

Chapter - I

Introduction

Project

Project is specific job which is non routine or temporary job with specific objectives which used to achieve a certain purpose uniquely.

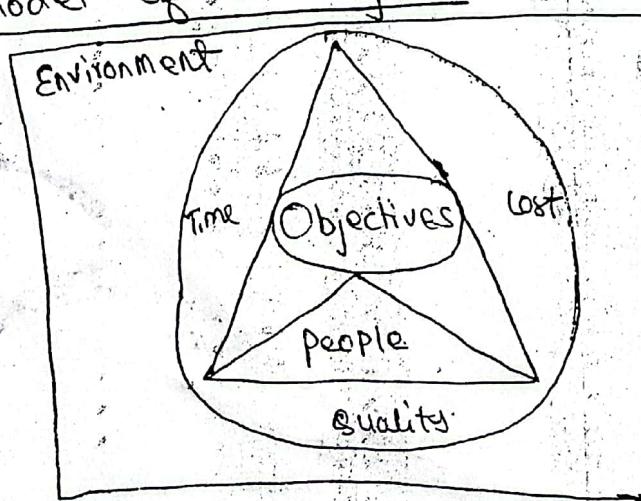
The development of software for an improve business process, the construction of a building bridge, the relief effort after a natural disaster all are projects.

Project must be expertly managed to deliver on-time, on-budget results, learning and integrate that organization needs.

According to Harvey Maylor "Project is any non repetitive, low volume, high variety activity which is undertaken to create a unique product or service with a start and a finish by any individual or an organization to meet specific performance objective within defined scope and performance parameters".

A set of organized activities aimed at achieving specific objectives within a limited amount of time, cost, people and quality is called project.

Model of a Project



Engineering projects.

The engineering project is a particular type of technological system, embedded in the context of technological systems in general. Engineering projects in many countries are specially defined by legislation, which requires that such projects should be carried out by registered engineers and/or registered engineering companies. i.e., companies with license to carry out such works as design and construction of building, power plants, industrial facilities, installation and erection of electrical grid networks, transportation infrastructure, gadgets, robots, software etc.

SMART Objectives of Project / Project Objectives

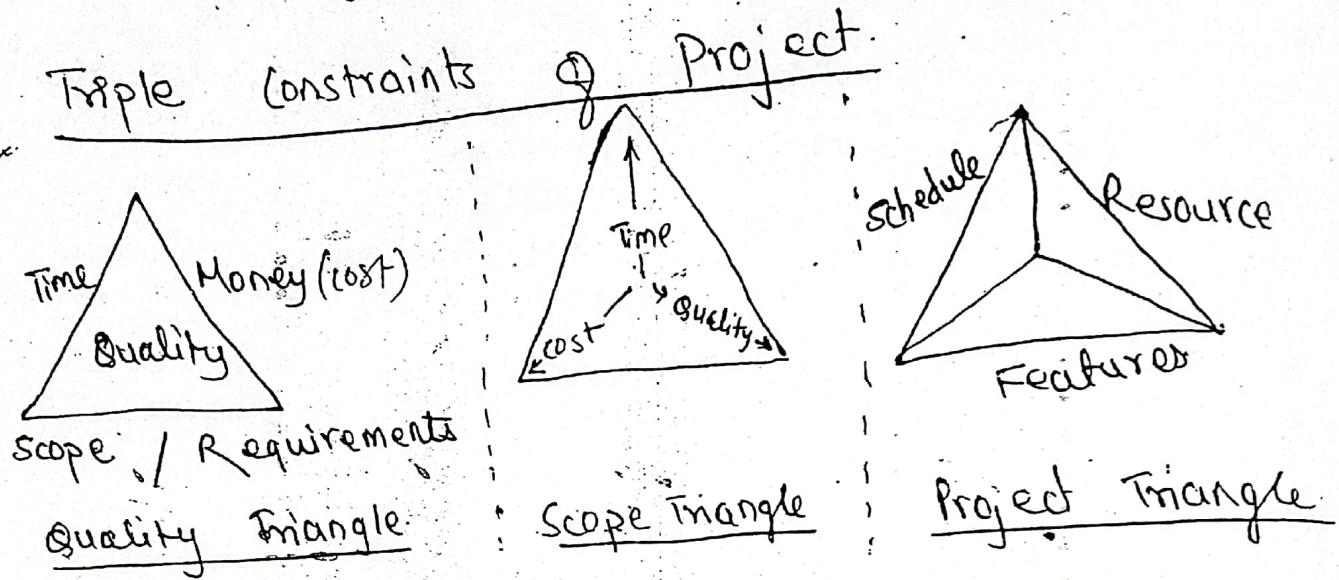
- S : Specific, clearly defined, not vague.
- M : Measurable, so that the project achievement can be measured, compared and controlled.
- A : Agree, by all the members of the team. Agreed goals raise the sense and commitment.
- R : Realistic, considering the given possible resources, experience, knowledge and time available.
- T : Time bound, if there is no time to complete the process, it will never be completed.

Project Management

Project Management involved project planning and monitoring and include such item as:

- Project planning
- Definition of work requirements
- Definition of quality of work
- Definition of resource needed.

- b) Project Management**
- Tracking progress
 - Comparing actual to predicted
 - Analyzing impact.
 - Making adjustments.



Quality / scope / project triangle shows the three inherent in any project.

These triangle illustrates the relationship among three primary forces in the project. Cost, Quality. The normal situation is that one of forces is fixed and other two will vary in proportion to each other.

Project Characteristics

- a) Specific Objective:** A project clearly defines objectives which a project succeeds. Objectives are predetermined and the end results are measurable.
- b) Temporary (Life Span):** A project cannot continue endlessly. It is a temporary endeavor. It has a start from birth to death. It passes through various stages i.e. formulation, planning, design, construction, operation and termination.

-routine and Non-repetitive: A project is non-routine and non-repetitive in nature.

constraints: A project operates within constraints of time, cost and quality.

flexibility: A project operates in a dynamic environment, so project needs flexibility to provide rapid response to changing environment. Tasks and changes are inevitable and project needs to address these issues for which a project needs to be flexible.

Resource Integration: Every project uses resources such as man, machine, money and minutes. So, integration of these resources is necessary for efficient use of these resources.

Team work: A project normally consists of diversified personnel specialized in their respective areas. They work from a various discipline so the co-ordination among them is called team work. A manager leads the team to accomplish the goal of the project.

Planning and Control: Each project has an effective planning and control system in order to efficient and effective completion of the project.

Contracting and Subcontracting: Most projects are contract based, complexity of a project increases the need of contracting and subcontracting. Contract may be of various type such as lump-sum contract, unit price contract, negotiated cost plus fixed fee contract and turnkey contract.

Beneficiaries: The ultimate users of the project

are the project beneficiaries. Each project
certain immunity of beneficiaries who are directly
associated with the project outputs.

Classification of Project

① According to Time frame and Speed

- Normal
- Crash.

② According to Nature of project

- Simple
- Complex
- Innovative
- Emergency

③ According to Scale and Size

- Mega : 5 - 20 yrs.
- Major : 3 - 5 yrs.
- Medium : 1 - 3 yrs.
- Small : small duration.

④ According to Orientation

- Product Oriented
- Process Oriented.

⑤ According to function

- Disaster prevention projects
- Development projects
- Service Sector projects
- Environment friendly projects.

⑥ According to Techniques

- Labour intensive techniques
- Capital intensive techniques

⑦ According to Foreign aid

- Joint venture aided project
- Bilateral project
- Multilateral project

- according to funding.
- Private sector project
 - Government sector project.
 - Grant project
 - Loan project.

Types of Project:

(a) Construction Projects

- Worship
- Jubilee line extension
- Millennium dome
- Customer call centre
- Method guidebook
- IT system.

(b) Research Project

- Business modelling
- Developing a model of Nepal's economy.
- Developing a new species of crops.
- Developing novel approaches to project management.
 - Military intelligence
 - Code-breaking.

(c) Reengineering Projects

- Taking sterling into Euro.
- Renumbering the UK telephone system
- Designing and installing of Intranet

(d) Procurement Project

- Outsourcing a specific construction or research projects.
- Outsourcing a complete business function.
- Imposing new rules and measures on a regulated industry.

- ④ Business Implementation Projects
- Developing a new business process to repackage and exploit existing assets.
 - Installing e-commerce.

Types of IT projects

⑤ System Integration:

It brings together a range of diverse ICT products and services building a pre-defined operational system to create a seamless environment.
Eg: Building a nationwide WAN.

⑥ Facilities Management:

These are very close to system integration. However, the aim of facilities management is to a full accountability and responsibility but not ownership, for establishing and operating customised IT facilities. Eg: establishing of an automated security and disaster control center.

⑦ Software Application Development:

ERP Application Development

⑧ Service Consulting:

It delivers a specific consulting service to a customer. This may or may not result in delivery of IT product or service. Eg: Counselling and Training on different ICI

Project life Cycle.

The project life cycle refers to a logical sequence of activities to accomplish the project's goal.

Project Life Cycle and Phases.

- (a) Initiation Phase.
- (b) Planning phase.
- (c) Implementation Phase
- (d) Termination Phase.

Characteristics of Project Life Cycle

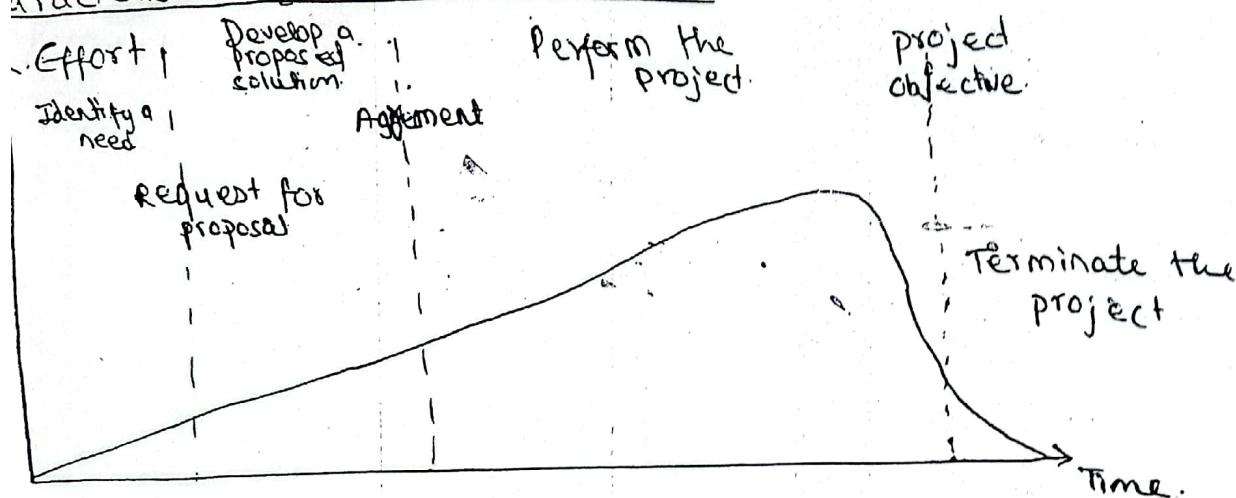
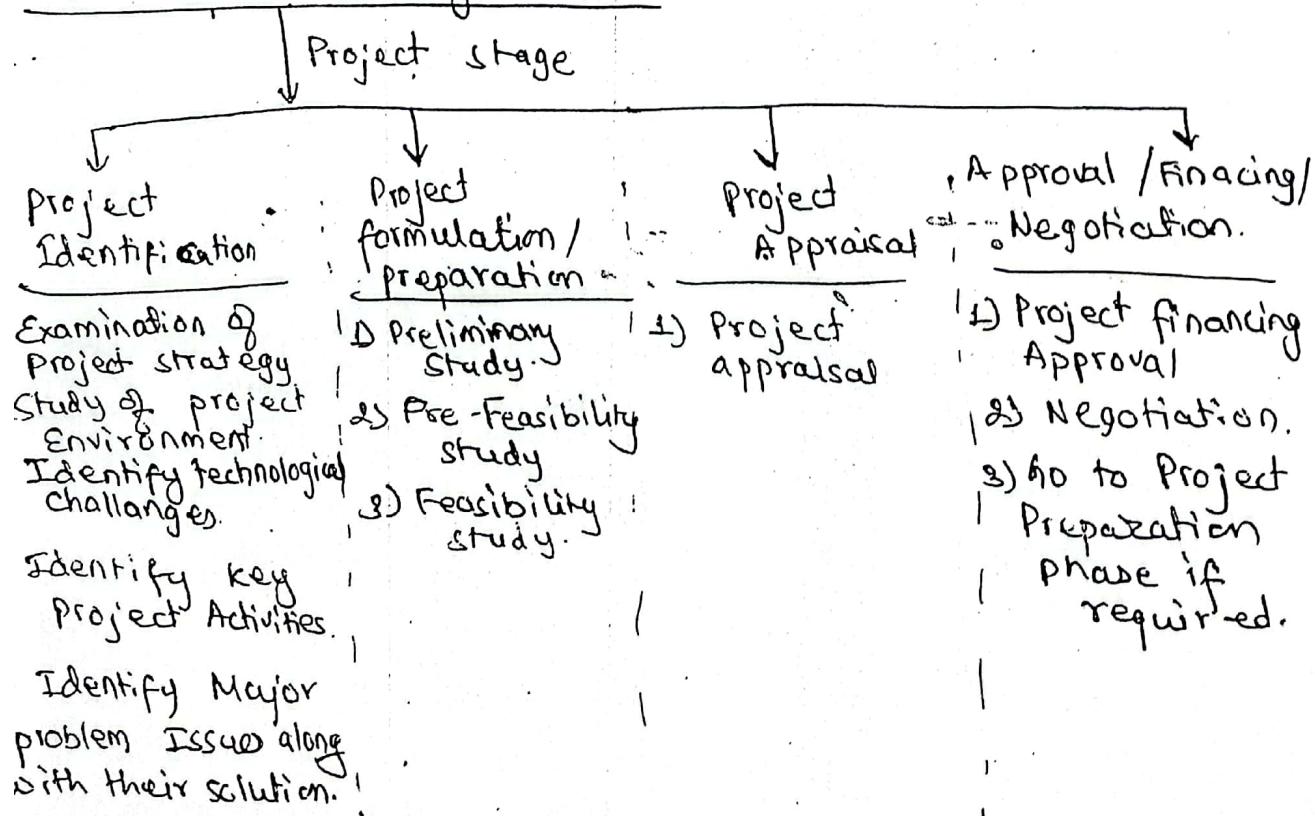
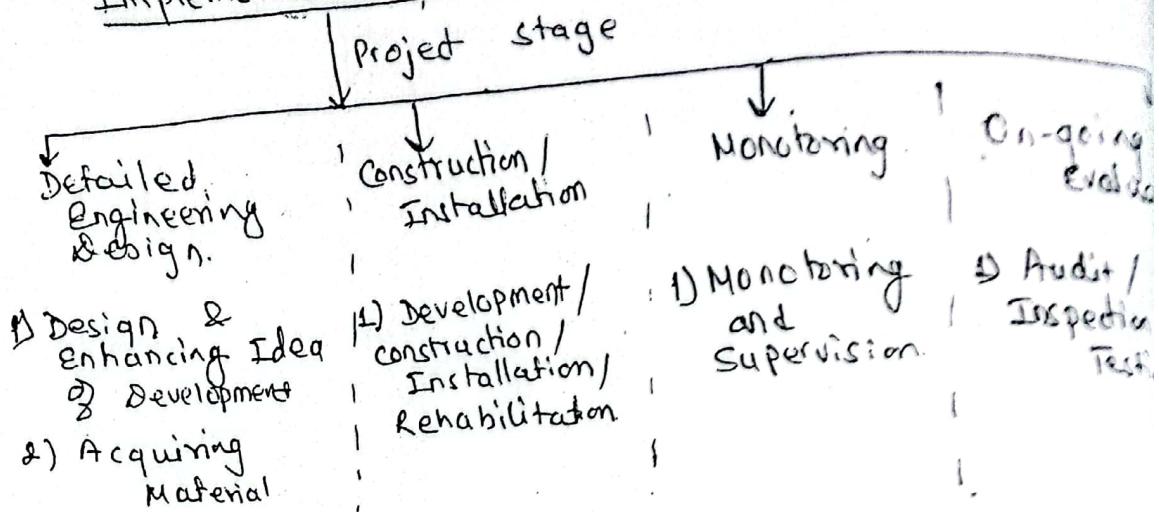


Fig: effort vs Time in project development cycle.

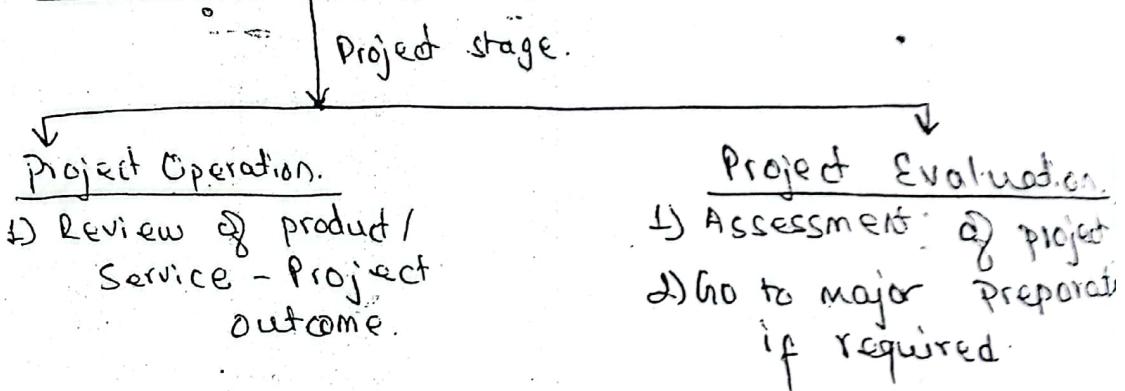
Initiation & Planning Phase.



Implementation phase



Termination phase.



The project development process is always a cycle because each stage of analysis develops from previous ones and in turn leads into subsequent stages investigation.

Project Management Vs General Management

General Management	Project Management
1) Responsible for managing the status quo	1) Responsible for overseeing
2) Authority defined by management structure	2) Lines of authority 'fuzz'
3) Consistent set of tasks	3) Responsible for cross-functional activities
4) Maintenance	4) Innovations
5) Optimization - Main task	5) Resolution of conflict
6) Limited set of variables	6) Intrinsic uncertainty

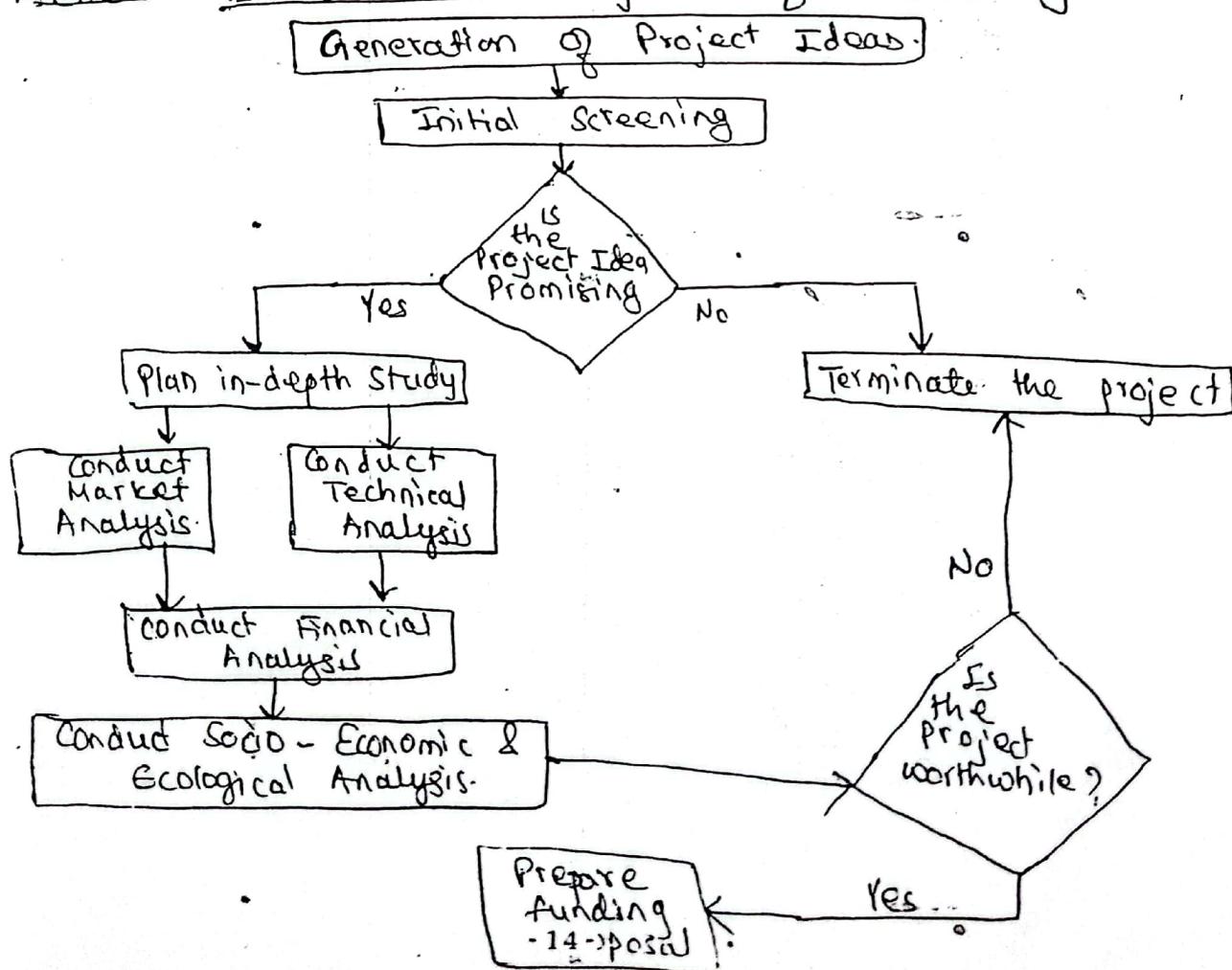
Feasibility study:

A feasibility study is a compressed, capsule version of the analysis phase of the system development life cycle aimed at determining quickly and at a reasonable cost if the problem can be solved and if it is worth solving. It can be viewed as an in-depth problem definition.

Types of Feasibility:

- (a) Technical feasibility.
- (b) Economic feasibility.
- (c) Operational feasibility.
- (d) Organizational feasibility.

Action: Schematic Diagram of Feasibility study.



Chapter-2

Project Management Body of Knowledge (PMBOK)

Project Management body of knowledge (PMBOK) is a collection of processes and knowledge areas generally accepted as best practice within the project management.

Project Management fundamentals are always same irrespective of what the knowledge base i.e construction, software, engineering, automobile, go development or social ones.

PMBOK recognize FIVE process groups and Nine knowledge areas for every type of project.

Five process groups are:

- i) Initiating Process Group.
- ii) Planning Process Group.
- iii) Executing Process Group.
- iv) Controlling Process Group.
- v) Closing process Group.

knowledge Areas are:

- i) Project Integration Management.
- ii) Project Scope Management.
- iii) Project Time Management.
- iv) Project Cost Management.
- v) Project Quality Management.
- vi) Project Human Resource Management.
- vii) Project Communication Management.
- viii) Project Risk Management.
- ix) Project Procurement Management.

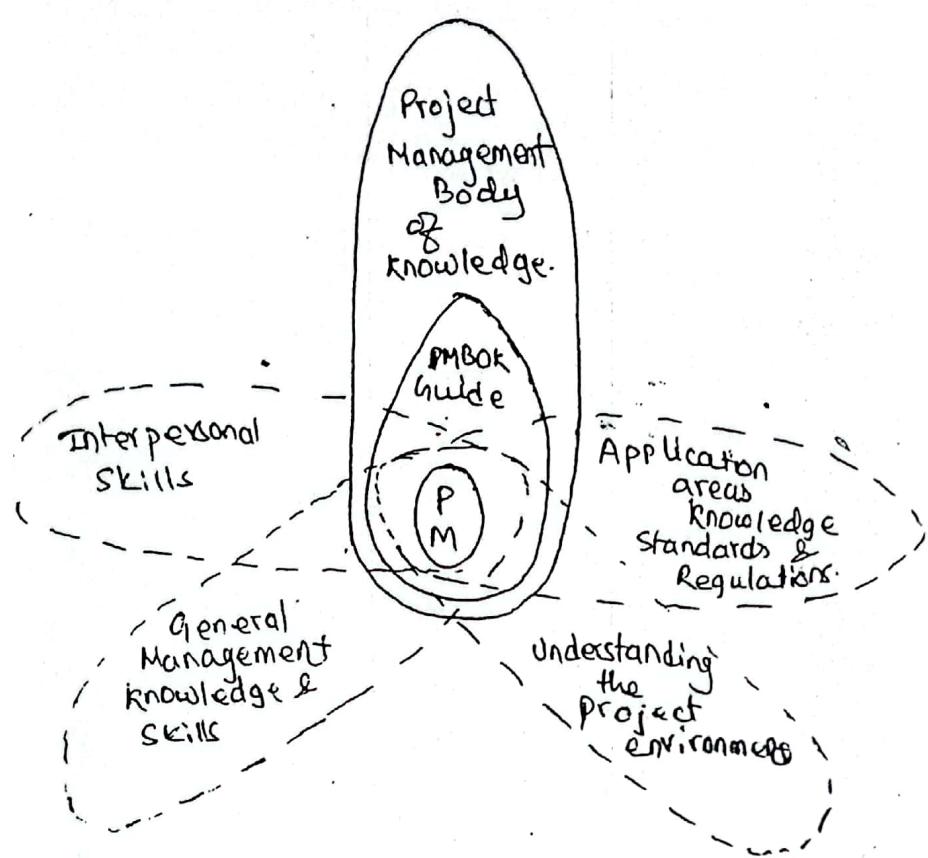


fig: Expertise Needed by Project Team/Manager according to PMI.

