing the net annual cash flow, discounted at the project's cost of capital and deducting the initial outlay (initial investment).

Decision criteria is to accept a project with a positive net present value. Advantages of this method are that it reflects the time value of money and maximizes shareholder's wealth. Its weakness is that its rankings depend on the cost of capital; present value will decline as the discount rate increases.

→ Payback Method :- A company chooses the expected number of years required to recover an original investment. Projects will be selected if initial outlay can be recovered within a predetermined period. This method is relatively easy since the cash flow doesn't need to be discounted. Its major weakness is it ignores the cash inflows after the payback period, and does not consider the timing of cash flows.

Internal Rate of Return (IRR)

This equates the net present value of the project to zero. The projects calculated (IRR) is equated with the required rate of return. If IRR (calculated) exceeds the predetermined rate, then it is accepted. The major weakness is that when evaluating mutually exclusive projects, use of IRR may lead to selecting a project that does not maximize shareholder's wealth.

Profitability Index :-

This is the ratio of the present value of project cash inflow to the present value of initial cost. Projects with a Profitability index of greater than 1.0 are accepted. The major disadvantage in the method is that it requires cost of capital to calculate and it cannot be used when there is unequal cash flows. The advantage of the method is that it considers all cash flows of the project.]

For evaluation of any project i.e. PROJECT APPRAISAL the evaluation of the following are required:-

- ① Technical evaluation
- ② Financial evaluation
- ③ Commercial evaluation
- ④ Economic evaluation
- ⑤ Management evaluation
- { ⑥ Social Cost Benefit Analysis  
⑦ Project Risk Analysis }

\* Technical Appraisal involves a critical study of the following aspects:-

- |                                     |  |
|-------------------------------------|--|
| (1) Selection of process/technology | (6) Product Mix                                      |
| (2) Scale of operations             | (7) Selection and procurement of plant and machinery |
| (3) Raw material                    | (8) Plant Layout                                     |
| (4) Technical Know-how              | (9) Location of the project                          |
| (5) Collaboration agreements        | (10) Project scheduling and implementation.          |

\* Commercial Appraisal:

That, It is concerned with market for the product/service, The idea of promoting a project is to provide service to the consumers and earn profit from there! -

The study can be done by focussing on the following:-

- |                                 |                            |
|---------------------------------|----------------------------|
| (a) Demand for product          | (c) Distribution channels  |
| (b) Supply position for product | (d) Pricing of the product |
| (e) Government policies         |                            |

\* Economic Appraisal:

Economic Appraisal measures the effect of the project on the whole economy. The stocks of capital and foreign exchange should be put into the best possible use. Resources should be used in an effective way. Then only the project can be evaluated as a good one.

\* Financial Appraisal:  
Explanation of

- |                     |                        |
|---------------------|------------------------|
| ① Net Present Value | ③ IRR                  |
| ② Payback method    | ④ Profitability Index. |

\* Management Appraisal:

Management is the most imp factor, because even if we have all good factors but we are not utilizing it in a proper way or it is not in the hands of a proper management team, then the entire project will be at a loss or failure. So, for a successful project, we need to evaluate the management.

Next comes the social-cost benefit analysis → how much benefit the project will bring to the society and how much benefit it is cost wise.

Project Risk Analysis: - The risk of the project must be analyzed and solved properly.

## 12 Four aspects of Project Feasibility Study:

Before making a final decision to take up a project, the technical, economic, commercial and financial justification of the chosen project shall be ascertained in concrete terms. Feasibility study is also known by the term "Techno-economic feasibility study".

Technical feasibility :- For projects concerning manufacturing activities, the technology proposed to be adopted needs careful consideration.

Technical feasibility study aims to analyze whether the technology proposed to be adopted is capable of producing the intended goods/services to the requirement and specifications and to the complete satisfaction of the consumers without becoming obsolete in the near future and at the same time proving to be cost effective in the long run.