Much of PMBOK is unique to Project Management, like PERT, WBS, EVA etc.

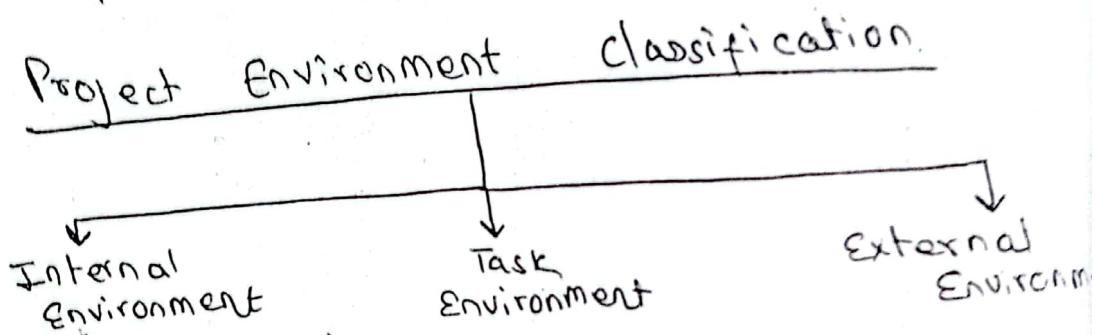
Some areas overlap with other management disciplines. General Management includes planning, organizing, staffing, co-ordinating, leading and controlling operations of an organization.

Financial Forecasting, Organization Behaviour and Planning techniques are also similar.

Project Environment

Projects must continually adapt to environmental changes as projects are environment specific. Environment consists of forces that influence the project's ability to achieve its objectives. Environment's dynamicity needs to be addressed with flexibility. Environmental influences on projects occur through:

- 1) Complexity
- 2) Uncertainty
- 3) Competition for Resources
- 4) Flexibility
- 5) Rapid Technological changes.



Internal Environment

- 1) They are located within the project.
- 2) They are controllable by the project.
- 3) They strengthen or weaken the project.

They are:

- a) Project objectives
- b) Constraints
- c) Structure
- d) Resource

Task Environment

- 1) They immediately surrounds the project.
- 2) They are made up of stakeholders.
- 3) Their interest and impacts are interrelated.

- 4) They affect project activities.
- 5) Project can influence task environment.

They are:

- a) Client
- b) Contractors
- c) Consultants
- d) Competitors
- e) Suppliers
- f) Government
- g) Labour Unions
- h) Finances

External Environment

- 1) They have broad forces in surroundings.
- 2) They effects climate in which project operates.
- 3) They are located outside the project.
- 4) They can't be controlled by the project.
- 5) They highly influence projects.
- 6) Pre-Assessment of External environment is done
- 7) through PESTLE Analysis.

Ex They are:

- a) Political
- b) Economical
- c) Socio-Cultural
- d) Technological
- e) Legal
- f) Environmental (Natural)

General Management skills.

- a) Strategic Planning
- b) Tactical planning
- c) Operational planning
- d) Financial Management
- e) Accounting
- f) Budgeting & commercial law
- g) Contracting
- h) Purchasing
- i) Procurement
- j) HR ~~Recruitment~~ Recruitment
- k) Promotion
- l) Transfer.

Effective and Ineffective Project Managers.

Effective Project Managers.

- a) Lead by Example
- b) Visionaries
- c) Technically competent
- d) Decisive
- e) Good Communicators
- f) Good Motivators
- g) Stand up to Top level Management
- h) Support Team Members.
- i) Encourages New Ideas.

Ineffective project Managers.

- a) Set Bad examples.
- b) Confused
- c) Lack Technical expertise
- d) Indecisive
- e) Poor Communicators
- f) Lack Team spirit
- g) Conservative
- h) Poor motivators
- i) Complaining about Demis-tors / Top level Maa

Essential Interpersonal and Managerial Skills

is not recognized that a project manager must be a people manager as well. Most project managers before excel at the technical aspects of project management such as scheduling, design and testing. They, however are weak or uncomfortable with the management disciplines, which deal with 'soft' skills e.g. Negotiations, Interpersonal and communication.

Essential Interpersonal and Managerial skills are:

Organized and Initiator.

Communicator

Influencer

Leader

Motivator

Problem Solver

Perspective nature

Result Oriented

Global Literacies.

Organized and Initiator.

Project Manager should not have lack of energy & fitness. S/He must be able to continue work under considerable pressure and odd condition.

Project manager must be the source of energy his/her own team.

She/he must have the ability to take necessary initiative to see a positive result, as and when required.

Communication.

- a) Able to deal with problem.
- b) Have problem solving attitude.
- c) Have problem analysis know-how.

Perspective Nature

An ability to look beyond the team to see how the project and the team fit in the organization as a whole.

Result Oriented

Project Manager's aim is not to complete it for work's sake, but to achieve the project goal.

Global Literacies

- ① The ability to succeed in a cross cultural environment.
- ② Understanding cross cultural issues.

Problem Solving Using Problem Tree

Developing a problem tree - steps:

- 1) Identify major problems existing within the stated problem areas.
- 2) Analyze their interrelationship and common issue. Determine the core problem among these major problems.
- 3) Write the causes of the major problems.
- 4) Write effects caused by the core problem.
- 5) Form a diagram of problem tree showing all effects and problems.
- 6) Review the diagram as a whole. Verify its completeness. Report from step 2-4 required.

- Expressing his/her thoughts or ideas
- written and Oral.
- Ensure
 - * simple & clearness.
 - * No complexity & ambiguity
 - * Completeness and comprehensiveness.
 - * Adequate feedback, if necessary.

Influencing

The ability to get people to do things that they would not do otherwise.

Leadership

- a) Impart Vision.
- b) Gain consensus for Goals
- c) Establish Directions.
- d) Inspire.
- e) Motivate
- f) self-assured leader.

Motivator

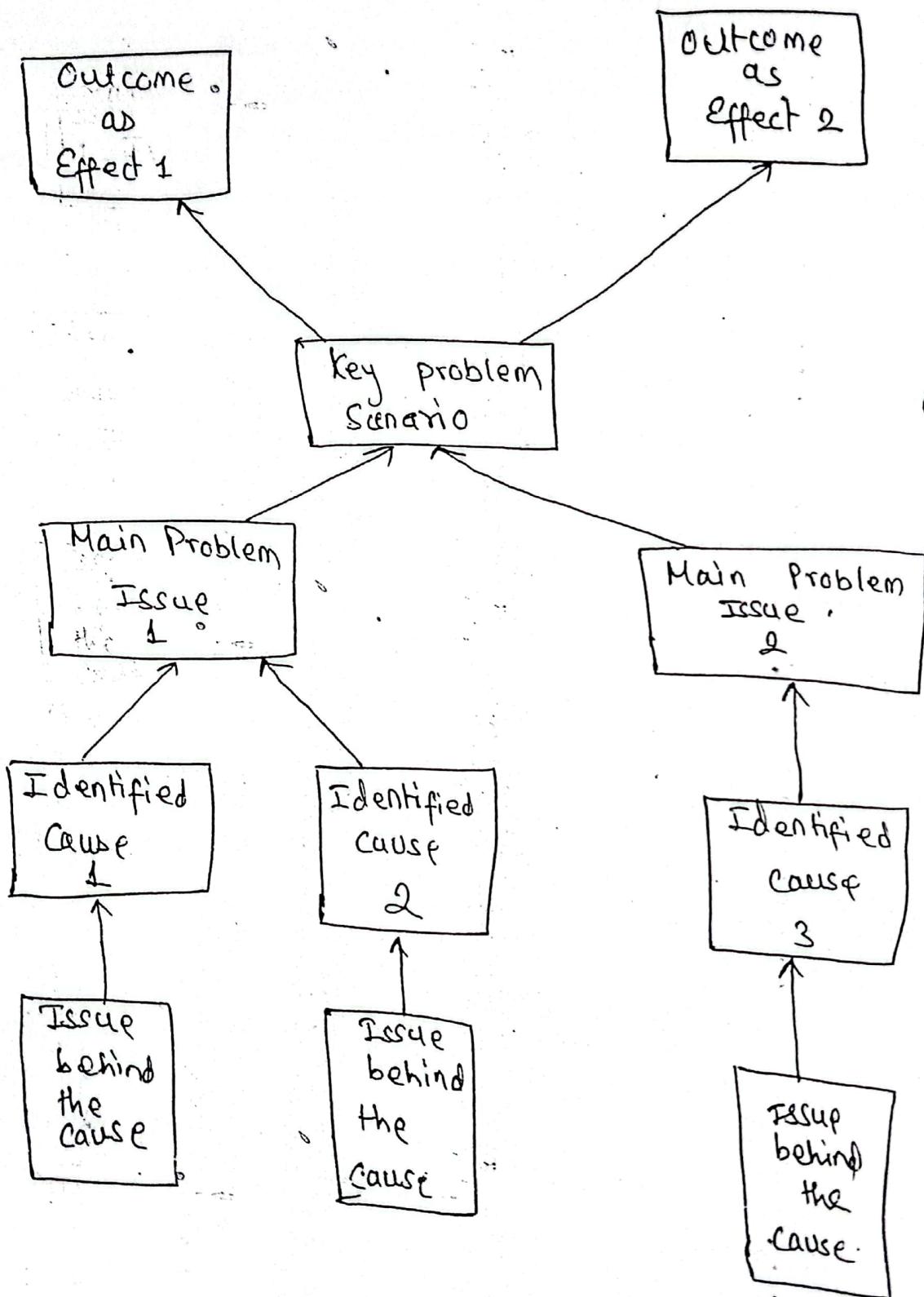
Energizing people to achieve high level of performance to overcome barriers to change.

Negotiation

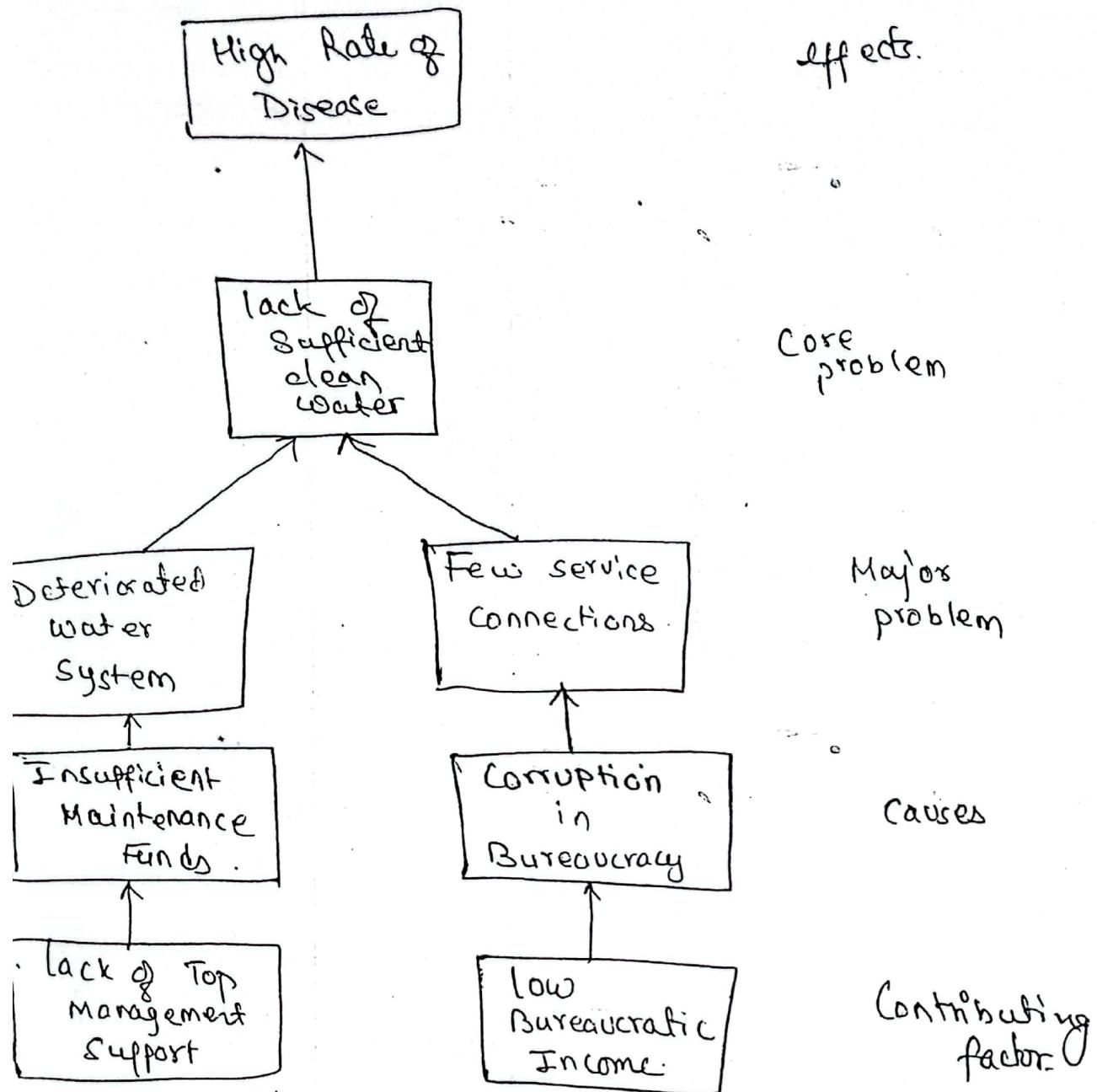
- 1) The ability while working with others, to come to an agreement.
- 2) It is the process of achieving consensus while avoiding conflict. Central to this is understanding that the best solution to a problem is one which attracts the consensus of all those involved.

Problem Solver

Problem Solving problem tree schematic diagram



Example:



Responsibilities of Project Manager

- Project Definition
- Project Team building
- Stakeholders Management
- Project Planning
- Project Organizational Design
- Project Implementation
- Project Progress control
- Financial Management -24-
- Change Management.

Chapter - 3

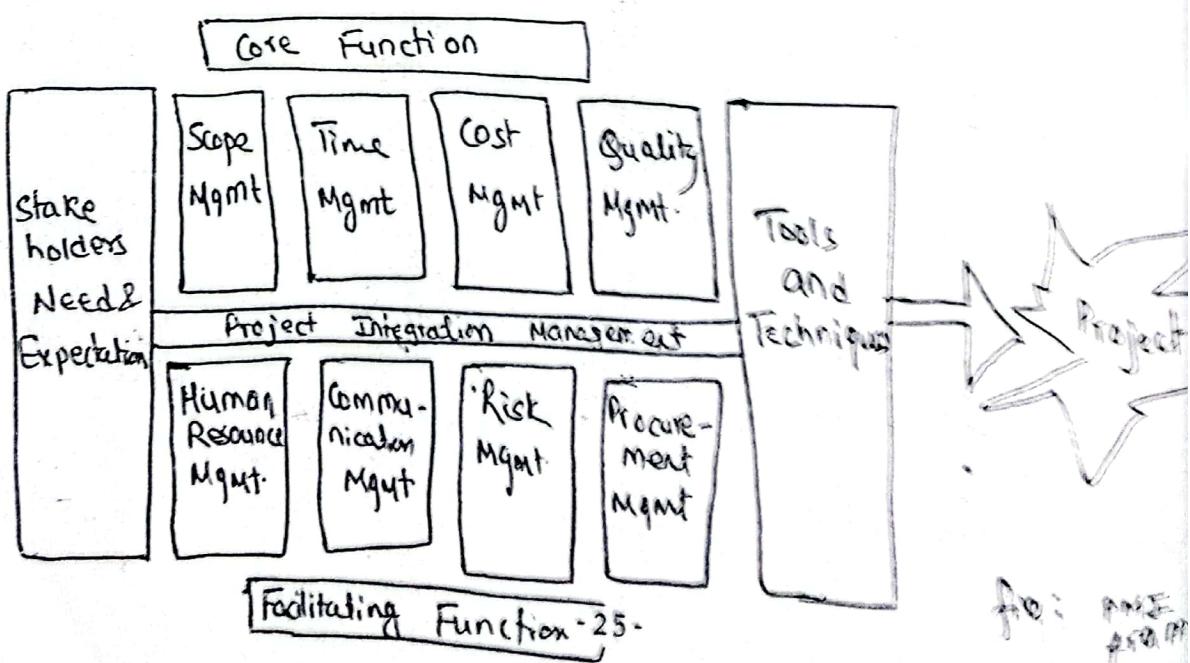
Portfolio and Project Management Institute (PMI) Framework

Project portfolio management (PPM)

Project portfolio Management is a strategy that allows organizations to align their IT and application development projects, resources and initiatives to corporate business objectives by developing and monitoring measures that treat assets as financial assets and to run as project-oriented business.

PPM enables integrated management of project scope, time, resource, skills, cost, procurement, communication, reporting and forecasting and management functions.

PMI framework



Stakeholders need & Expectations.

Stakeholders can be anyone involved in, interested in or affected by a project. End users who provide input to geospatial system design and analysis could be one example of stakeholders.

Project management knowledge areas

Project management knowledge areas are vital for project managers to understand. They are defined and delineated in a number of ways. This will follow the project Management Institute's knowledge area breakdown used for project management certification as a project management professional.

This knowledge areas are classified into following categories.

Core Knowledge areas

- Scope Management
- Time Management
- Cost Management
- Quality Management

Facilitating Knowledge areas.

- Human resources Management
- Communication Management
- Risk Management
- Procurement Management.

Integrative Knowledge areas

- Project Integration Management

Tools and techniques

Tools and techniques can help to increase understanding in any of these knowledge areas but are most vital in the core knowledge area. Although project management software packages can facilitate the use of these tools and techniques, the same techniques have long been used with pencil and paper.

Project Portfolios

Project portfolios attempt to integrate individual projects into a larger entity that can be aligned with an organization's vision and roadmap to success. The process is similar to investment portfolios that look at all holding and attempt to achieve a balance between risk and potential rewards.

Drivers of Project Success

- a) Top management support.
 - Very strong and visual commitment from top management.
 - CIO is always ready to help.
- b) clear Goals and Objectives.
- c) Client Support
- d) Realistic plan
- e) Appropriate resource (Man, Machine, Material, Money)
- f) Ownership
- g) Formal methodology
- h) Hard-working, focused staff
- i) Standard and structured ICT support
- j) Effective communication
- k) Experienced PM

Inhibitors of Project Success.

- a) Poor communication
- b) Lack of leadership
- c) Unclear expectations
- d) Poor up-front planning
- e) In-built negative attitude towards IT
- f) Changing business strategies
- g) Poor top management support
- h) Conflicts of objectives
- i) Inadequate resource
- j) Financial limitations
- k) Lack of historical data

Relationship between Inhibitors of project success and balanced-Score Card.

The balanced scorecard is a strategy performance management tool - a semi-standard structured report, reported by design methods and automation tools, which can be used by managers to keep track of execution of activities by the staff within their role and to monitor the consequences arising from these actions. As the balanced scorecard is ultimately just the identification of a small number of financial and non-financial measures, and attaching gets to them, so that when they are reviewed it is possible to determine whether current performance fits expectations. So managers can be alerted about areas where performance deviates from expectation. aware of these above mentioned inhibitors of project success. Managers can be encouraged to focus their attention on these areas.

Benefits of PPM

- a) Cost reduction and productivity increases.
- b) Business-based decision making.
- c) More predictable project outcomes.
- d) Closer alignment of IT with business.
- e) Better IT governance.

Types of PPM Users

(a) Execution-focused PPM users.

Manage the tactical details of project execution, with the reporting tools to communicate progress and expenditures back to business sponsors and executive management.

(b) Project Portfolio-level PPM users.

Create projects-related decision frameworks, selecting specific projects based on those frameworks, planning the delivery of those projects or investments, tracking those investments at a level and reporting on those activities.

Project Management Office

A Project Management Office (PMO) is a department within a business, agency or enterprise that defines and maintains standardization for project management within the organization and introduces classification of project Mgmt. roles & responsibilities, creation of archive data on lessons learned, and introduces new project management.

economics of repetitions in the execution of projects. PMO is established to create and maintain procedures and standards for project management methodologies to be used throughout the performing organizations. It is the source of documentation and metrics on the practice of project management and execution.

Types of PMO

Enterprise PMO

Organizational (departmental) PMO.

Special-purpose PMO.

Some Other types of PMO.

Functional PMO

Corporate PMO

Customer Group PMO

Function of PMO

Standardization in Estimation

Standardization in Planning

Standardization in Scheduling

Standardization in Control

Standardization in Report

Classification of project Mgmt. roles & responsibilities.

Creation of archive data on lessons learned.

- (f) Developing project management templates
- (g) Developing a project management methodology
- (h) Recommending and implementing changes and improvements to the existing project management methodology
- (i) Identifying project management standards
- (j) Identifying best practices in project management
- (k) Performing strategic planning for project management
- (l) Establishing a project management problem solving hotline.
- (m) Co-ordinating and/or conducting project management training programs.
- (n) Transferring knowledge through coaching or mentorship.
- (o) Developing a corporate resource capacity / utilization plan
- (p) Assessing risk in projects.
- (q) Planning for disaster recovery in projects
- (r) Performing & or participating in the post-project management of projects.
- (s) Acting as the guardian for project manager intellectual property.

Project Management Institute (PMI)

IT programs Management Office Community (CoP), views the PMO as a strategic driver of organizational excellence and seeks to enhance practices of execution management, organization and strategic leadership.

Recent Significant IT - Failures

<u>Company</u>	<u>Year</u>
Hudson Bay (Canada)	2005
UK Inland Revenue	2004/5
Avis Europe PLC (UK)	2004
Ford Motor Co.	2004
Hewlett - Packard Co.	2004
AT & T wireless	2004

Why IT projects fails ??

If decision makers in many organizations do not know how to analyze needs and focus resources on projects that would lead to better efficiency and cost savings.

Chapter - 4 Project Management

Project Management

Project management is the discipline of organizing, motivating and controlling resources to achieve specific goals.

It encompasses the knowledge, skills, tools and techniques to move forward project activities to meet the project requirements.

Advantages of project management

- ① Increased control of financial, physical and human resources.
- ② Improved customer relations.
- ③ Higher quality outcome.
- ④ Enhanced reliability in solutions.
- ⑤ Increased profit margins.
- ⑥ Improved productivity at work.
- ⑦ Better internal coordination.
- ⑧ Higher work morale.
- ⑨ Shorter development times.
- ⑩ Lower costs.

Project Management Context as per PMI

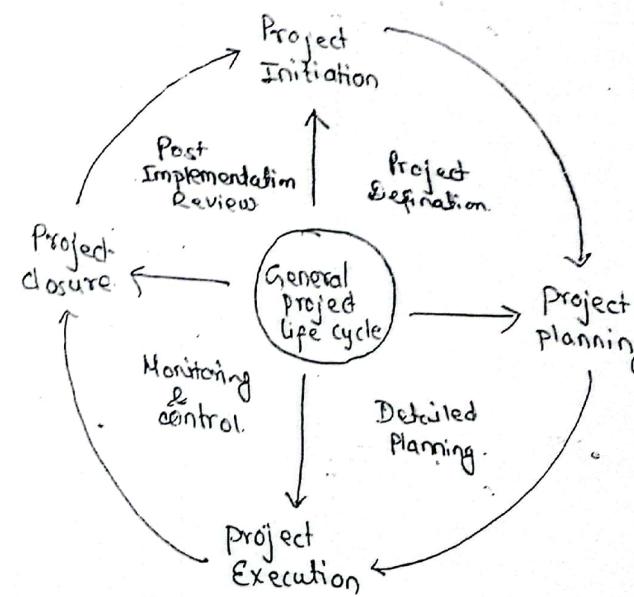
As per PMI, project management is sub-divided into different phases such as initiating, planning, executing, monitoring and closing. It helps decrease uncertainty.

Each phase is marked by completion of one deliverable.

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Project life cycles

Project life cycle refers to a logical sequence of activities to accomplish the project's goals or objectives. Project activities are grouped into phases so that the project manager and the core team can efficiently plan and organize resources for each activity. By planning activities by stages the project manager can objectively measure achievement of goals and justify their decisions to move ahead, correct, or terminate.



Project Initiation

It involves starting of project, by documenting business case, feasibility study, and terms of reference, appointing the team and setting up a project office.

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Project planning

It involves setting out the road map for project by creating the plans such as project resource plan, financial plan, quality plan, access plan and communication plan.

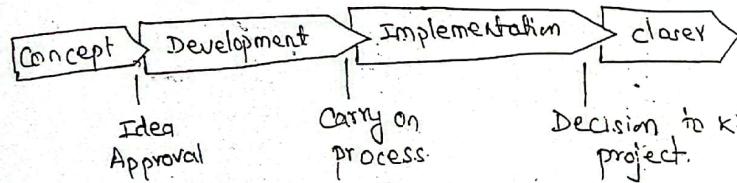
Project Execution

It involves building the deliverables controlling the project delivery, scope, costs, quality, risks and issues.

Project closure.

It involves winding down the project by staff, handing over deliverables to the customer, completing a post implementation review.

Different stages of project also can be illustrated below:



Project life cycle in different projects or Representative project life cycle

a. Construction

- Feasibility study
- Planning & design
- Construction
- Turnover & startup.

- b. Pharmaceuticals
- Discovery & screening
- Preclinical development
- Registration work
- Post-submission activities

Government Office

- ↳ feasibility study
- ↳ Concept and technology development
- ↳ System Development and Demonstration
- ↳ Production & Deployment
- ↳ Support

Defence

- ↳ strategic planning
- ↳ Concept and technology development
- ↳ System development and demonstration
- ↳ Production & deployment
- ↳ Support

Characteristics of project life cycle

project should successfully pass through each of the project phases ~~in order to continue~~ to the next.

Conclusion of a project phase is generally marked by a review on key deliverables and project performance, referred as:

→ Phase Exits / Stage Gates / Kill Points - Management review at this point determine whether the project should continue to its next phase and correct errors, if required.

Cost and staffing levels are low at start, higher towards the end and drop rapidly as the project close.

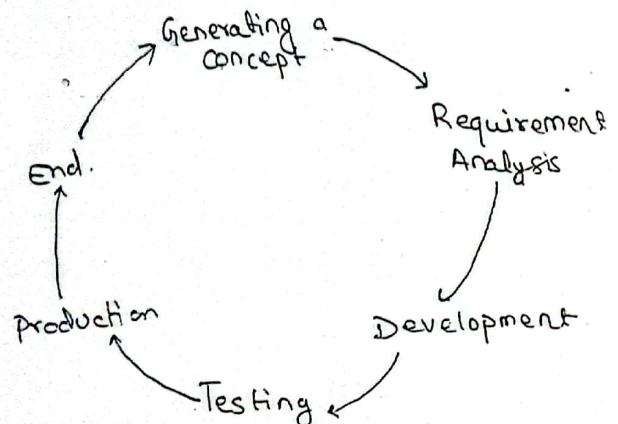
At the start of project,

- Risk and uncertainty are highest as because the probability of project success is low.
- Ability of the stakeholders to influence the "final characteristics of the project product" and "final cost is high" and gets progressively

lower as the project continues.

IT product Development life cycle (Basically Software Development)

Software Development Life Cycle (SDLC) is the process of developing software through business analysis, design, implementation and maintenance.
So SDLC is given below:



④ Generating a Concept:

The owner of the company feels that he needs software that would help him in tracking his expenses and income as well as enhance the selling process. This is how concept is generated. The owner will specifically tell the software company what kind of software he would like. In other words, he will specify his requirements.

⑤ Requirements Analysis: After the user knows his requirements, then it is given to a software who will analyze the requirement and prepare requirement document that will explain every end of it.

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functionality that are needed by the owner. The requirement document will be main documents for developers, testers and database administrators. In other words, this is the main documents that will be referred by everyone. After the requirement documents, other detailed documents may be needed. For example, a architectural design which is a blueprint for the design with the necessary specifications for the hardware, software, people and data resources.

Development:

After the detailed requirement documents, the developers start writing their code for their modules. On other hand, the testers in the quality assurance department start writing test plans, test cases and get ready for testing.

Testing:

Once the code are ready, they are compiled together and to make a build. This build is now tested by the software testers.

Production:

After testing, the application goes into production or handed to the owner.

End:

The owner will have to say bye to the software either because the business grows he does not meet the demand or for pre. reasons or he does not need the software.

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Product life cycle and Project life cycle

Product life cycle:

The product life cycle represents the amount of revenue a product generates over time from its inception to the point where it is discontinued. The five stages of the product life cycle are development, introduction, growth, maturity, and decline. In the development stage, the product isn't yet being sold, so there is no revenue. In the introduction stage, sales begin as people try the product. Sales will increase during the growth phase, peak during maturity, and eventually decline as the market shifts or better alternatives become available. There is a set time span for the given stage; the product life cycle may last only months, or a product like a refrigerator may remain in the maturity stage for decades.

The project life cycle has a definite end while the product life cycle may not. The product life cycle can have single or multiple projects.

The map for the product life cycle is somewhat conceptual and depends on the market condition. On the other hand projects have predictive and clearly defined roadmaps.

The product life cycle phases do not overlap while the project phases may overlap.

In the product life cycle, phases generally occurs only once, while in the project life cycle phases may repeat.

In the product life cycle phases are sequential, while in project life cycle phases may or may not be sequential.

System Development methodologies (SDM)

Project life cycles:

A project life cycle measures the work which goes into a project from beginning to end. The phases in project life cycle are initiation, planning, execution and closure.

[Note: Detailed about project life cycle is described].

Differences between Product life cycle and Project life cycle.

- ③ The product life cycle is longer than project life cycle.

SDM is a methodology based on phasing. For each phase in detail what has been agreed with stakeholders and what needs to be done in the implementation stage. SDM uses a process-oriented approach, this means that this method is mainly involved with the planning and organization of the system to make.

Software Development Models

Software Development Models

Predictive Models:

Waterfall, spiral, RAD etc. - 40-

Adaptive Models:

XP, Scrum, Agile etc.

Waterfall model

The waterfall model is a sequential (non-iterative) design process, used in software development process in which progress is seen as flowing steadily downwards (like a waterfall) through the phases conception, initiation, analysis, design, construction, testing, implementation and maintenance.

Requirements.

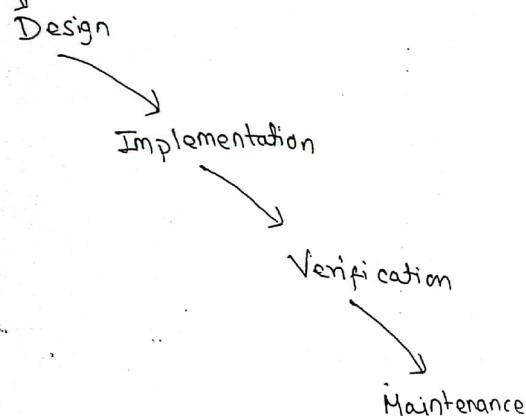


fig: waterfall model.

Requirements:

Unless you know what you are going to design, you cannot approach the problem. Here, specifications of the output or the final product is studied and marked.

Design

Every type of resource which will be required for the smooth designing of the software, is mentioned here in this phase. What type of database

be required, what type of data should be stored, etc are some of the important aspects are decided in this phase. The algorithms are in this phase which is most important.

Implementation

Here, the software is coded as per the algorithm. Hence it becomes very important that algorithm should be properly designed. The software designed, needs to go through constant software testing and error correction processes to find out if there are any flaw or errors.

Verification.

Various codes designed by different programmers are integrated and is tested. The setup of the software which needs to be installed at the client's systems is also tested and handed to client.

Maintenance Phase.

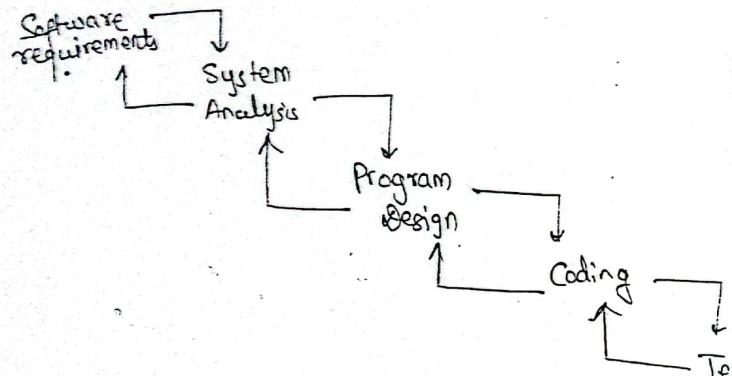
The cycle of software development does not end with handing the software to the client. Software designers may have to constantly provide support to the client to resolve any issues which may arise. During the maintenance phase, support and debugging is provided for all such problems.

Advantages

- 1. Simple.
- 2. Minimum resources.
- 3. Documentation is produced on every stage so that there is no problem on future.

- Disadvantages
- ① You cannot go back a step.
 - ② Any changes that a client mentions between may cause confusion.
 - ③ Problems if client changes his mind.
 - ④ Problems if technology differs.

Conventional Waterfall Model - Royce's Model



1. Systems and Software requirements:

- Captured in a product requirements document.

2. Analysis:

- Resulting in models, schema and business

3. Design:

- Resulting in the software Architecture.

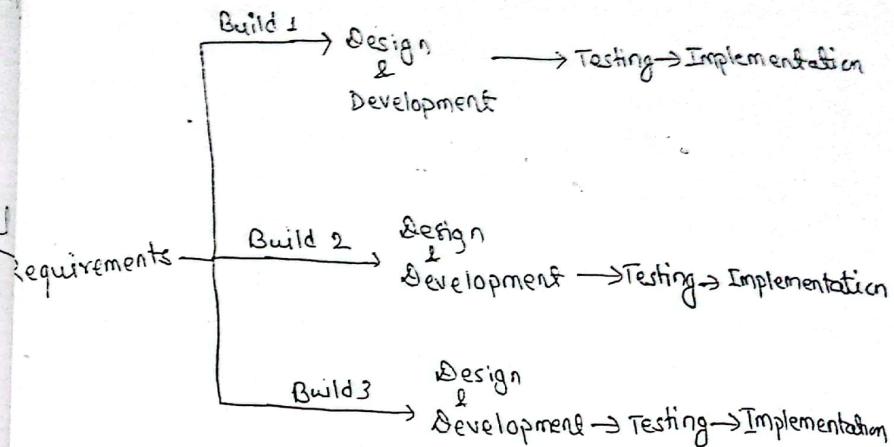
4. Coding:

- Development, proving and integration of software

5. Testing:

- Debugging of defects.

Iterative & Incremental Model



Iterative & incremental development is a combination both iterative design or iterative method and incremental build model for development. During software development, one or more iteration of the software development cycle may be in progress at the same time. This process may be described as an "evolutionary acquisition" or "incremental build" approach.

In this incremental model, the whole requirement divided into various builds. During each iteration development module goes through the requirements, design, implementation and testing phase. Each subsequent release of the module adds function to previous release. The process continues till the complete system is ready as per the requirement.

Advantages

Some working functionality can be developed quickly and early in the life cycle. Results are obtained early and periodically.

- ⑥ Parallel development can be planned.
- ⑦ Progress can be measured.
- ⑧ Less costly to change the scope / requirements.
- ⑨ Testing & debugging is easy.
- ⑩ Risks are identified and resolved during iteration and each iteration is an easily managed risk - High risk part is easier to manage.
- ⑪ With every increment, operational product is available.
- ⑫ Issues, challenges and risks identified from one increment can be utilized / applied to the next increments.
- ⑬ Risk analysis is better.
- ⑭ It supports changing requirements.
- ⑮ Initial operating time is less.
- ⑯ Better suited for large and mission-critical projects.

Disadvantages

- ① More resources may be required.
- ② Although cost of change is lesser, but it is not suitable for changing requirements.
- ③ More management attention is required.
- ④ System architecture or design issues may arise because not all requirements are gathered in the beginning of the entire life cycle.
- ⑤ Defining increments may require definition of process.
- ⑥ Not suitable for small projects.
- ⑦ Management complexity is more.
- ⑧ End of project may not be known.

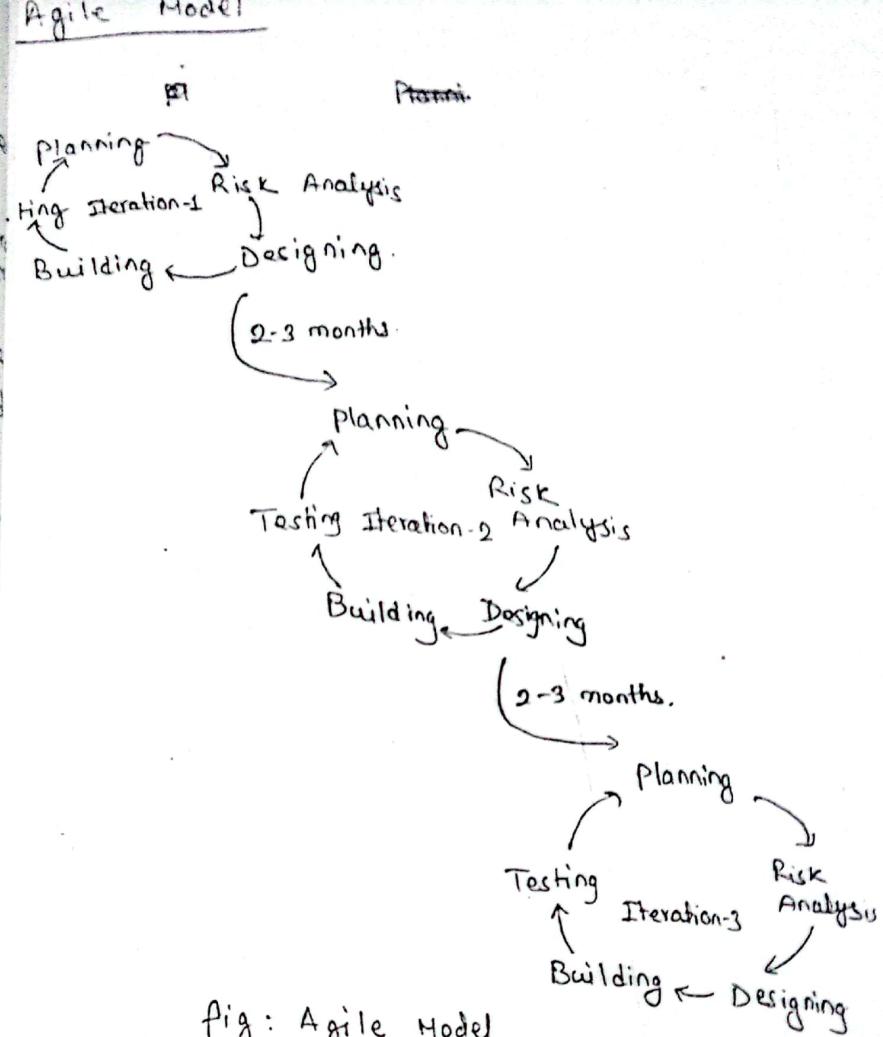


Fig: Agile Model

Agile SDLC model is a combination of iterative and incremental process models with focus on process adaptability and customer satisfaction by rapid delivery of working software product. Agile methods breaks the product into small increments builds. These builds are provided in iterations. Each iteration typically lasts from about one to three

weeks. Every iteration involves cross functional teams working simultaneously on various areas.

- Planning
- Requirements Analysis
- Design
- Coding
- Unit Testing
- Acceptance testing.

Agile Manifesto principles.

Individual & Interactions
Working Software
Customer collaboration
Responding to change

Advantages

- (a) Realistic approach.
- (b) Promotes teamwork and cross training.
- (c) Functionality can be developed rapidly and demonstrated.
- (d) Resource requirements are minimum.
- (e) Suitable for fixed or changing requirements.
- (f) Delivers early partial working solutions.
- (g) Good model for environments that change frequently.
- (h) Minimal rules, documentation easily employed.
- (i) Little or no planning required.
- (j) Easy to manage.
- (k) Gives flexibility to developers.

Disadvantages.

- (a) Not suitable for handling complex dependencies.
- (b) More risk of sustainability, maintainability and extensibility.
- (c) An agile leader and agile PM practice is most important.

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strict delivery management dictates the scope, functionality to be delivered, and adjustments to meet the deadlines.

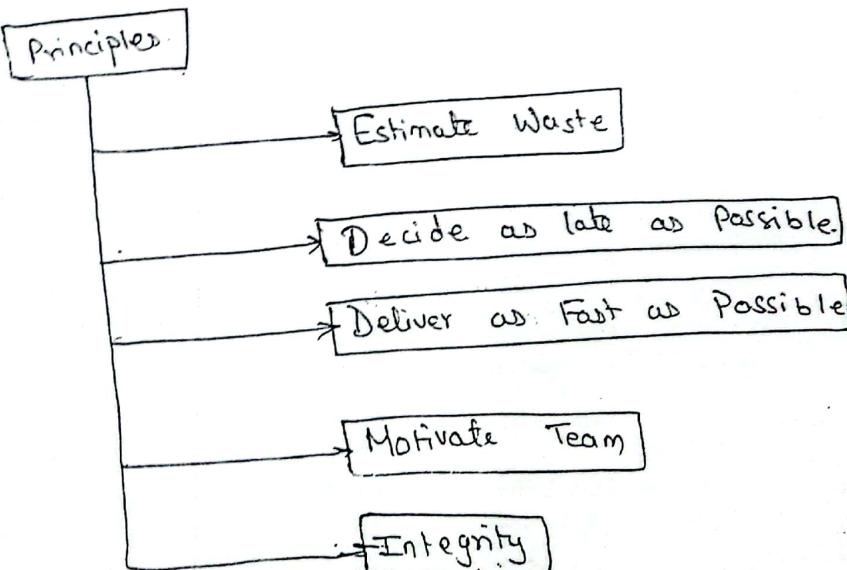
Depends heavily on customer interaction, so if customer is not clear, team can be driven to wrong direction.

e) High individual dependency due to minimum documentation.

Lean Model

A lean model is a systematic approach to identify and eliminate the waste through continuous improvement by flowing the product at the demand of the customer in the pursuit of perfection.

Principle of lean Model



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Eliminate waste.
Only deliver what's needed to the end user.

Decide as late as possible
Make decisions taking time so that they can be based in facts rather than assumptions.

Deliver as fast as possible.

Faster a product is delivered, faster you will get user response and faster you can improve in the next iteration. The concept is not fast coding, but try to deliver small user identified chunks for better understanding.

Motivate team

Motivate the team, give them roles; keep your team spirit high and whatever you can do to make them feel good in the project. A highly motivated team delivers project on time.

Integrity

Software system should be delivered in loosely coupled components. Every component or module function individually and when integrated with the project it works perfectly well. It should be a plug and play from the end user point of view. This spirit is derived from how actual production system work.

Advantages

- (A) Increased customer satisfaction.
- (B) Increased productivity.
- (C) Improved utilization of space or work areas.
- (D) Improved ability to react to changes.

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is advantages
Arranging right type of experienced people.
keeping high level of team cohesion.

Role and Responsibilities of key Project Members

Project Manager

- Managing project deliverables in line with the project plan
- Developing and maintaining a detailed project plan.
- Detailed project planning and control.
- Managing co-ordination of the partners and working groups.
- Recruiting project staff.
- Recording & Managing project issues
- Resolving cross-functional issues.
- Managing project scope
- Monitoring project progress & performance.
- Providing status reports to sponsor.
- Managing project training within the defined budget.

Project Sponsor

- Assured availability of essential project resource.
- Approves the budget.
- Besides tolerances.
- Leads the project Board.
- Ultimate authority -50-

System Administrator:

- Data Migration.
- Interfaces with other systems.
- Reporting, configuration and deployment.
- Set-up and maintenance of security.
- Contributing to technical strategy, policy and procedure.
- Development and operation of technical test programs.

Functional Manager:

- Provide all necessary support service to the project, including purchase.
- Managing HR and administration of performing organization.

Chapter - 5

Project and Organizational Structure.

System View of Project Management:

Project Management System is an organized set of tools and procedures for helping managers and teams to achieve project objectives.

Project System View consist of three parts:

System philosophy.

System analysis.

System management.

System philosophy.

View things as systems, interacting components working within an environment to fulfil some purpose.

System Analysis

Problem Solving approach.

System Management:

Address business, technological and organizational issues before making change to the system.

Key essences of System View of Project Management.

- ① Structured approach
 - organizational structure.
- ② Disciplined approach.
 - Coordinated management processes.
- ③ Defined approach.
 - Purposefully defined inputs and outputs for each process.

Organizational Structure

Organizational structure represents the formal relationship and main line of communication, flow of responsibility and authority through the management hierarchy.

Forms of organizational structure:

- ① Functional Organization
- ② Projectized Organization
- ③ Matrix Organization
 - ↳ Strong Matrix
 - ↳ Weak Matrix
 - ↳ Balanced Matrix.

① A functional organization

A functional organization is a common type of organizational structure in which the organization is divided into smaller groups based on specific functional areas such as IT, finance or marketing.

Functional departmentalization arguably allows greater operational efficiency because employees with shared skill and knowledge are grouped together by function.

A disadvantage of this type of structure is that the different functional groups may not communicate with one another, potentially impacting flexibility and innovation.

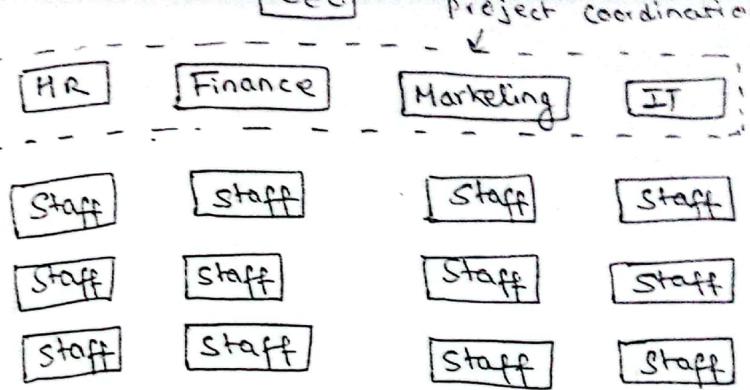


fig: functional Organization.

Projectized Organization Structure

Here, the project manager is in-charge of his project, and he has full authority over it. Everyone in his team reports to him.

The projectized organization structure is opposite to the functional organization structure. Here, either there will be no functional manager or if he exists, he will have a very limited authority. There is one of the main benefits of project-organized structure, as they are adaptive and learn from their own as well as from others' experiences.

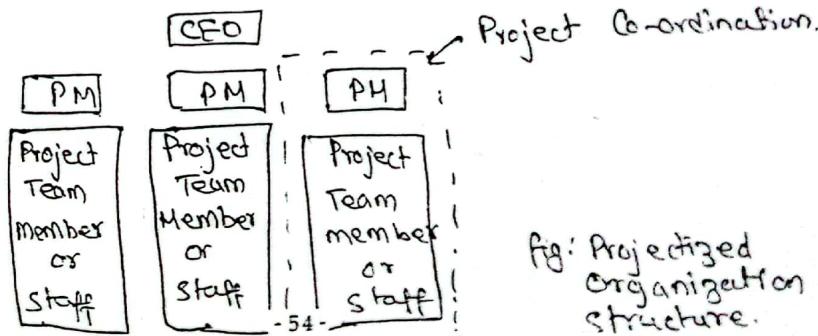


fig: Projectized Organization structure.

④ Matrix Organization

Matrix Organization

A matrix organizational structure is ~~recg~~ Matrix Organization

Company structure in which the reporting relationships are set up as a grid, or matrix rather than in the traditional hierarchy. In other words, employees have dual reporting relationships - generally to both functional manager and a product manager.

Balance of power is with the "Manager of project". PM rules the day but members are under functional manager.

Advantages

- Advantages

 - ⑤ Resources can be utilized properly, experts and equipment can be shared in project.
 - ⑥ Products and projects are formally coordinated across functional departments.
 - ⑦ Information flows both across and up the organization.
 - ⑧ Employees are in contact with many people which helps with sharing of information can speed the decision process.

Disadvantage

The matrix structure is generally considered the toughest organizational form to work due to conflicting rules on resources.

Types

Strong matrix Organization
Weak Matrix " "
Balanced " "

Balanced "

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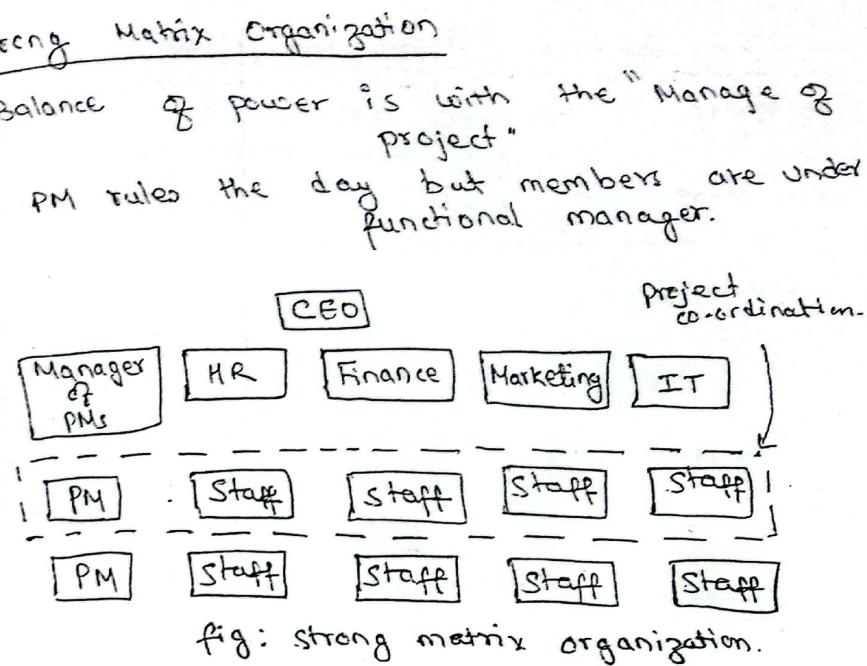


fig: strong matrix organization

Weak Matrix Organization

- PMs are simply "Project Coordinators" having very limited authority.
 - ↳ Functional Manager assigns works and PM negotiates, if required
 - ↳ PM expedites / facilitates the project.

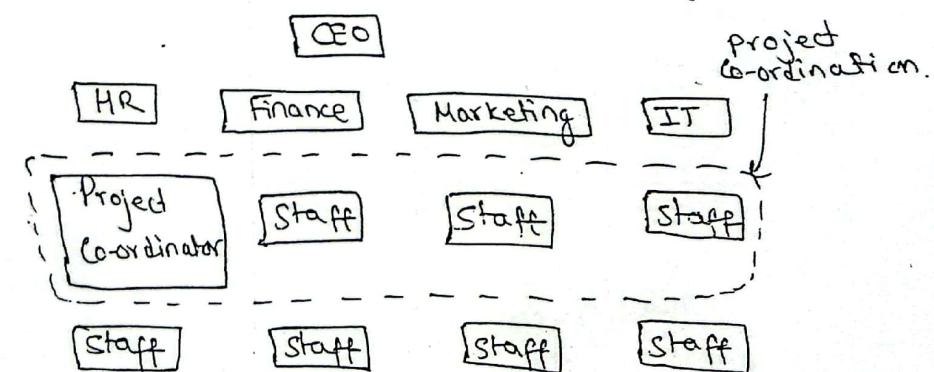
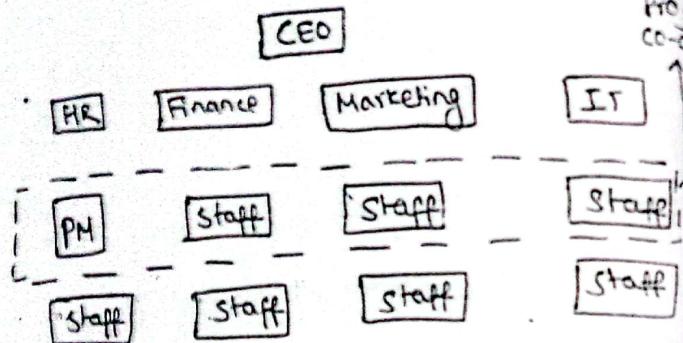


fig: Weak matrix organization.