Economic viability/feasibility :- Economic viability shows whether the investment made on the project will give a satisfactory return to the economy. The major aspects to be looked into are as follows:-  
(a) whether the project will make better use of available raw material.  
(b) whether the project will reduce/eliminate the use of some valuable resources.  
(c) whether the community as a whole will stand to gain as a result of the project.

Commercial feasibility :- Any product/service should be successfully marketed in the market before expecting any gain from it. If product is new to the market, it may require some time to gain the feasibility. Also the demand of a particular product must be noticed before its launch. The associated points to be noticed are the quality of the product, price of the product and the value of the product.

Financial feasibility : → Increase of funds, investments.

Legal feasibility → the assessment investigates whether any aspect of the proposed project conflicts with legal requirements like zoning laws, data protection acts, or social media laws. That is, the legal feasibility helps us understand how a project can be legally put forward.

Operational feasibility - Study to analyze and determine whether - and how well the organization's needs can be fulfilled by completing the project.

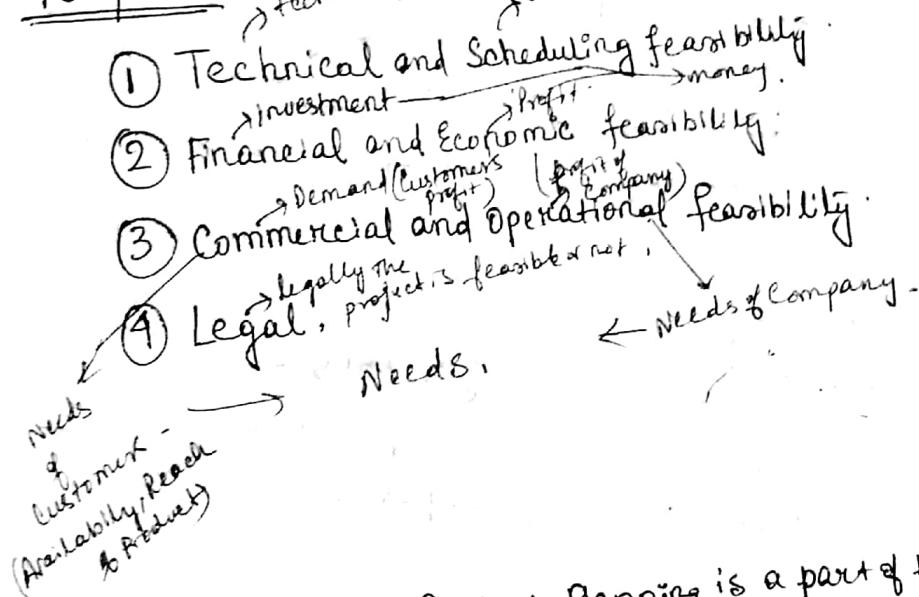
Scheduling feasibility → this assessment is important for project success, after all, a project will fail if not

completed on time. This estimates how much time the project will take to complete.

When these areas have been examined the feasibility study helps identify any constraints the proposed project may face:-

- Internal Project Constraints :- Technical (Technology), Budget, Resources etc.
- Internal Corporate Constraints financial, marketing, Export etc.
- External constraints :- Logistics, Environment, laws and regulations,

Aspects :-



(9) Project Planning :- Project Planning is a part of project management which relates to the use of schedules such as Gantt charts to plan and subsequently report progress within the project environment.

- ① Initially the project scope is defined and the appropriate methods for completing the project are determined.
- ② Following this step, the durations for the various tasks necessary to complete the work are listed and grouped into a work breakdown structure.
- ③ Project planning is often used to organize different areas of a project including project plans, work loads and the management of teams and individuals.

Project planning should be done before the project has started so that the scheduling can be done properly and resources can be accordingly used. Proper management is needed for further execution of the planning.

## 11) Project Scope and its necessity:-

Project scope is that part of project planning that involves determining and documenting a list of specific project goals, deliverables, features, functions, tasks, deadlines, and ultimately costs. In other words, it is what needs to be achieved and the work that must be done to deliver a project.

Developing a project scope is the initial phase of the project planning process. It typically involves drawing up a list of everything needed to create the framework of the project. This can include:

Project Scope Management ensures a project's scope is accurately defined and mapped and enables project managers to allocate the proper labor and costs necessary to complete the project. The three processes involved in project scope management are:-

- Planning → This includes capturing and defining the work that needs to be done.
- Controlling → This step focuses on scope creep, documenting, tracking and approving / disapproving of changes.
- Closing → This includes an audit of the project deliverables and assessing the outcomes of the original plan.

## SCOPE STATEMENT:-

Business Case: - ~~why~~ need of the project and its benefits.

Project Description: Overview of the project's final deliverable.

Success Criteria: Key components that will constitute a successful project as preagreed upon with the clients and stakeholders.

Limitations: Any resources or technology related issue that may limit the project.

Assumptions: Any assumptions that have been made and will affect the final outcome.

## Importance/Necessity of Project Scope :-

Managing the expectations of clients and stakeholders can be one of the most difficult tasks a project manager can face.. With a distinct scope, it helps everyone to stay on the same page throughout the lifecycle of the project. A well defined scope can help to avoid common problems like :-

- Requirements that constantly change.
- Requirements that need a rethink mid-project.
- The final outcome not being what the client expected.
- The budget overrunning.
- The project is way behind schedule.

Effective scope management can help to avoid some of these issues by clearly defining and communicating the scope to all parties involved in the project. Project scope helps to distinguish what is and is not involved in the project and ~~not~~ controls what is allowed or removed as it is executed. Scope management establishes control factors, that can be used to address elements that result in changes during the lifecycle of the project.

Project scope is critical because without it project managers would have no clue what time, cost or labor was involved in project. It forms basis for every decision a project manager would make on a job.

Cost Benefit Analysis:- A Cost Benefit analysis is a process by which business decisions are analyzed. The benefits of a given situation or business related action are summed, and then costs associated with taking that action are subtracted.

$$\text{Profit} : \text{Investment}$$

$$\text{Profit} = \text{Investment} - \text{Used Up money.}$$

Calculated by NPV: (BPI Profitability Index)

## Non-discounted Cash-flow Techniques:- (Capital Budgeting Techniques)

There are different methods adopted for capital budgeting.

The traditional methods or non discount methods include:

Payback period and ARR (Accounting Rate of Return) method,

The discounted cash flow methods include → NPV, Profitability Index and IRR.

### NON-DISCOUNTED

→ Payback Period method :- This method refers to the period in which the proposal will generate cash to recover the initial investment made. It purely emphasizes on the cash inflows, economic life of the project and the investment made in the project, with no consideration to time value of money. Through this method selection of a proposal is based on the earning capacity of the project. With simple calculations, selection or rejection of the project can be done, with results that will help gauge the risks involved; however, as the method is based on thumb rule, it does not consider the importance of time value of money and so the relevant dimensions of profitability.

$$\boxed{\text{Payback Period} = \frac{\text{Cashoutlay (Investment)}}{\text{Annual Cash inflow}}}$$

→ Accounting rate of return method (ARR) :-

This method helps to overcome the disadvantages of the payback period method. The rate of return is expressed as a percentage of the earnings of the investment in a particular project. It works on the criteria that any project having ARR higher than the minimum rate established by the management will be considered and those below predetermined rate are rejected.

This method ~~not~~ takes into account the entire economic life of a project providing a better means of comparison. It also ensures compensation of expected profitability of projects through the concept of net earnings. However, this method also ignores time value of money and doesn't consider the length of life of the projects. Also it is not consistent with the firm's objective of maximizing the market value of shares.

$$\boxed{\text{ARR} = \frac{\text{Average Income}}{\text{Average Investment}}}$$

## Discounted Cashflow methods

NPV, Profitability Index, IRR.