The Balanced Matrix Organization

- ↳ Power is balanced between PM and functional manager - both have equal authority
- ↳ Staff are assigned for the project to project needs by PM.
- ↳ Functional Manager facilitates to the project needs



Organizational structure Influences on project

Project characteristics	Organizational structure	Functional	Matrix			Projectized or pure
			Weak	Balanced	Strong	
Team Member's Authority	Little or None	Limited	Low to Moderate	Moderate to High	High	
Team Member's Role	None	0-25%	15-60%	50-95%	85-100%	
Common Title for M's Role	Part time	Part time	Full time	Full time	Full time	
M's Administrative Staff	Project Coordinator / Project Leader	Project Coordinator / Project Leader	PM / Project Officer	PM / Program Manager	PM / Program Manager	

fig: Balanced Matrix Organization

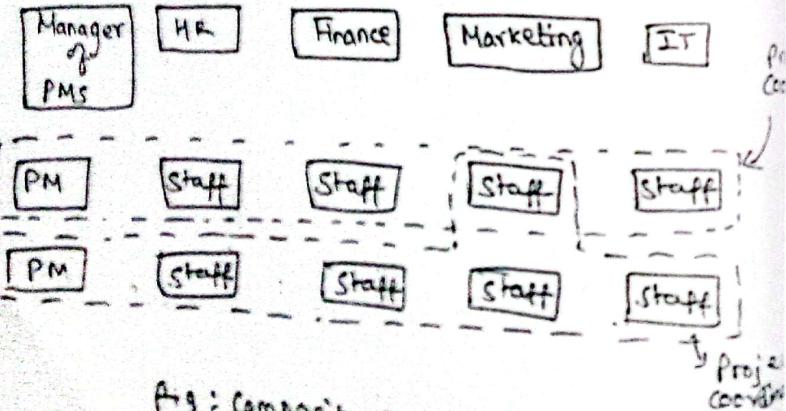


Fig: Composite organization structure

→ It is also known as mixed structure.

Chapter - 6 Project Management Process Groups

Project Management Process

Project Management Process
↳ These are concerned with describing and organizing the work of project.
↳ Five process. They are:

There are mainly five processes.

- Initiating processes.
 - Planning processes.
 - Executing processes
 - Controlling processes
 - closing processes.

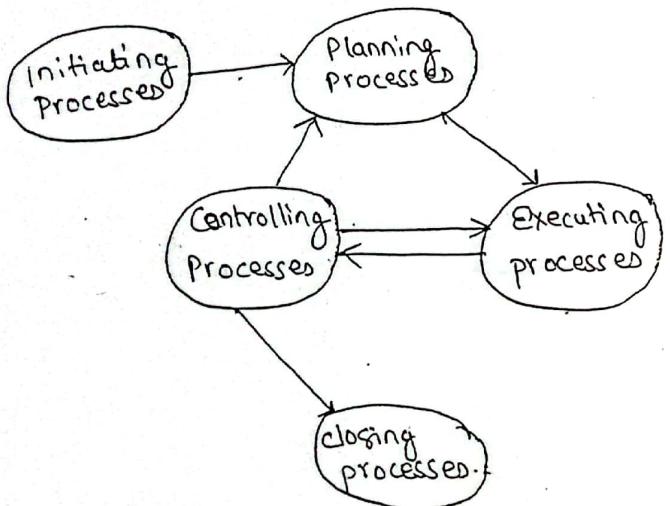


fig: links among ~~pre~~ process groups in a pho

Initiating process: Recognizing that a project phase should begin and committing to do so.

Planning processes: Devising and maintaining workable scheme to accomplish the business that the project ⁻⁵⁹⁻ undertaken to address

Executing process: Co-ordinating people and other resources to carry out the plan.

Controlling process: Ensuring that project objectives are met by monitoring and measuring progress and taking corrective action when necessary.

closing process: Formalizing acceptance of the project or phase and bringing it to an orderly end.

Overlaps of process groups in a phase.

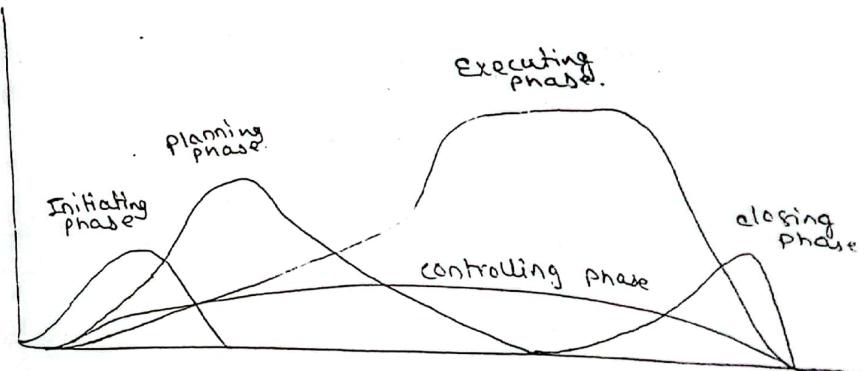


fig: overlaps of process groups in a phase.

Mapping a Project Management Process Groups to Areas of knowledge.

Chapter-7

Project Integration Management

Integration management is a collection of processes required to ensure that the various elements of projects are properly coordinated. It involves making trade-offs among competing objectives and alternatives to meet or exceed stakeholder needs and expectations.

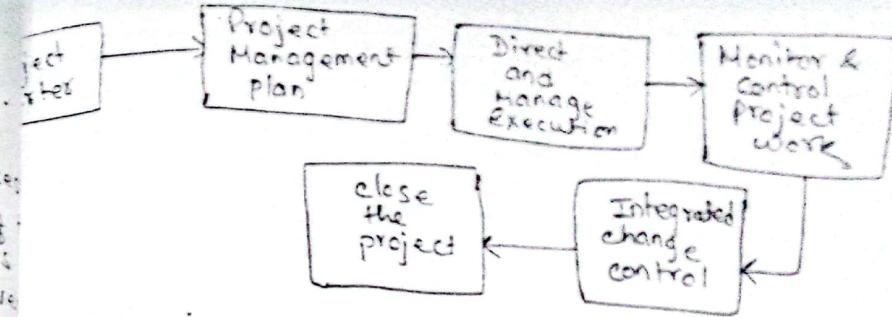
Also it includes the processes needed to define, combine, unify and co-ordinate the various processes and project management activities w/Project Charter.
the project management process groups.
It is the most important knowledge area for the project manager.

- Manage change and communication.
- Reduce project time and cost.
- Involve stakeholders early and often.
- Make results visible.
- Identify problems / solutions early.
- Use relevant experience as early as possible.

Integration Management Processes

- ① Develop Project Charter.
- ② Develop Preliminary Project Scope Statement.
- ③ Develop Project Management Plan.
- ④ Direct and Manage project Execution.
- ⑤ Monitor and Control Project Work
- ⑥ Integrated Change Control.
- ⑦ Close project.

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→ process has
• Input, tools and techniques and
• Output

A project charter is a document that formally recognizes the existence of a project and provides direction on the project's objectives and management. The project charter serves as an agreement contract between the project sponsor and project team - documenting the project's Measurable organizational value (MOV), defining its infrastructure, summarizing the project plan details, defining roles and responsibilities, showing project commitments and explaining project control mechanisms.

Project charter describes:

- ① Project need and perceived opportunity.
- ② Key goals and objectives.
- ③ Basic project scope.
- ④ Identified tangible and intangible benefits from the project.
- ⑤ Specified project evaluation criteria.

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Developing a Project charter

The project charter either directly or by reference to other documents should address the following information:

- ① Requirements that satisfy customer, sponsor, or other stakeholder needs, wants and expectations.
- ② Business needs, high-level project description, product requirements that the project is undertaken to address.
- ③ Project purpose or justification.
- ④ Assigned Project Manager and authority level.
- ⑤ Summary milestone schedule.
- ⑥ Stakeholder influences.
- ⑦ Functional organizations and their mode of participation.
- ⑧ Organizational, environmental and external assumptions.
- ⑨ Organizational, environmental and external constraints.
- ⑩ Business case justifying the project, including return on investment.
- ⑪ Measurable organizational values (MOR).
- ⑫ Summary budget.
- ⑬ Quality issues.
- ⑭ Assumptions and risks.

Project charter Development Process

The project charter development process include

Inputs

- (i) Contract
- (ii) Statement of work
- (iii) Enterprise environmental factors
- (iv) Organizational process assets.

Tools and Techniques

- (i) Project selection methods.
- (ii) Project management methodology.
- (iii) Project management information system.
- (iv) Expert judgment.

Output : Project charter

Statement of Work

A narrative description of the products or services to be supplied under contract is called statement of work. The statement of work includes the following:

Business Needs: Business need due to market demand, customer request, technological advancement, legal requirements and social needs etc.

Product Description: It includes known outline of product or services, characteristics of product or services.

Strategic planning: strategic planning involves determining long-term objectives, predicting future

trends, and projecting the need for new products and services.
Organizations often perform a SWOT analysis.

SWOT: Strength, Weakness, Opportunities and Threats

SWOT analysis

Very important to have managers from outside the IT department assist in the planning process as they can help to understand organizational strategies and identify the business areas that support them.

As part of strategic planning organizations:

- Identify potential projects.
- Use realistic methods to select which projects to work on.
- Formalize project initiation by issuing a project charter.

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- Use realistic methods to select which projects to work on.

→ Formalize project initiation by issuing a project charter.

Organizational Process assets

Organizational process assets are formal and informal policies, procedures and guidelines that could impact how project scope is managed.
Organizational process assets include:

Organizational policies pertaining to project scope planning and management.

Organizational procedures related to project scope planning and management.

Historical information of previous project and lesson learned.

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Organizational process assets include:

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→ Organizational procedures related to project scope planning and management.

→ Historical information of previous project and lesson learned.

Project management Methodology :

A project management methodology defines a set of project management process groups, their related processes and the related controls functions that are consolidated and combined into a functioning unified whole. A project management methodology may or may not be an elaboration of a project management standard.

Project Management Information System (PMIS)

PMIS are system tools and techniques used in project management to deliver information. Project managers use the techniques and tools to collect, combine and distribute information through electronic and manual means. Project management Information System (PMIS) helps plan, execute and close project management goals. During the planning process, project managers use PMIS for budget framework such as estimating costs. PMIS is also used to create a specific schedule and define the scope baseline.

Function of PMIS

- (a) Project information gain
- (b) Project monitoring.
- (c) electronic communication.
- (d) Project activity tracking.
- (e) Project data analysis.
- (f) change management.

Project Selection methods:

- Methods for selecting projects include:
- Focusing on broad organizational needs
 - Categorizing IT projects.
 - Performing net present value or other financial analysis.
 - Using a weighted scoring model scorecard.
 - Implementing a balanced scorecard.

In practice, organizations usually use a combination of these approaches to select projects. Each approaches has its advantage and disadvantages.

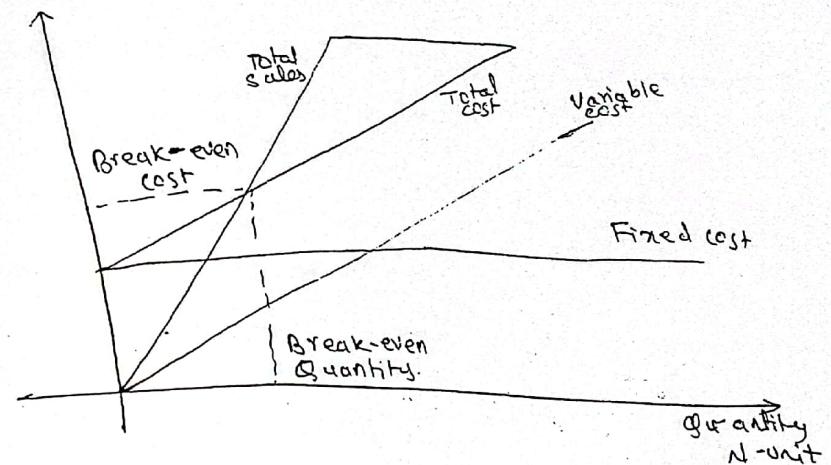
⇒ Focusing on Broad Organizational Needs:

Projects that address broad organizational needs are more likely to be successful because they will be important to the organization. It is often difficult to provide strong justification for many IT projects and/or estimate their financial value, but everyone agrees they have a high value. "It is better to measure gold roughly than to count pennies precisely."

The important criteria for projects are:

- There is a need for the project.
- There are funds available.
- There's a strong will to make the project succeed.

Break-even Analysis



- AKA Cost - Volume - Profit (CVP) Analysis.
- At Breakeven-point:

$$\text{Profit} = \text{Sales} - (\text{variable expenses} + \text{fixed expenses})$$

$$\text{Sales} = \text{Profit} + \text{variable expenses} + \text{fixed expenses.}$$

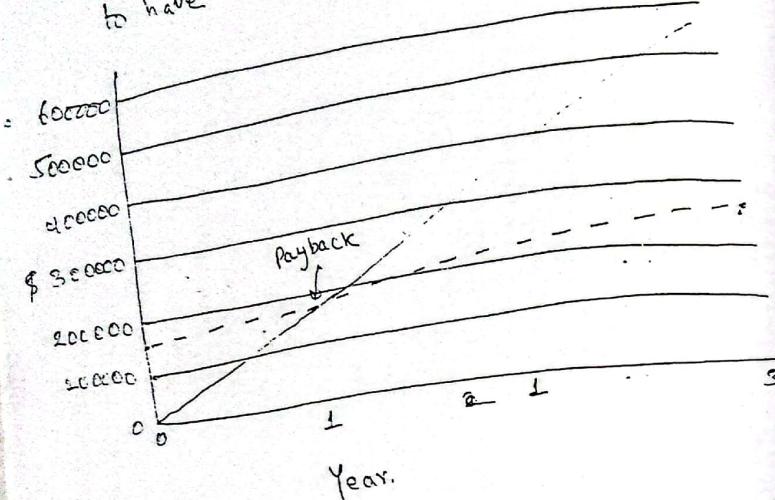
- Categorizing It projects: One categorizing and outflows to the present point in time is the impetus for a project. i.e., projects with a positive NPV should be considered if financial value is a key criterion because that means the return from a project exceeds the cost of capital. The higher the NPV, the better the project will be.
- A problem is an undesirable situation that prevents an organization from achieving its goals - system slow, need upgrades.
 - An opportunity is a chance to implement on Investment (ROI) the organization - creating a new project.
 - A directive is a new requirement imposed by management, government and some external influence - medical technologies must meet requirements.
- Return on investment (ROI) is calculated by subtracting the project costs from the benefits.
- $ROI = \frac{\text{Total discounted benefits} - \text{total discounted costs}}{\text{Discounted costs}}$

- Financial Analysis of the projects: Financial considerations are often an important consideration in selecting projects.
- Three primary methods for determining projected financial values of projects
- (A) Net present Value (NPV) analysis
 - (B) Return on Investment (ROI)
 - (C) Payback analysis.
- the higher the ROI, the better the project will be. Many organizations have a required rate of return or minimum acceptable rate of return on investment or projects. Internal rate of return (IRR) can be calculated by finding the discount rate that makes the NPV of all cash flow equal to zero. Mathematically, the IRR is defined as any discount rate that results in an NPV of zero of a series of cash flows.
- In general, if the IRR is greater than the project's cost of capital, or hurdle rate, the project will add value for the company.

Net - present Value Analysis

Net present value (NPV) analysis is a method of calculating the expected net monetary gain or loss from a project over time. Another important financial consideration is payback analysis. This payback period is the amount of time it will take to recoup, in the form of

net cash inflows, the total dollars invested in a project. Payback occurs when cumulative benefits equals the net costs. Many organizations want IT projects to have a fairly short payback period.



Weighted scoring model

A weighted scoring model is a tool that provides a systematic process for selecting projects based on many criteria.

⇒ Identify criteria important to the project selection process, e.g.,

- ⇒ Support key business objectives
- ⇒ Has strong internal sponsor support
- ⇒ Has strong customer support

⇒ Assign weights (%) to each criterion they add up to 100%.

⇒ Assign scores to each criterion for project

⇒ Multiply the scores by the weights of the total weight

the higher the weighted score, the better the project will be. Implementing a Balance Score Card.

The balanced scorecard is a strategic planning and management system that is used extensively in business and industry, government and nonprofit organizations worldwide to align business activities to the vision and strategy of the organizations, improve internal and external communications, and monitor organization performance against strategic goals. It can help your organization by translating high level organizational strategy into something that employees can understand and act upon in their day-to-day operations and initiatives. An effectively implemented balanced scorecard can help an organization in many ways:

- ⇒ Increase focus on strategy & results instead of tasks.
- ⇒ Breakdown communications silos between departments.
- ⇒ Better understand and react to customer needs
- ⇒ Improve organizational performance by measuring what matters.
- ⇒ Helps leaders budget time and resources more efficiently.
- ⇒ Help leaders and employees prioritize the work they do.
- ⇒ Help leaders to make better decisions.

Expert Judgment

Expert judgment is often used to assess the input needed to develop the project charter. Such judgment and expertise is applied to only technical and management details during this process. Such expertise is applied to only technical and management details during this process. Such expertise is provided by one group or individual with specialized knowledge or training, and is available from many sources, including:

- ④ consultants
- ④ stakeholders
- ④ professionals
- ④ industry groups.

Preliminary Project Scope Statements

A preliminary project scope statement is one of the outputs of the project initiation process. The purpose of the preliminary project scope statement is to identify the high level project objects. The project objectives must be clear, actionable and measurable.

Sections for preliminary project scope statement include:

- ④ Project Description

	Project Purpose
④ Project Objectives	
④ Project Requirements	
④ Project Assumptions	
④ Project Constraints	
④ Project Boundaries	
④ Project Risks	
④ Project Deliverables	
④ Project Milestones	
④ Project high level work-breakdown structures (WBS).	
④ Rough order of magnitude (ROM) estimate.	

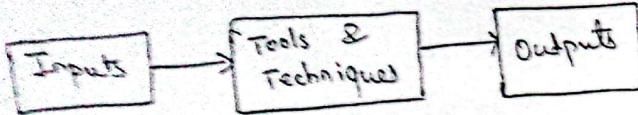
Developing preliminary project scope statements

Developing preliminary project scope statements include following things:

- ④ Inputs
 - i) Project charter.
 - ii) Project statement of work enterprise of work.
 - iii) Enterprise environment factors.
 - iv) Organizational process assets
- ④ Tools and techniques.
 - i). Project management and methodology.
 - ii) Project management information system.
 - iii) Expert judgment.

Output:

- Preliminary project scope statement.



Project Management Plan

A project management plan, according to PMBOK, is a formal approved document used to guide project execution and project control. The primary uses of project plan are to document planning assumptions and decisions, facilitate communication among project stakeholders, and document approved scope, cost and schedule baseline.

Developing a project management Plan

(A) Inputs:

- i) Preliminary Project Scope Statement
- ii) Project Management Processes
- iii) Enterprise Environmental Factors
- iv) Organizational Process Assets.

(B) Tools & Techniques:

- i) Project Management Methodology
- ii) Project Management Information System.
- iii) Expert judgment.

(C) Output:

- i) Project Management.

Project Planning Matrix (PPM)

Project Planning Matrix (PPM) or logical framework is a tool used in project planning to develop a well designed, objectively described and valuation-based projects.

PPM Project title Narrative summary	Start Date	Completion Date	Date of Analysis
Project goal	OVIs Measure of project Goal Achievement	MoV Way to measure the achievements of project	IAs long term value of project
Project purpose	Purpose fulfillment conditions	way to understand completeness of project	Purpose to goal
Outputs	Magnitude & characteristics of outputs.	Correctness	Output to purpose link
Inputs	level of effort or expenditure for each activity.	fulfilment	Input to Output link.

PPM is a matrix of four columns and four rows providing sixteen squares for a comprehensive description of project. PPM shows both the project logical structure and its major quantitative data. PPM is useful in planning process.

b) Deciding on the project & in executing it.

Characteristics of PPM

- i) Project logic moves vertically input to goal.
- ii) Horizontal logic moves horizontally from NS to goal.
- iii) cell center items should be linked properly.

Stakeholder Analysis

Stakeholder analysis in project management is the process of identifying the individuals or groups that are likely to affect or be affected by proposed action, and sorting them according to their impact on the action and impact on action will have on them. This information is used to assess how the interests of these stakeholders should be addressed in a project plan, policy, program or other action. Stakeholder analysis is a key part of stakeholder management. Stakeholder analysis document has information such as:

- a) Stakeholder's name and organization.
- b) Roles on the project.
- c) Unique facts about stakeholders.
- d) Level of influence and interest in the project.
- e) Suggestions for managing relationships.

Types of Stakeholders.

a) Primary Stakeholders

- are those ultimately affected either positively or negatively.

b) Secondary Stakeholders

- are the intermediaries, that is persons or organizations who are indirectly affected by an organization's action.

c) Key Stakeholders:

have significant influence or importance within an organization.

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Baseline Management

A baseline is used to perform analysis to find current performance against the expected level for a specific activity in established time-phase.

Project Baseline include:

- Schedule Baseline
- Cost Baseline
- Scope Baseline
- Quality Baseline

Key Elements of Baseline Project Plan.

- Scope Statement
- WBS
- Risk Management Plan
- Responsibility Assignment Matrix
- Logical Project Schedule
- Subsidiary management Plan:
 - ⇒ Cost Management Plan
 - ⇒ Staffing Plan
 - ⇒ QA Plan
 - ⇒ Communication Management Plan
 - ⇒ Disaster recovery plan

- Performance Measurement Baselines.
- Scope
- Schedule and
- Cost)

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Direct and Manage Project Execution.

Project plan execution involves managing and performing the work described in the project plan.

The application areas of the project directly affects project execution because the products of the project are produced during execution.

Skills for Project Execution

- General management skills. Eg: leadership, political communication etc.

- Product skills and knowledge.

Development of Direct & Manage Project Execution

overflow

a) Inputs

- 1) Project Management Plan
- 2) Approved corrective actions
- 3) Approved preventive actions
- 4) Approved change request.
- 5) Approved defect repair
- 6) Validate defect repair.
- 7) Administrative closure procedure.

b) Tools and Techniques.

- 1) Project Management Methodology.
- 2) Project Management Information System.

c) Output

- 1) Deliverables in project plan
- 2) Requested changes
- 3) Implemented change request.

- 4) Implemented corrective actions.
- 5) Implemented preventive actions.
- 6) Implemented defect repair.
- 7) Work performance information.

Task Implementation Workflow

As an outcome of System Analysis and Design development task are usually generated from solution scenarios as well as from URS and SRS. They represent new features or enhancement of existing function.

Task implementation workflow in IT Projects.

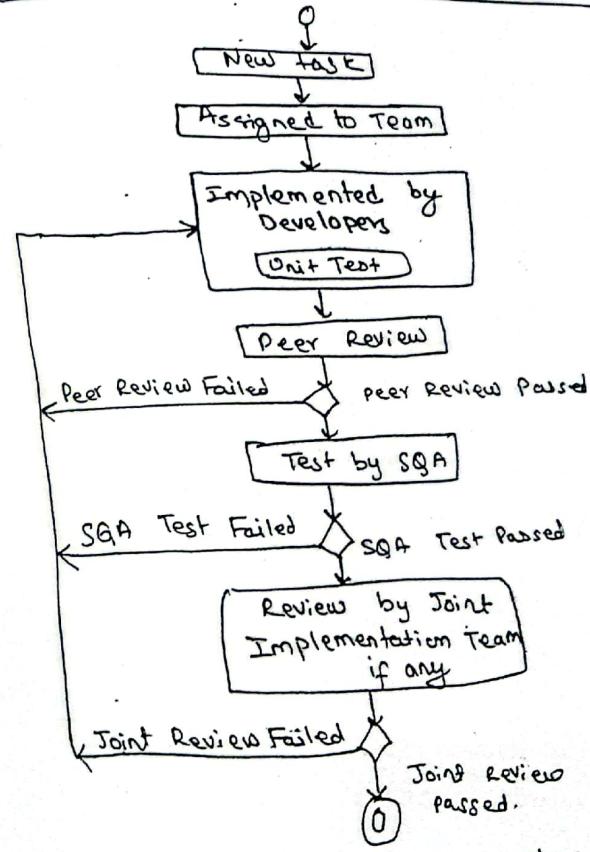


Fig: Task Implementation Workflow.

Work Performance Info.

Work performance as output of managing and controlling project work is the process of performing the work described in the project management plan. Monitoring, reviewing and regulating work is the process of tracking, reviewing and regulating work to meet the performance objectives defined in the project management plan.

- Schedule performance.
- Completed, pending and incomplete deliverables.
- Extent to which quality standards are being met.
- Resource utilization details.
- Lessons learned.
- Conflicting issues that raise and/or need to be addressed to maintain smooth work environment.

Monitor and Control Project Work

Monitor and control project work processes.

(a) Inputs.