## Discounted Cash-flow methods :-

→ NPV (Net Present Value) :- This is one of the widely used method, for evaluating capital investment proposals. In this technique the cash inflow expected at different periods of time is discounted at a particular rate. The present values of cash inflow are compared to the original investment. If the difference between them is (+) positive, then there is a profit and then project is accepted or else rejected.

$$NPV = \frac{PV_B - PV_C}{\text{Present Value of Benefits}}$$

→ IRR :- It is defined as the rate at which the net present value of the investment is zero. The discounted cash inflow is equal to the discounted cash outflow. This method also considers time value of money. It tries to arrive to a rate of interest at which funds invested in the project could be repaid out of the cash inflows. However, computation of IRR is a tedious task.

It is called internal rate because it depends solely on the outlay and proceeds associated with the project and not any rate determined outside the investment.

$$\text{If } IRR > \text{investment} = \text{profit (accept project or else reject)}.$$

→ Profitability Index (PI) :-

It is the ratio of the present value of future cash benefits, at the required rate of return to the initial cash outflow of the investment. It may be gross or net, net being simply gross - 1. The formula to calculate profitability index (PI) or benefit cost (BC) ratio is as follows:-

$$PI = \frac{\text{PV cash inflows}}{\text{Initial cash outlay A}},$$

$$PI = \frac{NPV(\text{benefits})}{NPV(\text{costs})}.$$

All projects with  $PI > 1.0$  is accepted.

BCR

## Ch-9 Software Project Characteristics and Management.

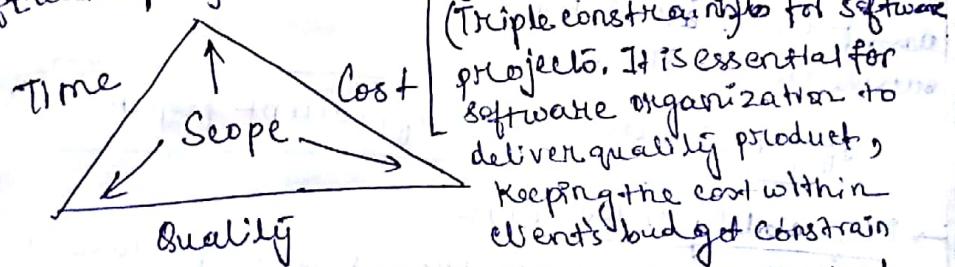
### Characteristics of Software Projects

- ① A clear and realistic goal:- You know what these
- ② Powerful team-leadership:-
- ③ Sense of ownership:-
- ④ Commitment to quality:-
- ⑤ Getting things done:-
- ⑥ Psychological safety:- (not being insecure and capable to take risks).
- ⑦ The right skills in your team!:-
- ⑧ Your tech-stack is a right fit!:- (Technology)

[commitment, people, goals, communication, focus, learning, change, environment]

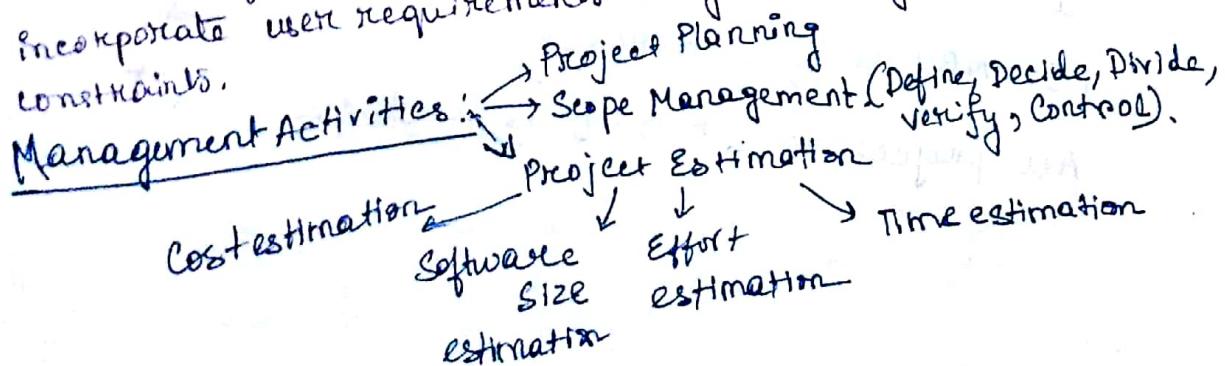
### Software Project Management :-

Software is said to be intangible product. Software development is a kind of all new stream in world business and there's very little experience in building software products. It's important that the product can fit the client's requirements. Hence, it is essential to manage software projects efficiently.



and deliver the project as per scheduled. There are several factors both internal and external which may impact this triple constraint triangle. Any of three factors can severely impact the other two.

Therefore, software project management is essential to incorporate user requirements along with budget and time constraints.



Risk management; Execution, communication, configuration management;

## IT in Projects:-

### Types for Softwares for Project:

#### ① Desktop :-

- (a) It is dependent on a particular hardware.
- (b) Security of data is an issue, as if the hardware is stolen or left open then the data might be taken in a pendrive or CD by a thief (who is an employee).
- (c) If there is any crash of the system then the data may not be recovered.
- (d) LAN connection or personal server may be needed for multiuser accessibility which might be costly as well.
- (e) Time to time updates are also essential.

#### ② Web based :-

- (a) Online :- can be accessed anytime from anywhere.
- (b) Online Server keeps stores all data.
- (c) There is a chance of hacking if there is no security.
- (d) Online service helps all the multiusers to access the data without any LAN.
- (e) non dependent on any particular device.
- (f) Auto updates are generally available.
- (g) Crash of system does not affect the data as it is available from online servers.

### Characteristics of Project Management Software:-

- (1) Collaboration → Team collaboration, (Stakeholders must be able to keep a track of the project all together along with managers).
- (2) Scheduling → Time management
- (3) Issue Tracking → Keeping track of the issues.
- (4) Project Portfolio Management → Organization must be able to measure and monitor multiple projects.
- (5) Document Management → Documents must be accessible to the management and stakeholders.
- (6) Resource Management
  - ↓
    - Human resources
    - & other hardmaterial management.

## Features of MS-Project :-

Microsoft is a project management software product, developed and sold by Microsoft. It is designed to assist a project manager in developing a plan, assigning resources to tasks, tracking progress, managing the budget, and analyzing the workloads.

It is a desktop based Project Management Software.

## Criterions for Software Selection :-

- ① Business and industry type expertise → Type of firm and the experts who would be using the software.
- ② Market Knowledge → All softwares used in different firms and available softwares.
- ③ Program/Project Management capabilities → Expertise of the user in the software whether he/she can handle it.
- ④ Methodology → Work of the software
- ⑤ Communication → Clear communication (regarding software) and help/support available from the software company.
- ⑥ Independence & objectivity
  - changes/customization available as per requirement.

Time Cost Trade off Analysis → Optimum Project Duration  
XP 305 → <sup>(Book)</sup> Nagarijan

## Fishbone Diagram:-

A fishbone diagram, also called a cause and effect diagram or Ishikawa diagram, is a visualization tool for categorizing the potential causes of a problem in order to identify its root causes.