- i) Project Management Plan.
- ii) Requested changes.
- iii) Work performance information.

(b) Tools & Techniques.

- i) Project Management Methodology.
- ii) Project Management Information System.
- iii) Earned value management.
- iv) Expert judgment.

(c) Output

- i) Recommended corrective actions.
- ii) Recommended preventive actions.
- iii) Forecasts.
- iv) Recommended defect repair.
- v) Requested changes.

Monitor and control project works can be done with following methods:

- 1) Tracking project progress.
- 2) Optimize benefits and benefits tracking.
- 3) Project Status Reports.

Tracking project progress:

After the project plan and project schedule are set up, project implementation begins then project manager needs to monitor process at regular intervals. Project manager can track project progress by collecting actual data, update and refresh project plan, analyzing dependencies and constraints, analyzing project plan and sharing project info with project members.

Optimize benefits and benefits tracking.

One of the major task of project manager is optimizing benefits and benefits tracking. It focuses on both financial benefits and non-financial benefits.

Project Status Reports.

It is the periodic collection of project info in an organization manner. It conform mutual understanding of the project progress and provide necessary inputs for re-planning. It also minimizes confusion associated with changes.

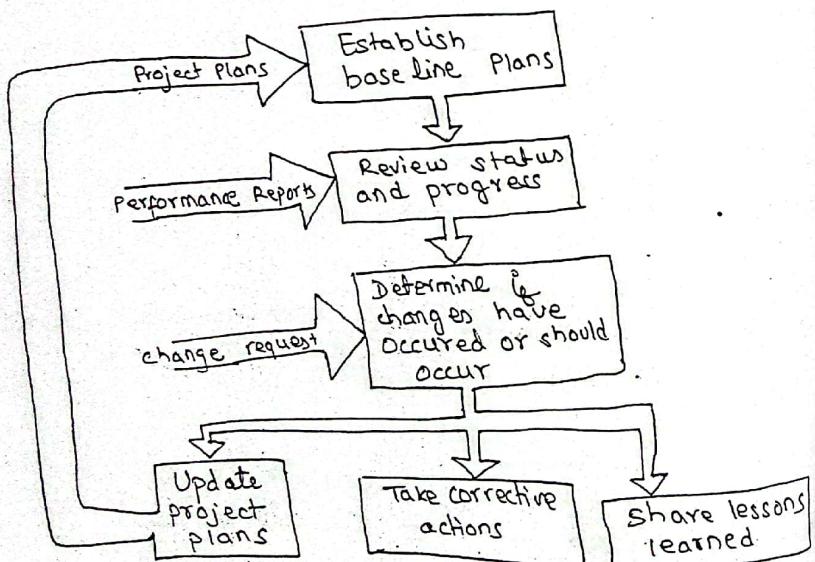
Integrated change control

It involves identifying, evaluating and managing the changes throughout the project life cycle. Integrated change control is the process that provides scope to manage any changes in the project in cost effective and efficient way.

The main objectives of change control is:

- Influence the factor that creates change to ensure they are beneficial.
- Determine that a change has occurred.
- Manages the actual changes when and as they occurred.

Block diagram of integrated change control



close project

Closing of the project is the process of finalizing all activities across all groups to formally complete the project. The main steps occurs on closing of project.

- Phase-end activities.
- Administrative closure procedure.
- Contract closure procedure.
- Updated Organizational process assets.

Contract closure procedure

- Verification of contract Requirements - Punch list.
- Formal Acceptance by the clients.
- Performance evaluation by Buyer of contract.
- Performance evaluation by Seller of contract.
- Perform Procurement Audit.
- Update project file and historical database.

Updated Organizational process assets

- Formal acceptance documentation.
- Project files
- Project closer documentation.
- Archiving is the last step in project closing.
- Historical information and lesson learned.

Project Scope Management

Scope refer to the work involved in creating the products of the project and the processes used to create them. Project scope management includes the process involved in defining and controlling what is or is not included in the project.

Project scope management include these different processes:

① Collecting requirements: Defining features and functions of the products during the project as well as the processes used for creating them.

② Defining scope: Reviewing the project charter, requirements documents, and organizational assets to create a scope statement.

③ Creating the WBS: Subdividing the major project deliverables into smaller, more manageable components.

④ Verifying scope: Formalizing acceptance of project deliverables.

⑤ Controlling scope: Controlling changes to project scope throughout the life of the project.

Scope statement

A scope statement is a document used to develop and confirms a common understanding of the project scope. It should include:

① A Project justification.

- a brief description of the project products
- o summary of all project deliverables
- o statement of what determines project success

Work-breakdown Structure (WBS)

WBS is a systematic & disciplined approach for breaking down a project into many components (deliverables). WBS lists all the activities needed to complete the project in a hierarchical order. WBS breaks down project activities in small events. WBS presents inter-relationship of activities.

WBS establishes cost & budgets. WBS groups project activities in hierarchical order for each stage of project. The project work is broken into smaller elements which will be manageable & measurable.

WBS process is a part of "Project Planning".

① Organizational Process Assets

② Project Scope Statement

③ Project Scope Management Plan

④ Approved Change Request.

Tools & Techniques

① WBS Templates

② Task Decomposition Techniques

③ Output

1. Updated project scope statement.

2. WBS

3. WBS Dictionary.

4. Project Scope Baseline.

5. Updated Project Scope Management Plan.

6. Requested changes.

Basic Principles of Creating WBSs.

1. A unit of work should appear at only one place in the WBS.

2. The work content of the WBS item is the sum of the WBS items below it.

3. A WBS item is the responsibility of only one individual, even though many people may be working on it.

4. The WBS must be consistent with the environment in which work is actually going to be performed.

5. Project team members should be involved in developing the WBS to ensure consistency and buy-in.

6. Each WBS item must be documented to ensure accurate understanding of the scope of work included and ~~not~~ included in that item.

7. WBS must be a flexible tool to accommodate inevitable changes while properly maintaining control of the work content in the project according to the scope statement.

100% Rule

The 100% rule states that WBS includes 100% of the work defined by the project scope.

ptures all deliverables - internal, external and
nterim - in terms of the work to be completed,
including project management.

8/80 rule:

This rule states that No task should be less than 8 hours or more than 80 hours.

Responsibility Assignment Matrix (RAM)

A responsibility assignment matrix (RAM) also known as RACI matrix or linear responsibility chart (LRC), describes the participation by various roles in completing tasks or deliverables for a project or business process. It is especially useful in clarifying roles and responsibilities in cross-functional / departmental project and be processes. RACI is an acronym that was derived from the four key responsibilities most typically involved: Responsible, Accountable, Consulted and Informed.

Responsibility Matrix Using RACI chart Using arbitrary example.

K Role of each assignment:

L R - Responsible.

A - Accountable.

C - To be consulted.

I - To be informed.

RACI chart

	Person 1	Person 2	Person 3	Person 4	Person 5
Activity	A	R	I	I, C	I
Define	A	A	R	C	C
Design	I	A	R	C	C
Develop	I	A	R	C	C
Test	A	I, R	I	R	I
Implementation	I	R	A	C	I

Scope Verification

The Scope Verification is the process through which the project customer formally accepts the project deliverables.

This is the process of obtaining formal acceptance of the project scope by the stakeholders.

Inputs

- 1) Project Scope Statement.
- 2) WBS Dictionary.
- 3) Project Scope Management Plan.
- 4) Deliverables.

Tools & Techniques

- 1) Inspection.

Output

- 1) Accepted Deliverables.
- 2) Requested changes.
- 3) Recommended corrective action.

Inspection

Inspection includes activities such as measuring, reviewing and testing undertaken to determine whether results conform to requirements. There are two ways to perform inspection.

Wide - band Delphi Technique:

This method is used to obtain expert opinion on technical issues, the required scope or risk involved. A request is sent to the experts and their returned responses are compiled and then sent back to them for further review to get consensus.

Management by Objectives (MBO)

It is a management philosophy with three objectives-

- (1) Establish unambiguous and realistic objectives.
- (2) Periodically Evaluate if objectives are being met.
- (3) Take corrective actions.

Scope - Control

Scope control is one of the keys to effective project management. Good project management requires managing scope in such a way that the goals of a project can be obtained in time without leaving out resolution of things that are critical to the project's success.

In scope control allows the changing and adding of critical tasks without adding in unnecessary items or items that would be best used for a later version that if added could lead a project to miss its critical deadlines.

Chapter-8 Project Time Management

Project Time Management includes the processes required to accomplish timely completion of the project.

Project Time Management Processes:

- 1) Activity Definition
- 2) Activity Sequencing
- 3) Activity Resource Estimating
- 4) Activity Duration Estimating
- 5) Schedule Development
- 6) Schedule Control

1) Activity Definition

Activity Definition involves developing a more detailed WBS and supporting explanation to understand all the work to be done so you can develop realistic duration estimates.

Activity Definition process is a part of "Project Planning Phase".

@ Inputs:

- 1) Project Environmental factors.
- 2) Organizational Process Assets
- 3) Project Scope Statement
- 4) WBS
- 5) WBS Dictionary
- 6) Project Scope Management Plan.

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E Tools & Techniques

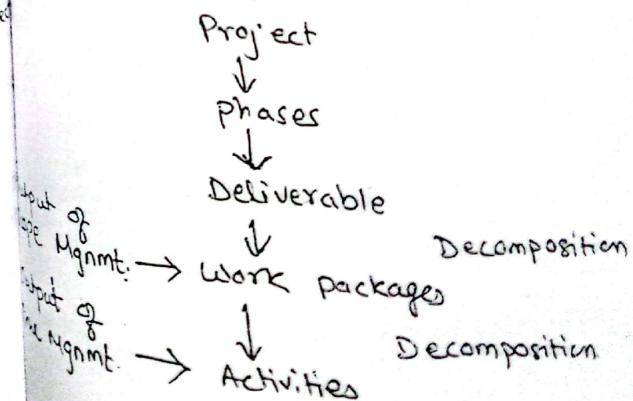
- 1) Decomposition
- 2) Templates
- 3) Rolling wave Plan
- 4) Expert Judgement
- 5) Planning Component

B Output

- 1) Activity List
- 2) Activity Attributes
- 3) List of Milestones
- 4) Requested changes.

Decomposition of Activities

In scope management, project deliverables are divided into smaller and more manageable components until the work and deliverables are linked to the work package level. This is called decomposition.



2. Arrow Diagram Method (ADM).
3. Schedule Network templates
4. Dependency determination.
5. Apply leads and lags

Output

1. Project Schedule Network Diagrams.
2. Updated Activity list.
3. Updated Activity Attributes
4. Requested changes.

Network Diagram

Network diagrams are the preferred technique for showing activity sequencing. A network diagram is a schematic display of the logical relationships among, or sequencing of project activities. The main formats are the arrow and precedence diagramming methods.

Precedence Diagram Method (PDM)

The precedence diagram method (PDM) is a tool for scheduling activities in a project plan. It is a method of constructing a project schedule network diagram that uses boxes, referred to as nodes, to represent activities and connects them with arrows that show the dependencies. It is also called activity-on-node (AON) method.

Features:

- Shows critical tasks, non-critical tasks and slack time.
- Shows relationship of the tasks to each other.
- Allow for what-if worst case best case most likely scenario.

Features of Decomposition of Activities.

1. Sub-divide work package into schedule activities.
2. Define activities to meet project objectives
3. Activities should be relatively smaller and manageable components.
4. Activities may be work packages or lower level items.
5. WBS and Activity list may be developed sequentially or concurrently.

Activity Sequencing.

Activity Sequencing is defined as the establishing the activity logic and the dependencies needed to create a realistic and achievable schedule. Activity Sequencing process involves reviewing activities and determining dependencies.

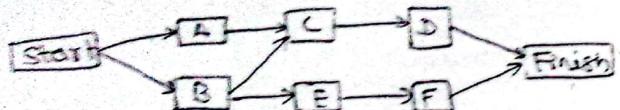
- Mandatory dependencies \Rightarrow inherent in the nature of work; hard logic
- Discretionary dependencies defined by the project team; soft logic
- External dependencies - involve relationships between project and non-project activities.

Inputs

1. Project Scope Statement.
2. Activity list.
3. Activity Attributes
4. List of Milestones.
5. Approved change request.

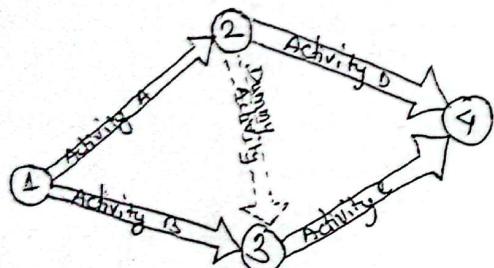
Tools & Techniques

1. Precedence Diagramming Method (PDM)



Arrow Diagram Method:

- Also called activity-on-arrow (AOA) network diagrams.
- Activities are represented by arrows.
- Nodes or circles are the starting & ending point of activities.
- Can only show finish-to-start dependencies.



Activity Resource Estimating:

- ④ Estimating schedule activity resources involves determining what resources like persons, equipment or materials etc and what quantity of each resource will be used, and when each resource will be available to perform project activities.

Activity Resource Estimating process is part of "Project Planning Phase".

Inputs

1. Enterprise environmental factor.
2. Organizational Process Assets.

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3. Activity list
4. Activity Attributes
5. Resource Availability
6. Project Management Plan

Tools & Techniques

1. Expert Judgment.
2. Alternative Analysis.
3. Published Estimating Data.
4. Project Management Software.
5. Bottom-up Estimating.

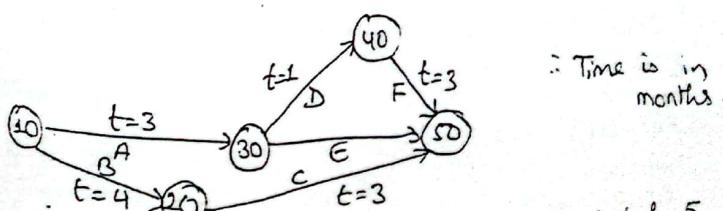
Outputs

1. Activity Resource Requirements.
2. Updated Activity Attributes.
3. Resource Breakdown Structure.
4. Updated Resource Calendar.
5. Requested changes.

Multi-point Estimating

Program Evaluation & Review Techniques (PERT)

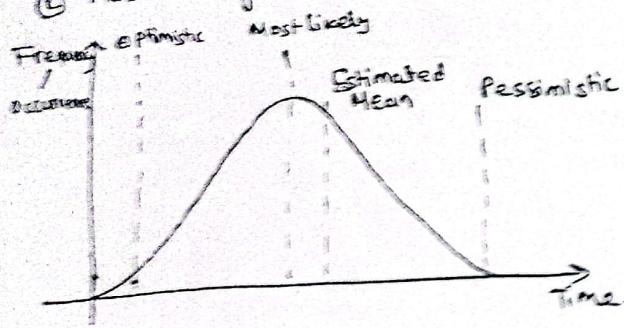
Program evaluation and review techniques, commonly abbreviated PERT, is a statistical tool, used in project management, which was designed to analyse and represent the tasks involved in completing a given project.



: Time is in months

fig: PERT network of seven-months project & 5 milestones.

- PERT formula is based on three values.
- (1) Pessimistic value
 - (2) Optimistic value
 - (3) Most Likely value.



Formula

$$\text{Estimated Mean Value} = \frac{\text{Pessimistic} + 4(\text{Most Likely}) + \text{Optimistic}}{6}$$

Reserve Time

A reserve time is a percentage of the project duration or a preset number of work periods in is usually added to the end of the project schedule. It may also be added to individual activity duration based on risk or uncertainty in activity duration.

Reserve time decision should be documented.

Schedule development & Control

Schedule development determines planned start or finish dates for project activities and can require that duration estimates and resource estimates are released and revised to create an approved project schedule (baseline) for progress tracking. Because of the uncertainty involved, the schedule is reviewed regularly, and it is often revised while the module Networks.

Project is in progress. As the project moves forward, changes to delivery risks come and go, and new risks are identified. The schedule essentially transforms the project from a vision to a time-based plan. Schedules also help to do the following:

- They provide a basis for us to monitor and control project activities.
- They help in determine how best to allocate resources so you can achieve the project goal.
- They help us assess how time delays will impact the project.
- We can figure out where excess resources are available to allocate to other projects.
- They provide a basis to help us track project progress.

Project Schedule Network Diagrams.

Resource Calendar

Activity During Estimates.

Project Management Plan

- Risk register.

Baselines & Techniques

Networks

- ② Critical Path Method.
- ⑤ Schedule compression.
- ⑥ what-if scenario Analysis.
- ④ Reserve team leveling.
- ⑥ Critical chain Method.
- ⑦ Project Management Software.
- ⑧ Applying calendars.
- ⑨ Adjusting Leads and lags.
- ⑩ Schedule Model.

Output

- ① Project schedule
- ② Schedule model Data.
- ③ Schedule baseline.
- ④ Updated Resource Requirements.
- ⑤ Updated Activity Attributes.
- ⑥ Updated Project Calendar.
- ⑦ Requested changes.
- ⑧ Updated Project Management Plan
- ⑨ Updated Schedule management plan

Principles of Scheduling

Rule 1: Scheduling is an art based on PM experience. As such, don't try for too tight or too flexible scheduling and don't commit to something that team cannot deliver.

Rule 2: Eliminate uncertainty whenever it arises. Perform risk analysis, update risk management plan, and use it during scheduling, as required.

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Rule 3: Build with variation of contingencies to cope

Rule 4: Pick the right level for "activity duration". Most common is a week.

Rule 5: Schedule for unexpected circumstances that PM could not foresee will interrupt the normal flow of the project. A good way to cope with this is to implement a bit of impromptu risk management. By anticipating likely risks and prioritizing them, PM will be better able to deal with the unexpected.

Milestones

A milestone is an event that receives special attention. It is often falsely put at the end of a phase to mark the completion of a work package. Rather, milestones should be put before the end of a phase so that corrective actions can be taken, if problems arise, and a deliverable can be completed on time. Milestones add significant value to project scheduling.

Milestones allow project management to much more accurately determine whether or not the project is on schedule - by schedule interval. This segmentation of the project schedule into intervals is an earlier indication of schedule problems and

-100-

a better view into the activities whose completion is critical.

Milestones are frequently used to monitor progress, but there are limitations to their effectiveness. They usually show progress only on the critical path, and ignore non-critical activities. It is common for resources to be moved from non-critical activities to critical activities to ensure that milestones are met. This gives the impression that the project is on schedule when actually some activities are being ignored.

Note:

while making Network diagram

- Forward Pass through network determines early start time for each activity.

For forward Pass

$$EF = ES + \text{Task Duration}$$

Backward Pass through network determines the late finish time for each activity.

For Backward Pass;

$$\text{Latest start} = \text{Late Finish} - \text{Task duration}$$

Critical Path Method (CPM)

Critical Path Method (CPM) is a step-by-step project management technique for process planning that defines critical and non-critical tasks with goal for preventing time-frame problems and project bottlenecks. The CPM is ideally suited to projects consisting of numerous activities that interact in a complex manner.

In applying CPM, there are several steps that

be summarized as:

- ① Define the required tasks and put them down in an ordered list.
- ② Create diagram showing each task in relation to the others.
- ③ Identify the critical & non-critical relationships among tasks.
- ④ Determine the expected completion or execution time for each task.
- ⑤ Locate or devise alternatives for the most critical paths.

Differences between PERT, CPM

PERT	CPM
It is a network analysis technique used to estimate project duration when there is a high degree of uncertainty about the individual activity during estimates.	CPM is a network diagramming technique used to predict total project duration.
Used probabilistic time estimates.	Used critical path to find total project duration.
It involves more work than CPM since it requires several duration estimates.	It involves less work than PERT.
Weighted average: $\frac{Optimistic\ time + 4(Likely\ time) + Pessimistic\ time}{6}$	Critical path is the longest path through the network diagram and has the least amount of slack.

Example 1

Activities	Immediate predecessors	Completion days
A	-	90 " 15 "
B	A	95 " 5 "
C	B	100 " 20 "
D	C	105 " 25 "
E	D	110 " 14 "
F	C & E	115 " 28 "
G	D	120 " 30 "
H	A	125 " 45 "
I	D & F	130 " 28 "
J	-	135 " 45 "

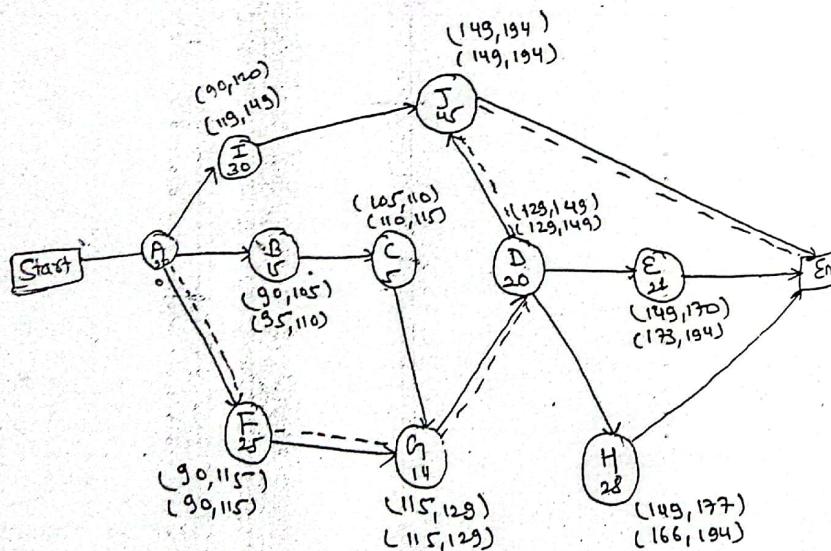


fig: Precedence Diagram method.

slack time calculations.

$$\text{Slack time} = LS - ES$$

Activity	LS	-	ES	=	slack
A	90	-	90	=	0
B	95	-	90	=	5
C	100	-	90	=	10
D	105	-	105	=	0
E	110	-	129	=	11
F	115	-	149	=	34
G	120	-	90	=	30
H	125	-	115	=	10
I	130	-	149	=	0
J	135	-	149	=	17
		=		=	29
		=		=	0

Critical path (Having slack zero).

$$A \rightarrow F \rightarrow G \rightarrow D \rightarrow J$$

$$90 + 25 + 14 + 20 + 45$$

$$= 194 \text{ days (Project completion days).}$$

Note! Shortest path is given by dotted line.

Chapter - 9 Project Cost Management

Example :-

Activity	Time estimates			μ	σ^2
	S	M	E		
A	1	2	3	2	0.111
B	2	3.5	8	4	1
C	6	9	18	10	4
D	4	5.5	10	6	1
E	1	4.5	5	4	0.044
F	4	4	10	5	1
G	5	6.5	11	7	1
H	5	8	12	9	4
I	3	4.5	9	7	1
J	3	9	9	8	1
K	4	4	4	4	0
L	1	5.5	7	5	1
M	1	2	3	2	0.111
N	5	5.5	9	6	0.444

~~Mean~~ ~~SD~~ ~~SD~~ Now,

$$\mu = 44$$

$$\sigma^2 = 9$$

$$P(T \leq d) = 0.841344 \quad (\text{From Z-curve})$$

where,

$$d = 44.$$

Cost and project

Cost is a resource sacrificed or foregone to achieve a specific objective or something given in exchange.

Cost are usually measured in monetary units like dollars, Rupees etc.

Types of cost

Direct cost : Cost of labor, Resource, Machinery etc

Overhead cost : Cost of Building rent, Maintenance, Insurance, Vacation, sick leave etc.

Administrative costs - Cost due to Management expenses, HRM & HRD activities.

Cost cost:

Project cost is the cost of running a project primarily involves labor cost, Resource cost and Special Machinery cost. i.e

Cost = Project's labor cost + Resource cost + Special Machinery cost

A company wants to launch a new project must allocate human resources, machineries and other resource to it. The overall cost of these is the project cost.

Product cost

Product cost is the cost involved in manufacturing a product. It involves various cost such as material cost, manufacturing cost and overhead cost. It is also known as sales price i.e.

$$\text{Product cost} = \text{Material cost} + \text{Manufacturing cost} - \text{Overhead cost}$$

Where,

$$\text{Overhead cost} = \text{Project's other cost} + \text{Project's profit amount}$$

Cost Management

Cost management is the process of planning and controlling the budget of a business. Cost management is a form of management accounting that allows business to predict impending business expenditure to help reduce the chance of going over budget.

Basic principles of project cost management

- 1) Profits are revenues minus expenses.
- 2) Life cycle costing is estimating the cost of a project plus the maintenance costs of the products it produces.
- 3) Cash flow analysis is determining the estimated annual costs and benefits of a project.
- 4) Benefits and costs can be tangible or intangible, direct or indirect.
- 5) Sunk cost should not be a criterion for project planning.

Management Plan can establish:

Precision level

Schedule activity cost estimates will adhere to a rounding off of the data to a prescribed precision (e.g., \$100, \$1000) based on the scope of the activities and magnitude of the project, and may include an amount for contingencies.

Units of Measure

Each unit used in measurements is defined, such as staff week, hours, staff days, lump sum etc. for each of the resources.

Organizational procedure links

The WBS component used for the project cost accounting is called a control account (CA). Each control account is assigned a code or account number that is linked directly to the performing organization's accounting system. If cost estimates for planning packages are included in the control account, then the method for budgeting planning packages is included.

Control thresholds

Various thresholds for costs or other indicators at designated time points over the duration of the project can be defined to indicate the agreed amount of variation allowed.

Earned value rules

Three examples are:

- i) Earned value management.
- ii) Earned value credit criteria.
- iii) Defined the WBS.

Reporting formats

The formats for the various cost reports are defined.

Process descriptions

Descriptions of each of the three cost management processes are documented.

Cost Management Processes:

- 1) Cost Estimating
- 2) Cost Budgeting
- 3) Cost Control.