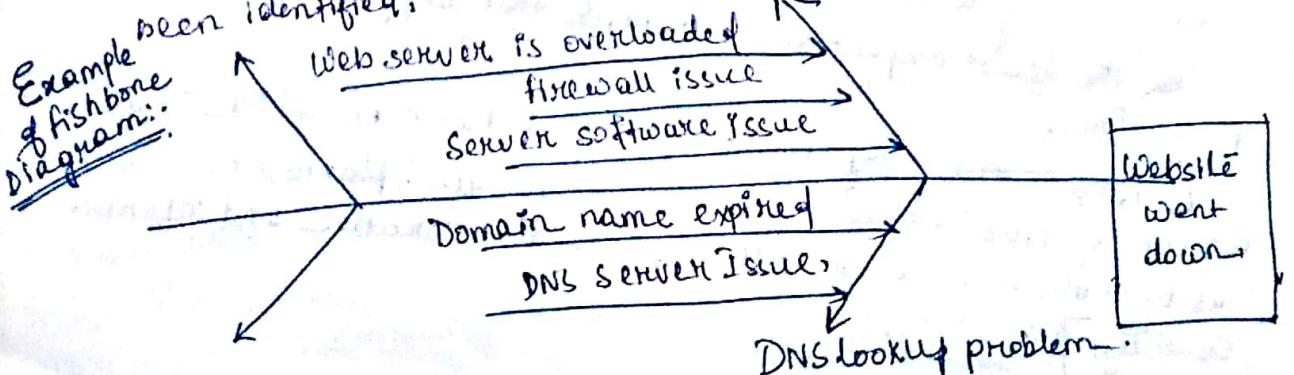
Dr. Kaoru Ishikawa, a Japanese quality control expert, is credited with inventing the fishbone diagram to help employees avoid solutions that merely address the symptoms of a much larger problem.

A fishbone diagram is useful in brainstorming sessions to focus conversation. After the group has brainstormed all the possible causes for a problem, the facilitator helps the group to rate the potential causes according to their level of importance and diagram a hierarchy. The design of the diagram looks much like a skeleton of a fish. Fishbone diagrams are typically worked right to left, with each large "bone" of the fish branching out to include smaller bones containing more detail.

• Fishbone diagrams are used in the "analysis" phase of Six Sigma's DMAIC (define, measure, analyze, improve, control) approach to problem solving.

### How to create a fish diagram:-

- Create a head, which lists the problem or issue to be studied.
- Create backbone for the fish (straight line which leads to the head).
- Identify at least four "causes" that contributes to the problem. Connect these four causes with arrows to the spine. These will create the first bones of the fish.
- Brainstorm around each "cause" to document those things that contributed to the cause. Use of 4Ps (Policies, Procedures, People and Plant) → keeps the conversation focussed.
- Continue breaking down each cause until the root causes have been identified.



## 8d Resource Allocation and Resource Levelling:-

A key component of planning is the allocation of small business resources to the project to ensure that personnel and materials are available as needed to achieve the goals. After the initial resource allocation is completed, resource levelling occurs to match the resource allocations to resource availability in a timely and cost-efficient manner.

### Resource Allocation:-

Resource allocation, also called resource loading, commits certain resources to project plan activities. More than one resource and type of resource can be allocated to each activity. Some project phases and activities require fewer resources than others, and these requirements can vary during length of the work. For e.g., roles committed to a software development project might include a team leader, change facilitator, business analyst, process owner, etc. But maybe the training specialist and technical writer are not required before the deployment phase. So, these two resources are allocated to the deployment phase of the project only.

### Resource Levelling:-

After using the resource allocation process to define project resource requirements, resource levelling is used to relate the requirements to available resources. This levelling process ensures that resource demand does not exceed available resources during a particular timeframe, and in light of individual activity interdependencies. During resource levelling, resource requirements are expressed in terms of the hours and days during which the resource is required. For example, assume that during the resource allocation process, a programmer is allocated for 8 hours each day to a project. However, the original plan assigns three different 8-hour tasks to the programmer on the same day. Using resource levelling, the three tasks are rescheduled to occur on three different days. As a result, the problem of the overallocation of the resource is resolved.

### → Resource levelling Approaches:-

One of three resource levelling techniques are typically used to correlate resource requirements to available resources: critical path, fast tracking and crashing. Using the critical path method, required project activities are specified, the time required to complete each activity is stated, and activity dependence is identified.

In turn, fast tracking enables tasks to be run simultaneously, and crashing is used to assign additional resources to a project stage or activity. Each technique is used to ensure particular project objectives are accomplished on time.