Cost Estimating.

Cost Estimating is a process of developing an approximation for the cost of the resources necessary to complete the project activities. Estimating also involves identifying and considering cost alternatives.

Cost Estimating process is a part of "Project Planning ~~Phase~~ Phase".

Inputs:

1. Enterprise Environmental Factors.
2. Organizational Process Assets.
3. Project Scope Statement.
4. WBS.
5. Project Management Plan.

Tools and techniques

1. Analogous Estimating.
2. Determining Resource Cost Rates.
3. Bottom-up Cost Estimating.
4. Parametric Estimating.
5. Vendor Bid Analysis.
6. Reserve Analysis.
7. Cost of Quality.

Outputs

1. Activity Cost Estimates.
2. Activity Cost Estimates, Supporting Details.
3. Requested Changes.
4. Update Cost Management Plan.

Types of Cost Estimates

Rough Order of Magnitude (ROM)

This type of cost estimation is done in very early stage of a project often 3-5 years before project completion. It provides rough ballpark of cost for selection decision. It is -25 to +75 % accurate.

Budgetary

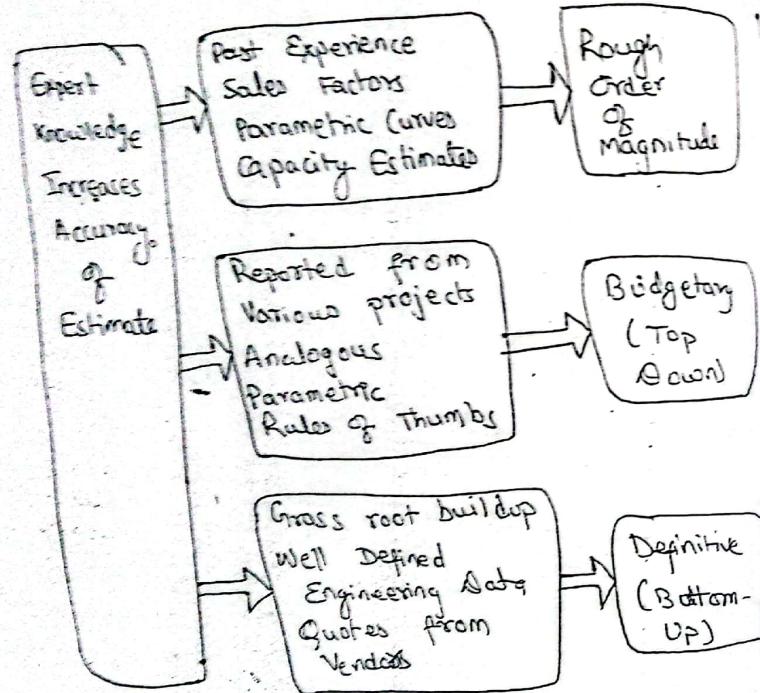
It is done in the early stage of project. This cost estimation is done in first 1-2 years of project lifecycle. It puts some cost in budget plans. It is -10 to +25% accurate.

Definitive

It is done later in the project lifecycle. For 112-3 details for purchases.

estimated for actual cost. It involves
8 - 5% to 30%.

Estimating Process & Accuracy



The above diagram shows that the most accuracy is most for the definitive process since it involves the grassroots buildup, well defined engineering data, quotes from vendors and WBS costing. Accuracy is least for the Rough Order of Magnitude since is done in very early stage of project cycle and is based on past experiences which may not always be correct.

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Enterprise Environmental Factors

- 1) Marketplace Conditions
- 2) Commercial Database.

Organizational Process Assets

- 1) Cost Estimating Policies.
- 2) Cost Estimating Templates.
- 3) Historical Information.
- 4) Project Files.
- 5) Project Team Knowledge.
- 6) Lessons Learned.

Cost Estimating Tools

Cost Estimating Tools is mechanisms that help humans in accessing the cost of project. They help in making expert judgment of the cost analysis and estimation process. Cost Estimation Tools are support framework that may be data driven or analogous, help in making very precise and accurate human decisions. Various types of cost estimation tools are:

Analogous This is based on top-down approach. They help in expert judgment. This makes a comparison with other projects. This tool is less accurate than other tools.

Data Driven This tool helps in making estimations based on the data to determine the resource cost.

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③ Bottom Up

This tool makes estimation of the work package of the WBS and then builds up. This process is relatively more accurate than other. This process needs sufficient information to make accurate estimates.

④ Parametric Modelling

It is mathematical tool for cost estimation. It is similar to analogous top-down. It is better to be used with historical info.

⑤ Vendor Bid Analysis

This method is about making estimate based on the amount of bids the vendor makes.

⑥ Reserve Analysis

It is used to determine if the amount of remaining reserve left is adequate. It compares the amount of risk remaining at any time in the project.

Cost Budgeting

Cost budgeting is the process of allocating cost to various project work items and providing a baseline. Initial cost estimate will be considered as cost budget. The cost of the project is determined by various inputs such as Project Scope, Activity costs, Project Schedule, Resource Calendar, and Contract Management and so on. Proper functioning of the project for the best possible result is determined by

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amount of allocations made to all of these items. Cost budgeting helps in making wise decisions related to the project cost. Less important tasks should get less budgeting priority for funding while more important tasks should get higher priority. Estimates should be made for different categories of events and functions, aggregated tasks or activities. Thus cost budgeting is a very important process in the "lifecycle of a project".

Inputs

i) Project Scope Statement.

ii) WBS

iii) WBS Dictionary.

iv) Activity Cost Estimates Supporting Details.

v) Activity Cost Estimates Supporting Details.

vi) Project Schedule.

vii) Resource Calendar.

viii) Contract Agreements.

ix) Cost Management Plan.

Tools & Techniques

i) Cost Aggregation.

ii) Reserve Analysis.

iii) Parametric Estimation.

iv) Funding Limit Reconciliation.

Output

i) Cost Baseline Requirements.

ii) Project Funding Management Plan.

iii) Updated Cost Management Plan.

iv) Requested Change.

Principles of cost budgeting

- 1) Plan for low expenditure for relatively less important items.
- 2) Estimate separately for different categories, events and functions.
- 3) Estimate separately for aggregated tasks, activities.
- 4) Estimate separately for emerging expenditure to deal with uncertainty as contingency budget or reserve budget.
- 5) Maintain "Promise Low, Deliver High" commandment.

Cost Aggregation

Cost Aggregation is defined as summing the cost for the individual work package to control the financial account up to the project level. This is achieved by the summation of the lower-level cost estimates that are associated with different work packages within the WBS.

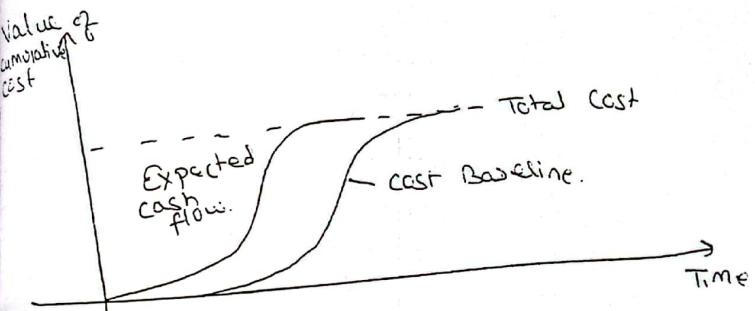
The main benefit of cost aggregation is that it allows the project management to see scheduled spending for every time period. This will allow project managers to see the activities as well as the corresponding costs.

Cost Baseline & S-Curve

Cost baseline is a time-phased budget that is used to measure and monitor cost performance in a project. It is derived from approved cost estimates.

Inputs for Cost Baseline

- 1) WBS
- 2) Task Schedule
- 3) Cost Estimates
- 4) Risk Management Plan



Cost Control Process

Project cost control includes:

- a) Monitoring cost performance
- b) Revised and update cost baseline
- c) Managing issues related to cost changes

Cost Control process is part of "Project Controlling phase".

@ Inputs

- 1) Cost Baseline
- 2) Project Funding Requirements
- 3) Performance Reports
- 4) Work Performance Info.
- 5) Approved Change Request
- 6) Project Management Plan

B Tools & Techniques

- 1) Cost Change Control System.
- 2) Performance Measurement Analysis.
- 3) Forecasting.
- 4) Project Performance Review.
- 5) Project Management Software.
- 6) Variance Management.

C Outputs

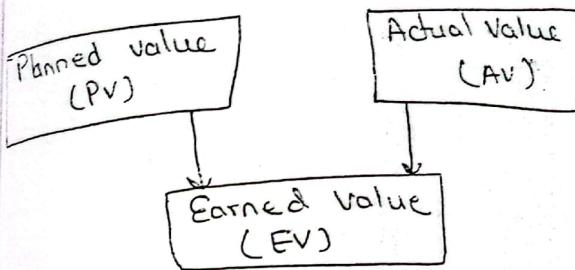
- 1) Updated Cost Estimates.
- 2) Updated Cost Baseline.
- 3) Performance Measurements.
- 4) Forecasted Completion.
- 5) Requested Change.
- 6) Recommended Corrective Actions.
- 7) Updated Organizational Process Assets.
- 8) Updated Project Management Plan.

Cost Control Methods

- 1) Cost Change Control System.
 - It defines the procedures by which the cost baseline can be changed, usually documented in the cost management plan.
 - Integrated with the integrated change control.
- 2) Performance Evaluation Analysis.
 - Earned Value Management (EVM)

Earned Value Management (EVM)

Earned value Management is a performance measurement technique that integrates scope, time and cost data. Earned value takes two metrics as inputs i.e. Planned Value and Actual costs based on the actual completion of work and measures the performance.



EVM Benefits

EVM contributes to:

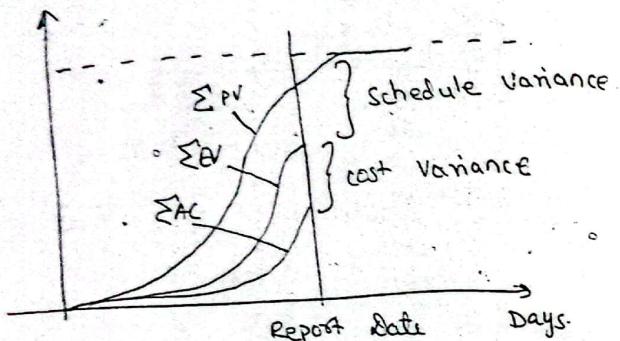
- a) Performance Tracking.
- b) Profitability Analysis.
- c) Project Forecasting.
- d) Better Accountability.
- e) Preventing Scope Creep.
- f) Improving Communication and visibility with stakeholders.
- g) Reducing Risk.

Variance Analysis

Variance Analysis is a statistical method in comparing the expected project plan results with expected project plans to determine if variance exists.

Project schedule and project cost are common factors measured. Cost baseline is the expected amount to be spent in the project. It is usually an S-curve, i.e., expenditure less in the beginning and at the end.

$$VAC = BAC - EAC$$



Example: 1

A project was estimated to complete in 20 days at the expense of Rs. 500,000. At the end of day 5, 25% of the work was completed with the expenditure of Rs. 125,000. Use EVM analysis to comment on performance. Also estimate the cost as well as duration required for completing the remaining work.

Soln

- (a) Budgeted cost of work scheduled (BCWS)
 Planned expenditure in 20 days = Rs. 500,000
 " " 1 day = Rs. 25,000
 " " 5 days = Rs. 125,000

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(b) BCWP (Budget cost of work performed)
 Work completed = $\frac{1}{2} \times \frac{25}{100}$
 = 0.25 work.
 Let,
 1 work = Rs. 500,000
 0.25 " = $0.25 \times 500,000$
 = Rs. 125,000.

(c) Actual cost of work performed (ACWP)
 Total expended at the end of 5th day
 = Rs. 130,000.

i) Schedule Variance (SV) = BCWP - BCWS
 = 125,000 - 125,000
 = Rs. 0.

∴ Project is not ahead or behind the project.

Schedule Performance Index (SPI)

$$\begin{aligned} &= \frac{BCWP}{BCWS} \\ &= \frac{125,000}{125,000} \\ &= 1. \end{aligned}$$

Revised Schedule (Duration)

$$= \frac{\text{Original Estimate}}{\text{SPI}}$$

$$\begin{aligned} &= \frac{20}{1} \\ &= 20 \text{ days.} \end{aligned}$$

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$$\text{ii) Cost Variance (CV)} = \text{BCWP} - \text{ACWP}$$

$$= 125,000 - 130,000$$

$$= -5000 \text{ Rs.}$$

+ve Budget overrun and vice versa.

Cost Performance Index (CPI)

$$= \frac{\text{BCWP}}{\text{ACWP}}$$

$$= \frac{125000}{130000}$$

$$= 0.96 < 1$$

<1 Budget overrun and vice versa.

Revised cost = Original cost

$$= \frac{500,000}{0.96}$$

$$= \text{Rs. } 5,20,000.$$

Example 2: When 125 cub.m of concrete is to be done in 10 days at the cost of Rs. 125000 at the end of 3rd day managed to complete 40 cub.m of concrete with expenses of Rs. 375000. Find EVM and comment on the performance.

Soln:- BCWS

$$\frac{40}{10} \text{ days} = 125000$$

$$1 \text{ day} = 12500$$

$$3 \text{ days} = 37500.$$

BCWP

$$125 \text{ cub.m} = 1250000$$

$$1 \text{ cub.m} = 10,000$$

$$40 \text{ cub.m} = 400000$$

ACWP = 375000.

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SV = BCWP - ACWS

$$= 400000 - 375000$$

$$= +25000$$

Means ahead of schedule & vice versa.

SPI = $\frac{\text{BCWP}}{\text{ACWS}}$

$$= \frac{400000}{375000}$$

$$= 1.067 (>1)$$

>1 ahead of schedule.

Revised schedule = Original cost $\frac{\text{AC}}{\text{SPI}} = \frac{500000}{1.067} = 9.36 \text{ days.}$

③ Cost Variance (CV) = BCWP - ACWP

$$= 400000 - 375000$$

$$= +25000 \text{ Rs.}$$

+ve Budget under run.

CPI = $\frac{\text{BCWP}}{\text{ACWP}}$

$$= \frac{400000}{375000}$$

$$= 1.067 (>1)$$

>1, Budget underRun.

Revised cost

Original cost

CPI

$$= \frac{1250000}{1.067}$$

$$= \text{Rs. } 1171509 \text{ /-}$$

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Chapter-10 Project Quality Management

Quality Theories

Project Quality

Quality is defined as the totality of characteristics of an entity that bear on its ability to satisfy stated or implied needs.

It is the conformance to requirements i.e. meeting written specifications.

It is also fitness for use i.e. insuring a product can be used as it was intended.

$$\text{Quality} = \frac{P}{E}$$

where,

P = Performance or result.

E = Expectations or requirements

3 C's of Quality

- 1) Commitment
- 2) Competence
- 3) Communication

Project Quality includes "all activities of overall management function that determine quality policy, objectives, and responsibilities".

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implements them by means planning, quality control, quality improvement, such as quality assurance and the quality system."

LEAN production Theory

Project management performance with regard to this issue can be improved by enhancing project management's ability to meet a customer's need. Lean project management forms a complementary approach to current project management and has been constructed by drawing two approaches: management of projects and lean production. The management of project's emphasis on meeting customer needs effectively and lean production's emphasis on meeting customer needs efficiently are utilized in lean project management to improve project management performance. The amalgamation of lean production with management of projects to form lean project management is examined and justified at the methodological level.

KAIZEN Theory

"kaizen" is derived from the Japanese word which means "continuous improvement" and methodologies have been developed that implement kaizen in small, incremental and purposeful steps yield dramatic change over time. The

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Kaizen philosophy lies behind many Japanese management concepts such as Total Quality Control, Quality control circles, small group activities, etc. The key elements of Kaizen are quality relations, the involvement of all employees, willingness to change, communication etc. Kaizen events are never long drawn out and sustained. They are limited to very short periods of time and the continuous improvement involves planning, doing, checking and acting. It is therefore more suited to the Agile method of project management than the waterfall method, as the Agile method is very flexible.

Kaizen literally means change (Kai) to become good (zen).

Principles of Kaizen

- ① Thinking of ways to make something rather than reasons why something can't be done.
 - ② Do not seek perfections; start change away and build on that change over time.
 - ③ When something doesn't work as expected, take the time to understand the root cause of why things went wrong.
 - ④ When faced with hardship, take the wisdom gained and look to apply it to your next task.
 - ⑤ Measure your failures and successes so you can tell if you are improving.

Elements of kaizen

1. Teamwork.
 2. Personal discipline.
 3. Improved morale.
 4. Quality Circles.
 5. Suggestions for improvement.

Just-In-Time JIT

JIT is used to indicate that process which is capable of instant response to demand without the need for any over stocking either in expectation of the demand being for the coming or as a result of inefficiencies in the process. It is a stockless production or lean production. JIT's approach towards production control focuses on simple control of a simple manufacturing system. JIT's simplified control is based on: a pull type system and the use of quality control of source utilizing the technique SPC.

Features of JIT

Numerous small machines - Inexpensive, adaptable,
quick change over manufacture, variety of
products.

Small batch production - Fast setup times, reducing batch size, improves productivity.

Employee flexibility - Staff to go to the work, off move around the shop floor. If break -128-

down occurs staff helps one another or move to other work.

- (4) Employees responsible for production and maintenance
They do repairs also. Total preventive maintenance
- (5) JIT implies - no need of receiving inspection
- (6) Spare - capacity - Operate well below full capacity

Quality Vs Productivity

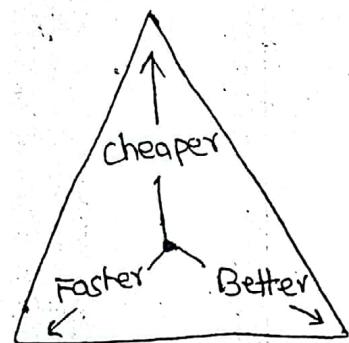


fig: Productivity Triangle.

Quality and productivity are different aspects of manufacturing cycle, productivity equals the amount of product versus the cost of making it. It means that the product is fit for purpose. The faster you make product to increase your profit, the higher the risk of poor quality. This could also apply to a call center, retail where quality may be determined by customer service. So the less staff you employ to save costs, might lead to longer queues or wait times and lead to customer complaints.

Higher quality labour and higher quality raw materials to greater productivity

-129- goods take more time and to

always means a diminution of quality. An exception is in cases where standardization and precision mean a significant increase of quality, as in machine parts, which can be made more standard and more precise by machine, which is also more efficient.

Improving IT Project Quality:

Improving IT projects include:

- (1) leadership that promotes quality.
- (2) Understanding the cost of quality
- (3) Focusing on organizational influences and workplace factors that affect ~~not~~ quality
- (4) Following maturity models.

Project Management Maturity Model (PMMM)

Project Management Maturity Model (PMMM) is a formal tool developed by PM Solutions and used to measure an organization's project management maturity. Once the initial level of maturity and areas for improvement are identified, the PMMM provides a roadmap, outlining the necessary steps to take toward project management maturity advancement and performance improvement. The PMMM follows the Software Engineering Institute's (SEI) Capability Maturity Model (CMM) five evolutionary maturity levels and examine maturity development across nine knowledge areas in Project Management.

A common method of determining the current level

of project management capability and maturity is to use the project management maturity model illustrated by five distinct levels of maturity as described below in levels:

level 1 - Adhoc: No formal, consistent process to execute a project.

Key characteristics:

- (1) Many, incomplete, informal approaches - each project handled differently.
- (2) Highly dependent on Project Manager.
- (3) Project Outcomes Unpredictable.
- (4) Little organizational support for project management
- (5) lesson learned are not gathered and passed on to other projects.

level 2 - Abbreviated:

There are some project management processes and systems in place to track cost, schedule and scope. Project success is largely unpredictable and cost and schedule problems are common.

level 3 : Organized

There are standardized, documented project management processes and systems that are integrated into the rest of the organization. Project success is more predictable and cost and schedule ~~prob~~ performance is improved.

level 4: Managed

Management collects and uses detailed measures of the effectiveness of project management. Project success is more uniform and cost and schedule performance conforms to plan.

Level 5: Adaptive
Feedback from the project management process and from piloting innovative ideas and technologies enables continuous improvement. Project success is the norm, and cost & schedule performance is continuously improving.

Quality Planning

Quality planning is the process of identifying which quality standards are relevant to the project and determining how to satisfy them. Quality should be planned in, not inspected in. Quality planning process is a part of "Project Planning phase".

(A) Inputs

- 1) Enterprise Environmental Factors
- 2) Organizational Process Assets
- 3) Project Scope Statement
- 4) Project Management Plan

(B) Tools & Techniques

- 1) Cost-Benefit Analysis
- 2) Benchmarking
- 3) Design of Experiments
- 4) Cost of Quality (CoQ)
- 5) Additional Quality planning Tools

(C) Output

- 1) Quality Management Plan
- 2) Quality Metrics
- 3) Quality checklist
- 4) Process Improvement Plan
- 5) Quality Baseline
- 6) Updated Project Management Plan

Project's Quality Requirements

Quality requirements should be a part of project scope definition. Expected level of quality can only be achieved through necessary quality planning during project initiation. Quality requirements should be optimized for cost and schedule estimates.

Attributes of Quality Requirements

- a) Completeness Criteria
- b) Correctness Criteria
- c) Usefulness Criteria

The Project Quality Requirements In IT projects

- (a) Functionality: Is the degree to which a system performs its intended function.
- (b) Features: are the system's special characteristics that appeal to users. It is important to clarify what functions and features the system must perform, and what functions and features are optional.
- (c) System Outputs: are the screens and reports + system generated. It is important to define

clearly what the screens and reports look like for a system.

- ④ Performance addresses how well a product or service performs the customer's intended use. To design a system with high quality performance, project stakeholders must address many issues.

- ⑤ Reliability is the ability of a product or service to perform as expected under normal conditions.

- ⑥ Maintainability: addresses the ease of performing maintenance on a product.

Cost of Quality (COQ)

Cost of Quality (COQ) is a measurement used for assessing the waste or losses from some defined process (e.g. machine, production line, plant, department, company, etc).

Recognizing the power and universal applicability of Cost of Quality ("COQ"), PQA has developed numerous proprietary Cost of Quality ("COQ") systems for ensuring the effectiveness of Cost of Quality ("COQ") implementation. The Cost of Quality ("COQ") measures on track changes over time for one particular process, or be used as a benchmark for one or more different processes. Cost of Quality ("COQ") can be used to identify the global optimum for a process and monitor that process' progress towards its global optimum.

The Cost of Quality is generally classified into four categories:

- ① External Failure Cost.
- ② Internal Failure Cost.
- ③ Inspection Cost.
- ④ Prevention Cost.

① External Failure Cost: Cost associated with defects found after the customer receives the product or service. Example: Processing customer complaints, customer returns, warranty claims, product recalls.

② Internal Failure Cost: Cost associated with defects found before the customer receives the product or service.

Example: Scrap, rework, re-inspection, re-testing, material review, material downgrades.

③ Inspection (Appraisal) Cost:

Cost incurred to determine the degree of conformance to quality requirements (measuring, evaluating or auditing). Example: Inspection, testing, process or service audits, calibration of measuring and test equipment.

④ Prevention Cost: Cost incurred to prevent (keep failure and appraisal cost to a minimum) poor quality. Example: New product review, quality planning, supplier surveys, process reviews, quality improvement teams, education and training.

Quality Management Plan

Quality management plan should describe how the project management team will implement quality policy. In ISO 9000 terminology, it should describe the project quality system. It should describe the project quality system. The organizational structure, responsibilities, procedures, processes and resources needed to implement quality management.

The quality management plan provides inputs to the overall project and must address quality control, quality assurance, and quality improvement for the project. The quality management plan for the project may be formal or informal, highly detailed or broadly framed, based on the needs of the project.

Quality Assurance

Quality Assurance is the application of the implementation of the planned, systematic quality activities to ensure that project employs all processes needed to meet requirements. It should be performed throughout the project. Prior to development of the ISO 9000 series, the activities described under quality planning were widely included as a part of quality assurance. Quality assurance is often provided by a Quality Assurance Department or similarly fitted organizational unit, but it does not have to be. Assurance may be provided to the project management team or

to the management of the performing organization or it may be provided to the customer and other, not actively involved in the work of projects.

(a) Inputs:

- 1) Quality Assurance Plan.
- 2) Quality Metrics.
- 3) Process Improvement Plan.
- 4) Work Performance Info.
- 5) Approved Change Request.
- 6) Quality Control Measurements.
- 7) Implemented Change Requests.
- 8) Implemented Corrective Actions.
- 9) Implemented Defect Repair.
- 10) Implemented Preventive Actions.

(b) Tools & Techniques:

- 1) Quality Planning Tools & Techniques.
- 2) Quality Audits.
- 3) Process Analysis.
- 4) Quality Control Tools & Techniques.

(c) Output:

- 1) Requested changes.
- 2) Recommended corrective actions.
- 3) Updated Organizational Process Assets.
- 4) Updated Project Management Plan.

Quality Audit

Quality Audit is a structured review of process management and product development activities. The objective of a quality audit is to identify lessons learned that can improve performance of the project within the performing organization. Quality audits may be scheduled or random, and they may be carried out by properly trained in-house auditors or by third parties such as quality system registration agencies.

Quality Audit may be:

- 1) Post project review
- 2) Internal project process review.
- 3) External regulator or customer audit.
- 4) Internal corporate quality group audits.

Approach to a quality Audit.

To check and know.

- ① Project planned quality is met.
- ② Products are safe and fit for use.
- ③ All law and regulations are followed.
- ④ Design is correct and among the best.
- ⑤ Data system are accurate and adequate.
- ⑥ Preventive measures are planned as required.
- ⑦ Proper corrective action taken when required.
- ⑧ Improvement opportunities are identified and actions taken.

A Quality Audit Approach affect the entire work lifecycle:

- ① Pre-defined standards will impact the way the project is planned
- ② Quality requirements and deliverables will be specific for work packages
- ③ Specific procedures will be identified in advance.
- ④ Quality Methods must be defined and followed.
- ⑤ Completed work and deliverables should be reviewed for compliances.

Quality Control Process.

Quality Control Process involves the monitoring and measuring of specific project results to determine whether they comply with relevant quality standards and identifying ways to eliminate causes of unsatisfactory performance.

Inputs

1. Quality Management Plan.
2. Quality Metrics.
3. Quality checklist.
4. Organizational Process Assets.
5. Work Performance Info.
6. Approved Change Request.
7. Deliverables.

Tools & techniques.

1. Cause and Effect Diagram.
2. Control charts.
3. Flowcharting.

- 4) Histogram.
- 5) Pareto Chart.
- 6) Run chart
- 7) Scatter Diagram
- 8) Statistical Sampling
- 9) Inspection.
- 10) Defect Repair review.

Output:

1. Quality Control Measurements.
2. Validated Defect Repair.
3. Updated Quality Baseline.
4. Recommended Corrective Actions.
5. Recommended Preventive Actions.
6. Requested Changes.
7. Recommended Defect repair.
8. Updated Organizational Process Assets.
9. Validated Deliverables.
10. Updated Project Management Plan..

Control Charts:

A control chart is a graphical display of data that illustrates the results of a process over time. It helps to prevent defects and allows you to determine whether a process is in control or out of control. It is used to determine whether a process is within control limits.

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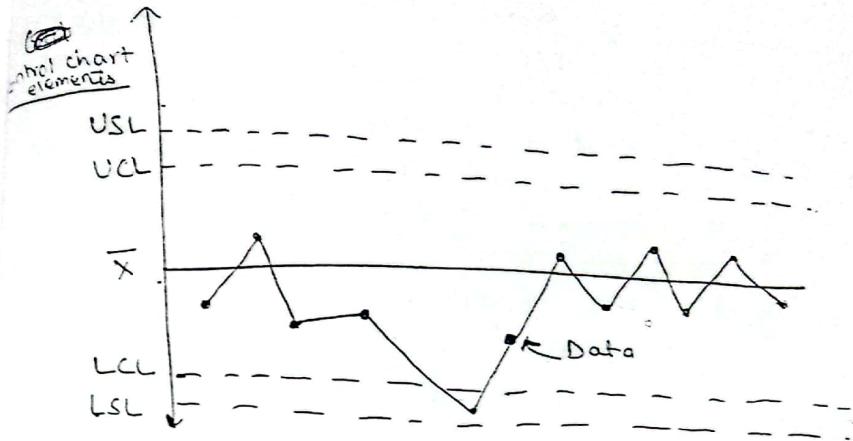


fig: Control chart.

USL → Upper Specification limit.

LSL → lower " "

UCL → Upper Control limit.

LCL → Lower " "

\bar{x} → Average

Rule of 7:

Rule of seven states that if seven data points in a row are all below the mean, above the mean or increasing or decreasing then the process needs to be examined for non-random problems.

If seven consecutive measures (data points) are plotted on one side of the average line then that could be considered as a Trend.

Pareto Charts:

One of the seven tools of quality control, it is a bar graph that displays variances by

the number of their occurrences. Variances are shown in their descending order to identify the largest opportunities for improvement, and to separate 'critical few' from the 'trivial many'. Pareto charts are used to display the Pareto principle in action, arranging data so that the few vital factors that are causing most of the problems reveal themselves. Concentrating improvement efforts on these few will have a greater impact and be more cost-effective than undirected effort.

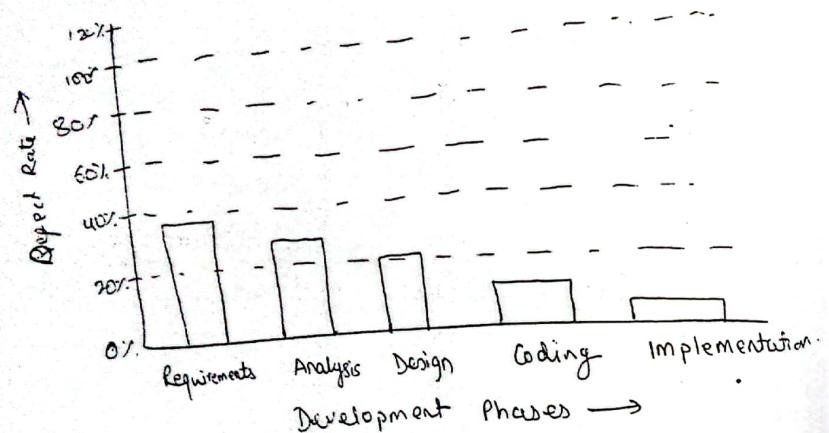


fig: Pareto chart.

Sampling Terms

- Attributes
- Attribute Sampling
- Variable Sampling
- Sampling Size (n)
- Sampling Plan.

Statistical Term.

- Mean
- Median
- Mode
- Range
- Variance
- Standard Deviation
- Normal Distribution

Testing of IT System.

Testing of IT system includes:

(a) Inspection: Measuring, examining and testing the process time to time. Inspections are variously called reviews, product reviews, audits and walk-throughs.

(b) Control charts: Graphic display of the results over time of a process.

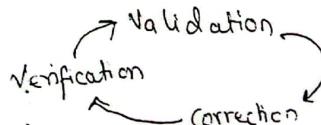
(c) Pareto diagrams: It is a histogram ordered by frequency of occurrence that shows how many results were generated by type or category of identified cause.

(d) statistical sampling: It involves choosing part of a population of interest for inspection that reduces the cost of quality control.

(e) Flowcharting.

(f) Trend Analysis: Using mathematical techniques to forecast future outcomes based on historical results.

Test life cycle.



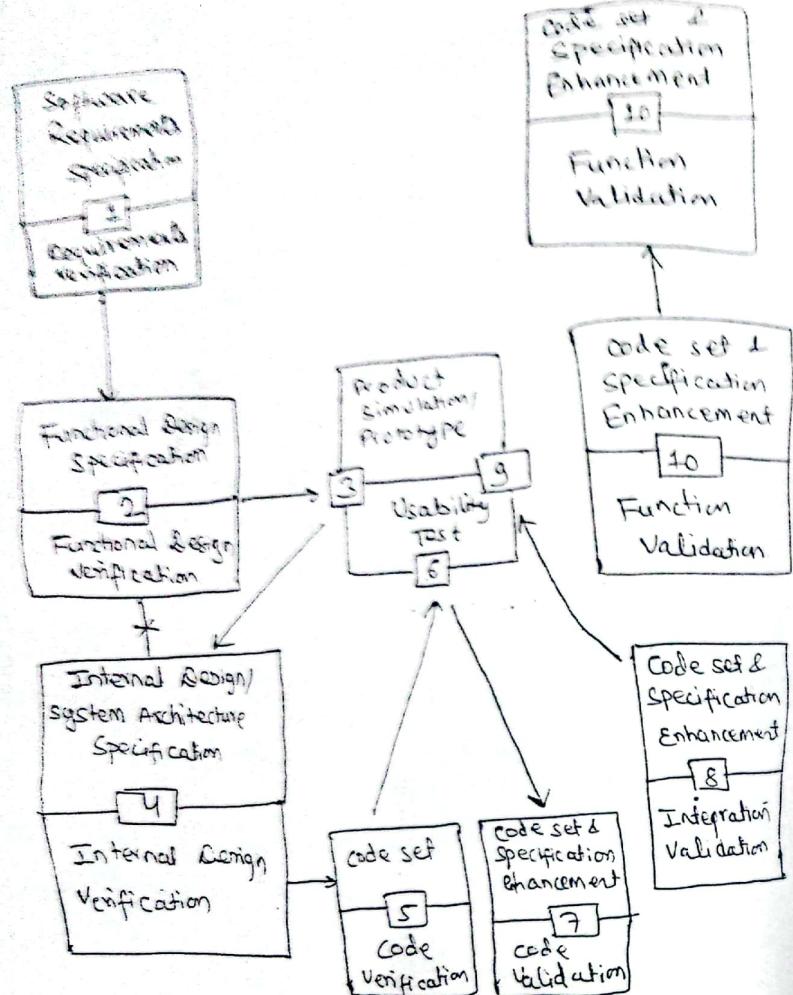


fig: U-Model of Test lifecycle .in SDLC

Chapter - 11 Project Communication Management

Project Communication Management is a group of processes required to ensure timely and appropriate development, collection, dissemination, storage and ultimately, disposition, of project information. The project communication management processes provide the critical links among people and information that are necessary for successful communications. The project communication management includes:

- Communication Planning
- Information Distribution
- Performance Reporting
- Manage Stakeholders

Importance of Communication Management

- Importance of communication management are:
 - The greatest threat to many projects is a failure to communicate as required when required.
 - Our culture does not portray IT professionals as being good communicators.
 - Research shows that IT professionals must be able to communicate effectively to succeed in their positions.
 - Strong verbal skills are a key factor in career advancement for IT professionals.

Communication Planning Process

Communication planning is the act of determining the information and communications needs of the stakeholders. Every project should include some type of communications management plan, a document that guides project communications as and when required. It includes to identify the following:

- a) Who needs what information.
- b) When they will need it.
- c) How it will be given to them.

It consists of the following phases:

- a) Communication Requirement Analysis.
- b) Organizing and conducting effective meetings.
- c) Using E-mail effectively.
- d) Communications management plan.

(A) Input

- 1) Enterprise Environmental Factor
- 2) Organizational Process Assets
- 3) Project Scope Statement
- 4) Project Management Plan
 - Constraints
 - Assumptions

(B) Tools & Techniques

- 1) Communications Requirements Analysis.
- 2) Communications Technologies.

(C) Output

- 1) Communications Management Plan.

Communication requirement Analysis

The analysis of communications requirements results in the sum of the information needs of the project stakeholders. The project manager should consider the number of potential communication channels or paths as an indicator of the complexity of a project's communication. The total number of communication channels is $\frac{n \times (n-1)}{2}$ where n = number of stakeholders. Thus, a project with 10 stakeholders has 45 potential communication channels.

Information typically required to determine project communications requirements includes:

- a) Organization charts
- b) Project organization and stakeholder responsibility relationships.
- c) Disciplines, departments, and specialities involved in the project.
- d) Logistics - how many persons will be involved with the project and at which locations.
- e) Internal Information needs. (communication across organizations)
- f) External Information needs (communication with media or contractors)
- g) Stakeholder information.
- h) Project scope statement.
- i) Project management plan.

Organizing and Conducting Effective Meetings

Conducting meetings for efficient information flow among the team members associated with a project is very vital for the successful completion of the project. The following points highlight how to organize and conduct effective meeting.

- ① Determine if a meeting can be avoided,
- ② make sure that a meeting is needed.
- ③ Define the purpose and intended outcome of the meeting.
- ④ Determine who should attend the meeting.
- ⑤ Provide an agenda to all participants before the meeting.
- ⑥ Prepare handouts, visual aids, and make logistical arrangements ahead of time.
- ⑦ Run the meeting professionally; discuss objectively, keep record of time and minutes.
- ⑧ Build relationships.
- ⑨ Prepare a meeting minutes and distribute it to all concerned ones.

Using Email Effectively

- ① Make sure that email is an appropriate medium for what you want to communicate.
- ② Be sure to send the email to right people.
- ③ Use meaningful subject.

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- ④ Limit the content to one main subject, and be as clear and concise as possible.
- ⑤ Limit the number and size of attachments.
- ⑥ Delete it if you don't need, and can't open.
- ⑦ Make sure you question the source.
- ⑧ Make sure your anti-virus software is up-to-date.
- ⑨ Respond to and file e-mails quickly.

Communications Management Plan

Communications management plan is contained in, or is a subsidiary plan of the project management plan.

It provides

- ① Stakeholder's communication requirements.
- ② Information to be communicated.
- ③ Person responsible for communicating the information.
- ④ Person or groups who will receive the information.
- ⑤ Frequency of the communication, such as weekly.
- ⑥ A project schedule for producing information.
- ⑦ Access methods for obtaining information. etc.

Information Distribution Process

Information distribution is making needed information available to project stakeholders in a timely manner. Information distribution includes implementing the communications management plan, as well as responding to unexpected requests for information. Getting the right information to the right people at the right time and in a

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useful format is just as important as developing the information in the first place. Important considerations include:

- a) Using technology to enhance information distribution
- b) Formal and informal methods for distributing information.

Information Distribution process is a part of "Project Execution Phase".

(a) Inputs

- 1. Communication management plan.

(b) Tools & Techniques

- 1. Communications skills.
- 2. Information Gathering and Retrieval System.
- 3. Information Distribution Methods.
- 4. Lesson Learned Process.

(c) Output

- 1. Updated Organizational Process Assets.
- 2. Requested Changes.

Traceability Matrix

A traceability matrix ties together requirements, functional specifications, tasks, test cases, source code and other relevant artifacts.

A traceability matrix helps the team to visualize the relationships between various elements of the system and the requirements. It enables the study of the impact of proposed changes on the system, when required.

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Performance Reporting Process

Performance reporting process refers to collecting and disseminating performance information. Stakeholders should be kept informed about how resources are used on the project. Performance reporting includes:

- a) Latest status, progress measurement and forecasting.
- b) Information on scope, schedule, cost and quality, and possibility of risk and upcoming procurement issues.

Performance Reporting process is a part of "Project Controlling Phase".

(a) Inputs

- 1. Work Performance Info.
- 2. Performance Measurement.
- 3. Forecasted Competition.
- 4. Quality Control Measurement.
- 5. Project Management Plan
 - Performance Measurement baseline
- 6. Approved change Request.
- 7. Deliverables.

(b) Tools & Techniques

- 1. Information Presentation Tools.
- 2. Performance Information Gathering & compilation.
- 3. Status Review Meeting.
- 4. Time Reporting System.
- 5. Cost Reporting System.

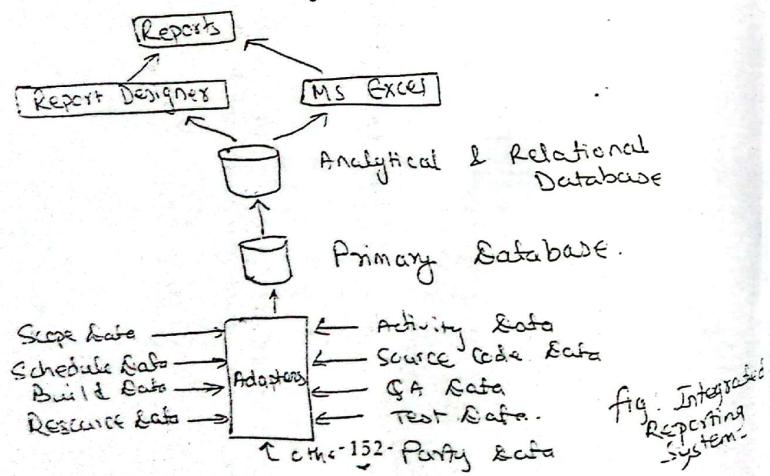
(c) Output

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1. Performance Reports
2. Forecasts
3. Requested changes
4. Recommended Corrective Actions.
5. Updated Organizational Process Assets.

Integrated reporting System.

In many organizations, project management staff spends a huge amount of time in gathering, evaluating, formatting and disseminating status. A lot of this work is repetitive and info. A lot of this work is repetitive and info. Performing routine, time-consuming, recurring reporting work often prevents high-level reporting work from identifying the real problem and bottlenecks. An integrated report management tool has lot of importance in this context. It will collect data during operation, store them into a relational and analytical database and provide them in a "ready to analysis" manner as and when required.



Chapter - 12 Project Risk Management

Understanding Risk

Risk is the possibility of loss or injury. They are events or conditions that may occur, and those occurrence, if it does take place has harmful projects. It is any event that could prevent the project realizing the expected goal. Risk and risk potential changes as the project progresses.

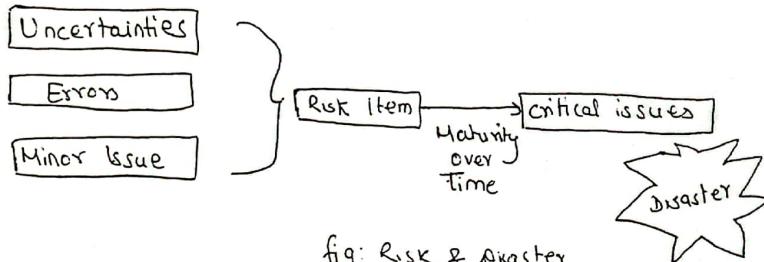


fig: Risk & Disaster

Types of Risk

- a) Project Risk
- b) Process Risk

Project Risk

Project risks are defined as the undesirable event, the chance this event might occur and the consequences of all possible outcomes. Project risks are caused by technical aspect of work or work product.

Risk Management Planning Process

Risk Management planning process is the process of deciding how to approach the plan the risk management activities for a project. It describes about "How do I plan for risks in my project?"

An appropriate sequence for risk management activities is risk identification, risk quantification and risk response development and control. Risk Management planning process is a part of "Project Planning Phase".

Input

1. Enterprise Environmental Factor
2. Organizational Process Assets
3. Project Management Plan.

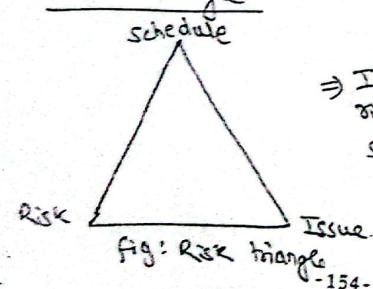
Tools & Techniques

1. Planning Meeting and Analysis.

Output

1. Risk Management Plan.

Risk Triangle



⇒ It represents impact of project's risk and issues on project schedule.

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Risk Management Plan

It is the description of the procedures that will be used to manage risk throughout the project. In addition to documenting the results of the risk identification and risk quantification processes, it should cover who is responsible for managing various areas of risk, how the initial identification and quantification outputs will be maintained, how contingency plans will be implemented, and how reserves will be allocated.

It may be formal or informal, highly detailed or broadly framed, based on the needs of the project. It is a subsidiary element of the overall project plan.

Risk Identification

Risk identification is the process of determining which risks are likely to affect the project and documenting the characteristics of risk. Risk identification is not a one-time event; it should be performed on a regular basis throughout the project. Risk identification should address both internal and external risks. Strictly speaking, risk involves only the possibility of suffering harm or loss. In the project context, however, risk identification is concerned with opportunities as well as threats.

Risk identification may be accomplished by identifying cause-and-effects or effects-and-causes.

Risk identification process is a part of "Project planning Phase".

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Inputs

1. Enterprise Environmental Factor
2. Organizational Process Assets
3. Project Scope Statement
4. Risk Management Plan
5. Project Management Plan

Tools & Techniques

1. Documentation Review
2. Information Gathering.
3. Checklists
4. Assumptions
5. Diagramming Techniques

Output

1. Risk Register

Risk Identification Techniques

Different risk identification techniques are:

a) Brainstorming:

This is most often used technique of risk identification process. This is probably used by all people many scenarios. Brainstorming involves getting Subject matter experts, team members, risk management team & anyone else who might benefit the process in a room and asking them to start identifying possible risk events.

The trick here is that one person's idea might spawn another idea and so on, so that by the end of the session you would have identified

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the possible risks. The facilitator could start the group off by going through the categories of risks to get everyone thinking in the right direction.

b) Delphi Technique

Delphi technique is a lot like brainstorming, only the people participating in the meeting don't necessarily know each other. In fact the people participating in this technique don't all have to be located in the same place and can participate anonymously. We can use email to facilitate the Delphi technique very easily. The process involves inquiring via a questionnaire with all experts both inside and outside the company and they in turn send the responses back to you. All responses are organized by content and sent back to the Delphi members for further input additions or comments. The participants then send their comments back one more time and a final list of risks is compiled by the facilitator.

The Delphi technique is a great tool that allows consensus to be reached very quickly. It also helps prevent one person from unfairly influencing the others in the group and thus prevents bias in the outcome because the participants are usually anonymous and don't necessarily know how others in the group responded.

Nominal Group Technique

Another technique that is similar to the Delphi is the nominal group. This requires the

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participants to be together in the same room. Each participant has paper and pencil in front of them and they are asked to write down what risks they think the project faces. The papers are given to the facilitator, who sticks them up to the wall or a white board. The panel is then asked to review all the risks posted on the board. Rank them and prioritize them in writing and submit the ranking to the facilitator. Once this is done you should have a complete list of risks.

a) Interviewing.

Interviews are questions and answer sessions held with others, including other project managers, subject matter experts, stakeholders, customers team members and users. These folks provide you with possible risks based on their past experiences with similar projects.

This method involves interviewing those with previous experience on project similar to yours or those with specialized knowledge or industry expertise. Ask them to tell you about any risks that they have experienced or that they think may happen on your project.

b) Root Cause Identification.

Root Cause Identification involves digging deeper than the risk itself and looking at what the cause of the risk is. This helps define the risk more clearly and it also helps you later when it's time to develop the response plan for the risk.

④ SWOT - Strengths, Weakness, Opportunities & Threats
Strengths, weakness, opportunities and threats (SWOT) is an analysis technique that examines through each of these viewpoints the project itself, project management processes, resources, and the organization and so on. It also helps broaden your perspective of where to look for risks.

Qualitative Risk Analysis Process.

It is the process of assessing the impact and likelihood of identified risks. The process prioritizes risks according to their potential effect on the project.

Qualitative Risk Analysis process is part of "Project Planning Phase".

Input

1. Organizational Process Assets.
2. Project scope statement.
3. Risk Management Plan.
4. Risk Register.

Tools & Techniques.

1. Risk Probability & Impact Assessment.
2. Probability & Impact Matrix.
3. Risk Data Quality Assessment.
4. Risk Categorization.
5. Risk Urgency Assessment.

Output

1. Updated Risk Register.

Risk Data Quality Assessment

- A qualitative risk analysis requires accurate and unbiased data if it is to be credible.
- Analysis of the quality of risk data is a technique to evaluate the degree to which the data about risks is useful for risk management.
- It involves examining the degree to which the risk is understood and the accuracy, quality, reliability and integrity of the data about the risk.

Quantitative Risk Analysis Process

Quantitative Risk Analysis Process is the process of determining numerically the probability of each risk and its consequences of project objectives. It quantifies risk exposure and determines the size of cost and schedule contingencies reserves that may be needed. It also identifies risk requiring the most attention.

"Quantitative Risk Analysis process is part of Project Planning Phase."

Inputs

1. Organizational Process Assets.
2. Project Scope Statement.
3. Risk Management Plan.
4. Risk Register.
5. Project Management Plan

- Project schedule management plan.
- Project cost management plan.

Tools & Techniques

1. Data Gathering and Representation Technique.
2. Quantitative Risk Analysis and Modeling Technique.

Output

1. Updated Risk Register.

Modeling Techniques

Various techniques for quantitative Risk Analysis process are:

(a) Sensitivity Analysis.

It is a deterministic modeling technique used to test the impact of a change in a value of independent variable on a dependent variable. It is also known as aka-what-if Analysis. Tornado diagrams are used for sensitivity analysis.

(b) Monte Carlo Approach - Modeling & Simulation.

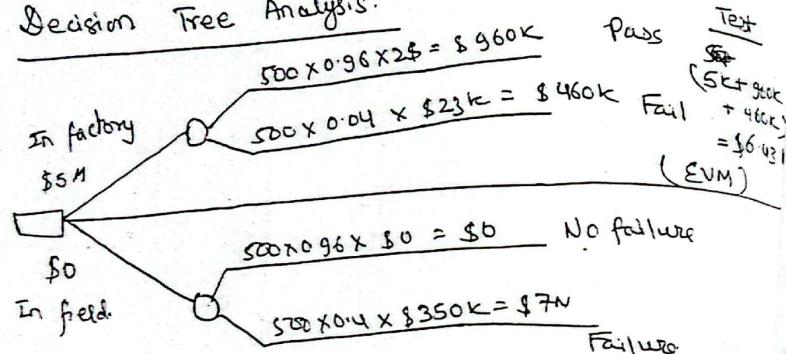
It is similar to sensitivity analysis and known as what-if Analysis - Monte Carlo Approach.

(c) Expected Value Creation or Expected Monetary Value (CEVM)

It is the study of decision making criteria for each decision-event combination along with the associated probabilities of different profit conditions.

Decision Trees are used for EVM study
Formula:
 Risk Exposure = Event (Probability) \times Event (Impact)

Decision Tree Analysis.



Risk Response Planning.

Risk Response Planning is the process of developing options to enhance opportunities and reduce threats to the project's objectives, ultimately reducing overall risk.
 Risk Response Planning process is a part of "Project Planning Phase".

Inputs

1. Risk Management Plan.
2. Risk Register.

Tools & Techniques

1. Strategies for Negative Risks or Threats.
2. Strategies for Positive Risks or Opportunities.

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3 strategies for both Threats and Opportunities.
 4 Contingent Response strategy.

Output

1. Updated Risk Register.
2. Updated Project Management Plan.
3. Risk related Contractual Agreements.

Resolution of Risks.

Once a project manager has profiled the risks, they can be ranked into an ordered list representing the various threats to the project to be dealt with. The more significant can then be examined and assigned an action by the project team. This process is known as resolution of risks.

Typical actions for resolution of risk include:

- Research and review:** The risk is not yet fully understood. Its impact or likelihood of occurrence may be unclear or the context in which it may occur ~~can~~ seem unreasonable. Further research by members of the project team is warranted.
- Accept and Prevent:** The risk is unavoidable and must be accepted as-is. This category of risks become extremely important to a project since they cannot be resolved but still represent a threat to completion. Anticipation therefore become the key to dealing with this category of risk.
- Reduce and Protect:** ~~This~~ The risk as it stands is unacceptable.