### Benefits of Resource Allocation and Resource Leveling

Resource allocation and leveling support the proper allocation of business resources during a project's life cycle. The appropriate allocation of resources attempts to ensure that delays in the completion of tasks will be avoided. As a result, the on-time completion of project tasks is more likely. Such completion of tasks avoids conflicts in team members' assignments, which can lead to budget overruns. Through the avoidance of over- and under-allocation of resources, it is more likely that a project is completed on time and within the budget.

8e Value Engineering :- (VE) is a systematic method to improve the "value" of goods or products and services by using an examination of function. Value, as defined, is the ratio of function to cost. Value can therefore be increased by either improving the function or ~~reducing~~ reducing the cost. It is a primary tenet of value engineering that basic functions be preserved and not be reduced as a consequence of pursuing value improvements.

The reasoning behind value engineering is as follows:- If marketers expect a product to become practically stylistically obsolete within a specific length of time, they can design it to only last for that specific lifetime. The products could be built with higher-grade components but with value engineering they are not because this would impose an unnecessary cost on the manufacturer, and to a limited extent also an increased cost on the purchaser. Value engineering will reduce ~~to~~ these costs. A company will typically use the least expensive components that satisfy the product's lifetime projections.

[ Due to the very short life spans, however, which is often a result of this "value engineering technique", planned obsolescence has become associated with product deterioration and inferior quality.]

### (13) Statement of Work:-

A Statement of Work (SOW) is a document routinely employed in the field of project management. It defines project-specific activities, deliverables and timelines for a vendor providing services to the client. The SOW typically also includes detailed requirements and pricing with standard regulatory and governance terms and conditions. The statement of work includes all aspects of performance requirements as well as how performance will be assessed.

Elements of an Effective SOW ( Purpose, Scope of Work, Work Description, Period of Performance, Deliverables Schedule, Applicable standards, Acceptance Standards,

- Scope of Work → Briefly defines the work to be done by the contractor.  
(Special Requirements, addendum, Contract terms and payment schedule).
- Deliverables Schedule → Lists the specific deliverables, describing what is due and when.
- Period of Performance → Specifies the allowable time for the project, i.e. start and finish times and key scheduling considerations.
- Location → Specifies the location where the work will be completed to include any necessary resources such as hardware, software and office space.
- Reporting → Explains reporting requirements to include content, design and frequency.

This document also includes any policies that address sensitive and proprietary information, confidentiality and non-disclosure agreements, and any other terms and conditions. A well written SOW provides vendors an understanding of project requirements; provides evaluation guidelines; minimizes overall evaluation and contract negotiation requirements; and reduces the need for future project changes.

### Steps to develop or write SOW:-

- ① Establish a preliminary scope statement that defines identifies the project objective or purpose. Be sure to include a description of the type of work being performed including and boundaries associated with performance and duties.
- ② List the tasks to be performed to indicate any performance

(Q.D)

Requirements and all project requirements that the contractor must comply with during contract performance.

- ③ As much as possible, group similar or related tasks and organize each task in logical order.
  - ④ Identify any resources that are necessary to complete each task that includes labor, equipment or materials.
  - ⑤ Identify project deliverables required for the project to be successfully completed
  - ⑥ Identify any time-sensitive milestones or deliverables.
- ⑦ Describe quality expectations and applicable deadlines in terms of quality, quantity, time and appearance. Performance deliverables should be realistic, objective and measurable.
- ⑧ Determine how you will monitor the deliverables. Some methods used include random sampling, periodic inspections and reporting.

### SOW:-

A Statement of Work (SOW) is an important part of both project and contract management that helps guarantee that the work for a project will be done according to certain guidelines and expectations. Contractors or collaborators outside our organization will use the SOW to guide their work during a specific project. An effective SOW will include, among other things, work details, schedules, terms, and expected outcomes, so it's imperative that it's done correctly and doesn't leave anything out. An SOW can be used for a wide variety of projects, ranging from a single visual design made by a graphic artist for a client, to a large-scale government building contract. In this article, you'll learn how to overcome common challenges and create a solid SOW for any industry.

A Statement of Work is a document used in project and contract management. It covers the working agreement between two parties: the client, buyer or government entity and the agency, vendor, or contractor. A SOW typically includes:- scope of work, project objectives, schedule, tasks, deliverables, payment of the project, expected outcomes, certain terms, conditions and requirement.

## Purpose of the Statement of Work:-

An SOW is used when contractors or collaborators outside your organization are working on a project with your internal project team. It can also inform vendors or contractors who are bidding on your project. An SOW is often used in conjunction with other related documents, including:-

- Request for proposal (RFP):- Organizations use this document to procure goods and/or services from vendors or contractors.

- Master Services Agreement (MSA):- This is a ~~deadli~~ detailed contract that outlines two parties' terms and responsibilities.

Since a well-written SOW outlines tasks and deliverables of a vendor or contractor, it can provide a good foundation for writing a RFP or MSA down the road. However, the SOW should only be written after terms and guidelines have been decided upon, and should adhere to the correct format and use clear language detailing specific tasks, deliverables and/or services the contractor is responsible for. This will help avoid conflicts when negotiating the contract.

Statements of work are typically used when the work can be described according to specific directions or instructions, and when the requirements, tasks and conditions are easily understood by both parties. An effective SOW should also provide information on performance outcomes as well as standards and metrics.

## Common elements of SOW:-

- Project Objectives
- Project scope
- Major deliverables
- Tasks that support the deliverables, and which party will complete them.
- Payment costs, terms and deadlines.
- Internal and external standards and guidelines.
- Criteria used to determine whether deliverables are acceptable and how they will be accepted.
- Signatures of both parties.

## Three types of Statements of Work:-

(92)

### ① Design / Detail SOW :-

(a) Used in :- Government Contracts (where contractors are required to follow specific regulations).

(b) About :- This SOW tells the vendor, contractor or supplier exactly how to do the work and what processes to follow. It clearly defines the buyer, client or entity's requirements, whether they be materials, measurements, quality control or requirements.

### 2. Level of Effort / Time and Materials / Unit Rate (Statement of Work),

(a) Used in :- Temporary or contract workers, or for delivery order contracts.

(b) About :- Used for hourly service workers. It is simply based on work hours and the material needed to perform the service. The SOW describes the service being performed over a given period of time in a general way. It is often used for temporary or contract workers, or for delivery order contracts.

### 3. Performance-Based SOW :-

(a) Used in :- Government entities, & American and Canadian Government procurements.

(b) About :- Covers the purpose of the project, the resources and equipment that will be provided, and the quantifiable end results. However, it does not tell the contractor how to perform the work. It offers the most flexibility in terms of how the contractor works, and focuses on outcomes over processes.

### Statement of Work format :-

① Introduction → Identify the type of work

② Objectives / Purpose → Why the work is being done

③ Scope of Work → Work that needs to be done and processes involved in completing the work.

④ Requirements and

Tasks → Breaks down the scope into more granular tasks.

⑤ Period of Performance → Time period during which work will be performed. (dates, time, month, start & end dates).

⑥ Place of Performance → Area of Performance of Tasks.

⑦ Resources & Testing → Available resources and testing them (by managers, team leaders, clients, contractors).

### ③ Deliverables and Schedule/Timeline

Listing all the deliverables the vendor, supplier or contractor will deliver to the client, buyer or entity. (including description of the deliverables).

### ④ Payment Terms and Schedule → Payment at the time needed for a particular work, or by the quality of the work.

Payment can either be fixed or may depend upon the required resources.

### ⑤ Special Requirements :-

- (a) Security
- (b) Industry-specific standards
- (c) Hardware/Software access restrictions or requirements
- (d) Travel requirements
- (e) Post-work requirements
- (f) Exclusions and assumptions

### ⑥ Acceptance Criteria/Signatures → How the client will accept the project deliverables.

Example :- Manage a particular event.