The project team must act to reduce the risk and to establish contingency plans should the risk occur. The risk will have to be reviewed in future to define the threat it poses.

(d) Eliminate and Protect:

The risk is unacceptable under any circumstances and must be eliminated as a possibility. The project team must put in place processes and procedures not only to ensure the immediate threat is eliminated but that it does not re-occur in the future.

Strategies for negative risk or threat-

(a) Risk Avoidance.

→ Eliminating a specific threat or risk, usually by eliminating its causes.

(b) Risk Transference:

→ Shifting the consequence of a risk and responsibility for its management to a third party. Shift risk to another person, group, location etc.
eg: outsourcing.

(c) Risk Mitigation:

→ Reducing the impact of a risk event by reducing the probability of its occurrence.

Strategies for positive risks or Opportunities.

(a) Exploit

⇒ Enhance plan to ensure that the opportunity is realized.
⇒ Eliminate uncertainty to ensure opportunity happens.

(b) Share

⇒ Involved 3rd party who are better able to realize opportunity.

(c) Enhance

⇒ Modifies the size of opportunity by increasing probability and maximizing key drivers of positive impact risks.

Strategies for both Threats and Opportunities

(a) Risk Acceptance.

(b) Contingent Response strategy.

Risk Monitoring and Control Process.

It is a process of keeping track of identified risks, monitoring residual risk, executing risk plan and evaluating the effectiveness in reducing risk.
It is a part of "Project Controlling Phase".

Inputs

1. Risk Management Plan.
2. Risk Register.
3. Approved Change Requests.

4. Work Performance Info.
5. Performance Report.

Tools & Techniques

1. Risk Reassessment
2. Risk Audit.
3. Variance and Trend Analysis.
4. Technical Performance Measurement.
5. Reserve Analysis.
6. Status Meeting / Review Meetings.

Outputs

1. Updated Risk Register.
2. Requested changes.
3. Recommended Corrective Actions.
4. " Preventive "
5. Updated Organizational Process Assets.
6. Updated Project Management Plan.

Risk Audit

Risk audit is a technique for monitoring and controlling risk. Risk audits examine and document the effectiveness of risk responses in dealing with identified risks and their root causes, as well as the effectiveness of the risk management process.

It can be performed as part of regular Quality Assurance (QA) audit.

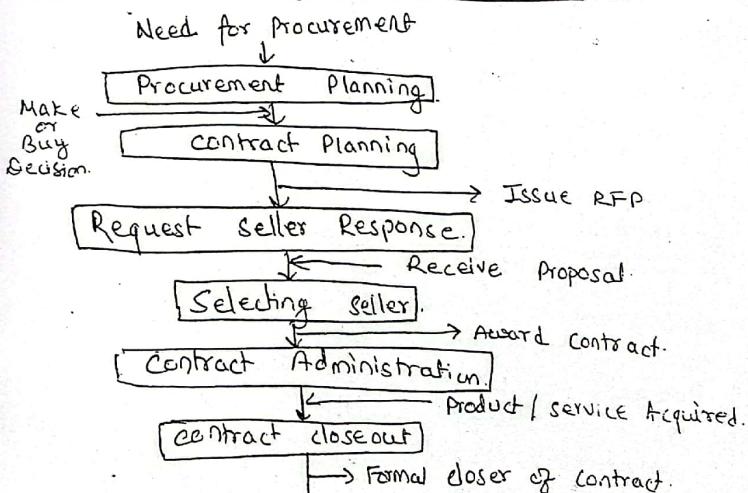
Chapter-13 Project Procurement Management

Procurement Management is a group of processes required to purchase or to acquire the products, services or results needed from outside the project team to perform the work.

Project Procurement Management Processes include

- ① Plan Purchases and Acquisitions Process
- ② Plan Contracting Process.
- ③ Request Seller Responses
- ④ Select Sellers Process.
- ⑤ Contract Administration Process.
- ⑥ Contract Closure Process.

Procurement Management Process flow



Plan Purchases and Acquisitions Process

It is the process that identifies which project needs can best be met by purchasing or acquiring products, services or results outside the project organization, and which project needs can be accomplished by the project team during project execution. This process involves consideration of whether, how, what, how much and when to acquire.

Plan Purchases and Acquisitions process is a part of "Project Planning Phase".

Inputs

1. Enterprise Environmental Factors.
2. Organizational Process Assets.
3. Project Scope Statement.
4. WBS
5. WBS Dictionary.
6. Project Management Plan.
 - Risk Register.
 - Risk-related contractual Agreements.
 - Resource Requirements.
 - Project Schedule.
 - Activity Cost Estimates.
 - Cost Baseline.

Enterprise Environmental Factors (EEF)

Enterprise Environmental Factors are any environmental factors either internal or external to the Project that can influence the Project's success.

EEF includes culture, weather conditions, government regulations, political situations, market conditions etc.

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Organizational Process Assets (OPA)

Organizational Process Assets would include anything the organization has acquired that you can use in the management of the project. They are formal and informal plans, policies, procedures and guidelines. These are very important for the planning stage, irrespective of the nature of the project. Whether your project is long-term or short-term, OPAs are a must.

List of OPAs

- 1) Standardized guidelines.
- 2) Proposal evaluation Criteria.
- 3) Workbreakdown structure templates.
- 4) Project schedule network diagram templates.
- 5) Risk templates.
- 6) Organizational standard processes.
- 7) Project closure guidelines.
- 8) Project management Processes.
- 9) Defect management databases.
- 10) Lessons learned and historical databases.
- 11) Change control procedures.
- 12) Financial control procedures.
- 13) Project files.

Make or Buy checklist

Reasons to Make

- cheaper to make.
- experience making it
- Idle production facility available.

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- Compatible and fits in production line.
- Part is proprietary.
- Not dependent on supplier.
- Fragile part → \$ packing.
- High transportation costs.

Reasons to Buy:

- cheaper to buy.
- No production facilities.
- Avoid fluctuating / seasonal demand.
- Inexperience with making process.
- Available Suppliers.
- Maintain existing supplier.
- Higher reliability and quality.

Contract Types:

1) Fixed Price Contracts.

These are also called Lump sum contracts. The seller and the buyer agree on a fixed price for the project. The seller is bound to accept high risk in this type of contract. The buyer is in the least risk category as the price is already fixed and the seller has agreed to this. These must be fully detailed specific statements from the checklists, project scope statements from the Seller side which the buyer will use.

Fixed price contract types:

a) Fixed Price Incentive Fee (FPIF)

- If project ends sooner, an additional amount is paid to the seller.

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⑥ Fixed Price Award performance fee (FP4F) - If the amount paid to the seller exceeds expectations, (usually 10%) will be

⑦ Fixed Price Economic Price Adjustment (FPEPA)

- The fixed price can be re-determined depending on the market pricing rate.

2) Cost Reimbursable Contracts.

Under a cost reimbursable contracts, the seller will work for a fixed time period, and will raise the bill after finishing work. A major drawback of this type of contract is that the seller can raise an unlimited or unknown amount which the buyer is compelled to pay.

This types of contracts are rarely used.

Types of Cost Reimbursable Contracts.

a) Cost Plus Fee (CPF) or Cost plus Percentage of costs (CPPC) - The seller will get the total cost they incurred on the project plus a percentage of fee over cost. Always beneficial for the seller.

b) Cost Plus Fixed fee (CPFF) - A fixed amount (for seller) is agreed upon before work commences. Cost incurred on the project is reimbursed on top of this.

c) Cost Plus Incentive Fee (CPIF) - A performance based extra amount will be paid to the seller over and above the actual cost they have incurred on the project.

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(d) Cost plus Award Fee (CPAF) - The seller will get a bonus amount plus the actual cost incurred on the project. Very similar to CPFF contract.

(3) In Time & Material Contracts or Unit Price Contracts

Unit price contracts are what we call an hourly rate. This type of contract is typical in freelance work. The main advantage of this type of contract is that the seller will make money for every hour he spends on the project.

Plan Contracting Process

It is the process that prepares the documents needed to support the request Seller Response process and Select seller process.
Plan Contracting process is a part of "Project Planning Phase".

Inputs

1. Procurement Management Plan
2. Contract Statement of Work
3. Make-or-Buy Decisions
4. Project Management Plan
 - Risk Register
 - Risk-related Contractual Agreements
 - Resource Requirements
 - Project Schedule
 - Activity Cost Estimates
 - Cost Baseline

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Tools & Techniques

1. Standard forms
2. Expert Judgment

Output

1. Procurement Documents
2. Evaluation Criteria
3. Updated contract Statement of Work

Standard Forms

Standard forms include standard contracts, standard descriptions of procurement item, non-disclosure agreements, proposal evaluation criteria checklists, or standardized versions of all parts of the needed bid documents.

Evaluation Criteria

Evaluation Criteria are the borderline that are developed and used to rate or score proposals. Evaluation criteria are often included as part of the procurement documents.

Request Seller Response Process

This process obtains responses, such as bids and proposals, from prospective seller on how project requirements can be met. Request Seller Response process is a part of "Project Planning Phase".

Inputs

1. Organizational Process Assets
2. Procurement Management Plan
3. Procurement Agreements

Tools & Techniques.

1. Bidder Conference.
2. Advertising.
3. Develop qualified Seller list.

Output

1. Qualified Seller list.
2. Procurement Document Package.
3. Proposals.

Select Sellers Process.

Select sellers process receives bids or proposals and applies evaluation criteria, as applicable, to select one or more sellers who are both qualified and acceptable as a seller.

Select sellers process is a part of "Project Execution Phase".

Inputs

1. Organizational Process Assets.
2. Procurement Management Plan.
3. Evaluation Criteria.
4. Procurement Document Package.
5. Proposals.
6. Qualified Seller list.
7. Project Management Plan
 - Risk Register
 - Risk Related Contractual Agreements.

Contract Negotiation.

It clarifies the structure and requirement of the contract so that mutual agreement can be reached prior to signing the contract.

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There are five stages of Contract Negotiation. They are:

- Protocol
- Probing
- Scratch bargaining.
- closure
- Agreement.

Contract Administration Process.

Contract Administration Process ensures that the seller's performance meets contractual requirements and that the buyer performs according to the terms of the contract.

Both the buyer and the seller administer the contract for similar purposes. Each party ensures that they meet their contractual obligations and their own legal rights are protected.

Contract Administration process is a part of "Project Controlling Phase".

Inputs

1. Contract Agreement.
2. Contract Management Plan.
3. Selected Sellers.
4. Performance Reports.
5. Approved Change Requests.
6. Work Performance Info.

Tools & Techniques.

1. Contract Change Control System.
2. Buyer Conducted Performance Review.
3. Inspections and Audits.
4. Performance Reporting.
5. Payment System.

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- 6. Claims Administration.
- 7. Record Management System.
- 8. Information Technology.

Output

- 1. Contract Documentation.
- 2. Requested changes
- 3. Recommended Corrective Actions.
- 4. Updated Organizational Process Assets.
- 5. Updated Procurement Management Plan.
 - Contract Management Plan.

Contract closure Process

It performs the formal project closing activities, since it involves verification that all work and deliverables were acceptable. It also involved administrative activities such as updating records and archiving information for future use. It is a part of "Project closing Phase".

Input

- 1. Procurement Management Plan.
- 2. Contract Management Plan.
- 3. Contract Documentation.
- 4. Contract closure Procedure.

Tools & Techniques

- 1. Procurement Audits.
- 2. Record Management System.

Output

- 1. closed Contracts.
- 2. Updated Organizational Process Assets.

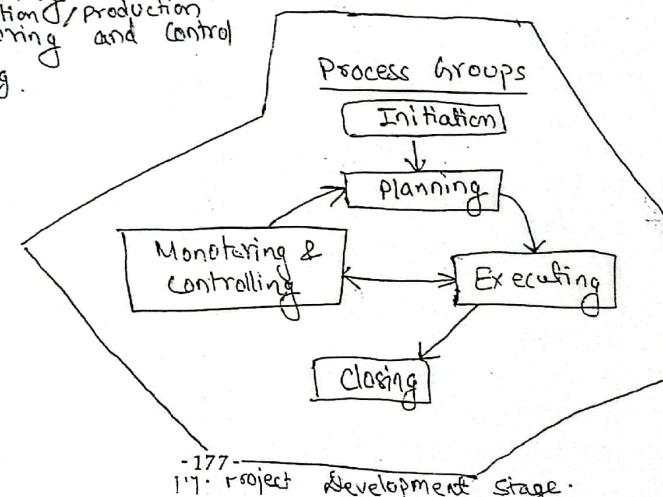
Chapter - 14

Developing Custom Processes for IT Projects.

Developing IT project management methodology

There are different methods/process to developing IT project management methodologies, they are traditional approach, PRINCE2, PRISM (project Integration Sustainable Methods), critical chain Project Management, Event chain Project methodology, process based methodology, agile methodology, lean project management, extreme project management, benefit realization management etc. All these methodologies have their own phases for the project management. These phases are:

- i) Planning Initiation
- ii) Planning
- iii) Execution/production
- iv) Monitoring and Control
- v) Closing.



I) Initiation

Project initiation means selecting and formally starting an IT project. This phase includes pre-case studies, feasibility study, etc. The key outcomes of this phases include selecting the project manager, identifying key stakeholders, completing business case, business charter and project initiation documents.

II) Planning

The purpose of project planning is to guide execution. The key outcomes are team contract, project scopes, work division, schedule, cost estimation, identifying deliverables, risk estimation, gaining formal approval and planning documents.

III) Execution

Execution consists of the processes used to complete the work defined in the project plan to accomplish the project's requirements. Execution process involves coordinating people and resources, as well as integrating and performing the activities of the project in accordance with the project management plan. The deliverables are produced as outputs from the processes performed as defined in the project management plan and other frameworks that might be applicable to the type of project at hand. Execution process group include:

- 1) Direct and Manage Project Execution.
- 2) Quality Assurance of deliverables.
- 3) Acquire, Develop and Manage Project team.
- 4) Distribute Information.
- 5) Manage Stakeholders expectations.
- 6) Conduct Procurement.

IV) Monitoring and Controlling

Monitoring and controlling consists of these processes performed to observe project execution so that potential problems can be identified in a timely manner and corrective action can be taken, when necessary to control the execution of the project.

Monitoring and controlling includes:

- a) Measuring the ongoing project activities ('where we are');
- b) Monitoring the project variables (cost, effort, scope, etc) against the project management plan and the project performance baseline ('where we should be');
- c) Identify corrective actions to address issue and risks properly (How can we get on track again);
- d) Influencing the factors that could circumvent integrated change control so only approved changes are implemented.

Closing

Closing includes the formal acceptance of the project and the ending thereof. Administrative activities include the archiving of the files and documenting lessons learned. This phase

consist of:

a) Project close:

finalize all activities across all of the process groups to formally close the project or a project phase.

b) Contract closure:

complete # and settle each contract and close each contract applicable to the project or project phase.

IT project Process Tailoring

Tailoring provides necessary adjustment of project activities to reflect the uniqueness of the project while keeping the projects goal in mind.

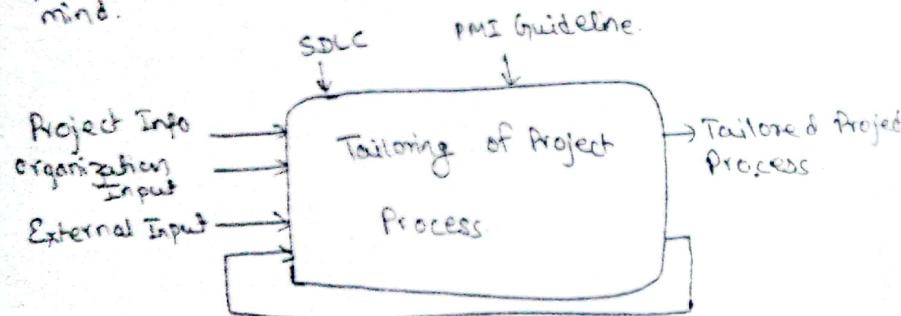


Fig: Tailoring of project process-

Barriers to implementation of tailored project Management

1. Lack of sustained top management commitment.
2. Insufficient Training on Integrated Project Management.

- 3. Lack of planning.
- 4. Lack of resources
- 5. Lessons learned and good practices not shared across projects.
- 6. Not invented here syndrome.
- 7. Poor incentives / award criteria.
- 8. Over-extended reviews.

Moving Forward with Customized Management Processes

There is no definite set of governing methodologies for the IT project management. Each project is unique in terms of operational requirements, business environment, mission criticality, technology choices and client-supplier relationship. Each project needs different needs different customized-tailored-tuned separate driveway in its road to success.

The primary problem is that current project management methodology is handicapped by fundamental structural constraints. They may be changes in resources, changes in features, and keeping balance among planned schedule, budget cost and initially perceived quality to the project outcome.

Although the greater number of IT projects are being successfully executed every day, there is much room for improvement. However we have to insure that only right processes are selected according to project needs. Possible areas of improvements are:

- 1) Right volume of documentations.
- 2) Concurrent and overlapping activities.
- 3) Managing resources in economic way.
- 4) Productivity Vs Quality.

Preventive Maintenance of Office Computer System

a) General Issues

- Working environment : Heat, Humidity, Air flow etc.
- Conditioning power supply.
- Keep apart from strong magnetic things.
- Maintain normal shutdown procedure.

b) Daily Issues:

- Automated virus scan.
- Differential or Incremental backup.

c) Weekly Issues:

- clear temporary files and folders and recycle bin.
- Update antivirus software.
- Defrag hard disk.
- clean the printer

d) Monthly Issues.

- clean machine, keyboard, mouse, external drive etc.

e) Yearly Issues.

- Clean the inside of the machine.

Certified Associate in Project Management (CAPM)

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Certified Associate in Project Management (CAPM) is a credential offered by the Project Management Institute (PMI). As of November 13, there were 24,196 active CAPM certified individuals worldwide. PMI's Certified Associate in Project Management (CAPM) is an entry-level certification for project practitioners. Designed for those with less project experience, the CAPM is intended to demonstrate candidate understanding of the fundamental knowledge, terminology and processes of effective project management.

Project Management Maturity

Project management maturity refers to the progressive development of an enterprise-wide project management approach, methodology, strategy, and decision-making process. The appropriate level of maturity will vary for each organization based on its specific goals, strategies, resource capabilities, scope and needs.

Project Management Maturity Model

~~Project Management Maturity Model is given on last page of this chapter.~~

Promoting Project Excellency through awards and assessment

client projects must demonstrate excellent performance, all project management aspects, including the management of people, purpose, processes, resources and results. Results are only credited insofar as they are a consequence of leadership and management.

There concept of project excellence promote the use of research, experiments, assessments awards, incentives and other means in order to bring innovation to the way a project is managed.

All projects participating in the Project Excellence award are assessed for their excellence using the standardised approach based on IPMA project Excellence model.

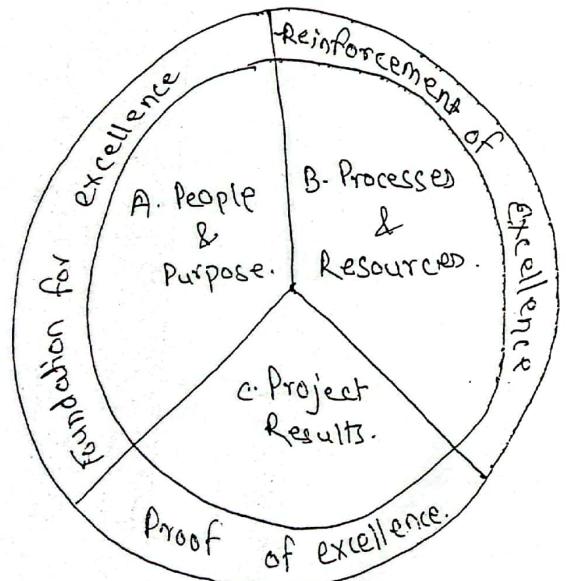


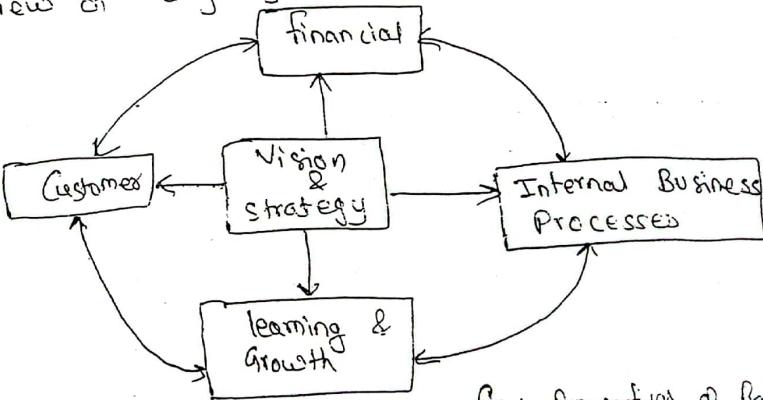
fig: IPMA Project Excellence Model.

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Chapter - 15 Balanced Scorecard and ICT project Management.

The balance scorecard is a strategic planning and management system that is used extensively in business and industry, government and non profit organizations worldwide to align business activities to the vision and strategy of the organization, improve internal and external communications and monitor organization performance against strategic goals.

It was originated by Dr. Robert Kaplan (Harvard Business School) and David Norton as a performance measurement framework that added strategic non-financial performance measures to additional financial metrics to give managers and executives a more balanced view of organizational performance.



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fig: Perspective of Balance Scorecard.

Financial: Encourages the identification of a few relevant high-level financial measures. In particular, designers were encouraged to choose measures that helped inform the answer to the question "How do we look to shareholders?"

④ Customer:

Encourages the identification of measures that answer the question "How do customers see us?"

⑤ Internal business processes:

Encourages the identification of measures that answer the question "What must we excel at?"

⑥ Learning & Growth:

Encourages the identification of measures that answer the question "How can we continue to improve and create value?"

Certifications:

PMI offers a comprehensive certification program for project practitioners of all education and skill levels. There are currently six credentials available, rigorously developed, globally accredited and easily transferable across borders and industries.

Types

- ① Certified Associate in Project Management (CAPM)
- ② Project Management Professional (PMP)
- ③ Program Management Professional (PgMP)
- ④ PMI Agile Certified Practitioner (PMI-ACP)
- ⑤ PMI Risk Management Professional (PMI-RMP)
- ⑥ PMI Scheduling Professional (PMI-SP)
- ⑦ GPNZ - Professional certification.

Code of Ethics

A code of ethics is a guide of principles designed to help professionals conduct business honestly and with integrity. A code of ethics document may outline the mission and values of the business or organization, how professionals are supposed to approach problems, the ethical principles based on the organization's core values and the standards to which the professional is held.

Project Management Maturity Model.

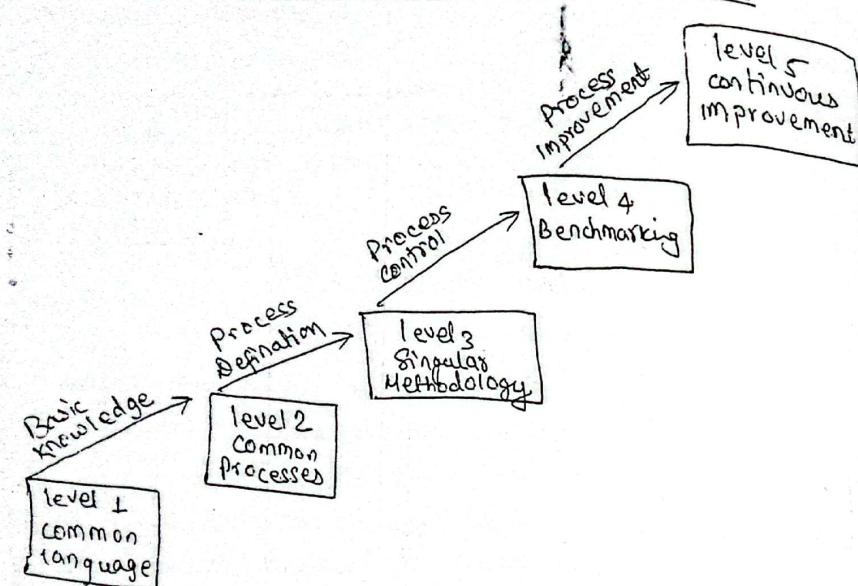


fig: Project Management Maturity model.

Future trends

future trends in project depends on:

- ① Communication.
- ② Information & Technology.
- ③ Innovations.
- ④ Research.
- Modern Machinery & equipments.
- Use of Medias.

Important Questions For Short Notes.

Six Sigma

Six Sigma at many organizations simply means a measure of quality that strives for near-perfection. Six Sigma is a disciplined, data-driven approach and methodology for eliminating defects from manufacturing to transactional and from product to service. The statistical representation of six sigma describes quantitatively how process is performing. To achieve six sigma, a process must not produce more than 3.4 defects per million opportunities. A six sigma defect is defined as anything outside of customer specification. A six sigma opportunity is then the total quality of chances for a defect. Process sigma can easily be calculated using a six sigma calculator.

⑩ COCOMO (constructive cost model)

It is a procedural software cost estimation model developed by Barry W. Boehm. The model parameters are derived from fitting a regression formula using data from historical projects.

- It is done in 3-phase.
- ① Basic COCOMO
 - ② Intermediate COCOMO
 - ③ Detailed COCOMO.

Pareto Analysis & 80/20 Rule.

Pareto Analysis is a statistical technique in decision-making used for the selection of a limited number of tasks that produce significant overall effect. It uses the 80/20 principle (also known as 80/20 rule) the idea that by doing 20% of the work you can generate 80% of the benefit of doing the entire job. Take quality improvement for example, a vast majority of problems (80%) are produced by a few key causes (20%). This technique is also called the vital few and the trivial many.