

Introduction

- Programmed based on PMBok® Guide.
- Principles & theory of Project Management.
- Practical examples.



A Guide to the
**PROJECT MANAGEMENT
BODY OF KNOWLEDGE
(PMBOK® GUIDE)**

Fifth Edition

Course Structure

- **About PMP® , CAPM® , PMI® & PMBOK®
Guide**
- **Course Syllabus**
 - **Assignments**
 - **Assessments**
- **Course Details**
 - The Project Management Framework
 - Project Management Processes
 - Project Management Knowledge Areas

	CAPM	PMP
Overview	CAPM certification is designed for project team members, entry-level project managers and qualified undergraduate or graduate students. CAPM is also suitable for anyone switching into Project Management Profession but is not qualified for PMP Certification. CAPM demonstrates a good knowledge of Project Management terminology, concepts and methodology.	PMP certification is meant for experienced Project Managers who want to gain credibility and recognition for their knowledge and skills in Project Management, and want to advance their project management career.
Who should apply?	Candidates for the CAPM credential contribute to projects as subject matter experts and team members. They may also serve as project sponsors, facilitators, liaisons or coordinators.	Those who lead and direct cross-functional teams to deliver projects within the constraints of schedule, budget, and scope.
Eligibility Criteria	<p>To qualify for the CAPM Exam, you need:</p> <p>a. Secondary Education + 1500 hrs of experience on a Project Team</p> <p style="text-align: center;">OR</p> <p>b. Secondary Education + 23 hrs of formal Project Management education</p>	<p>To qualify for the PMP Exam, you need:</p> <p>a. High School Diploma or a global equivalent + 60 months / 7500 hrs of PM experience + 35 hrs of formal Project Management education</p> <p style="text-align: center;">OR</p> <p>b. Bachelor's degree or a global equivalent + 36 months / 4500 hrs of PM experience + 35 hrs of formal Project Management education</p>

CAPM

PMP

Exam Fee (USD)	a. \$300 for non-PMI members b. \$225 for PMI members	a. \$555 for non-PMI members b. \$405 for PMI members
Exam. Time	3 hours	4 hours
No. of Exam Questions	135 Scored + 15 Pretest = 150 Total	175 Scored + 25 Pretest = 200 Total
Difficulty Level	Considerably less difficult than the PMP Exam	Generally considered to be difficult (a subjective matter)
Type of Questions	Objective-type; Mostly direct questions based on PMBOK Guide content.	Objective-type; Mostly situational questions.
App. Mode	Online and paper-based	Online and paper-based
Subj to Audit?	Yes	Yes
Validity	5 years	3 years
Renewal	Retest after 5 years. Details: a. Submit the online application in the 5th year b. Take the exam within the 5th year c. No need to submit eligibility info again d. Not subject to audit again	Earn 60 PDUs during the 3 year certification cycle.
Recognition / Market Value	CAPM was introduced in 2003 and is a relatively new certification. It is steadily gaining popularity. It might not get you a Project Manager job, a promotion or a steep pay-hike immediately, but it certainly demonstrates your seriousness about pursuing Project Management as a career. It provides you a step in the door into Project Management.	PMP was introduced in 1984 and has been the premier certification in the field of Project Management for many years. It's well recognized across the world and many companies use it as a pre-requisite for Project Manager positions..
More Information	Refer to About CAPM Certification and CAPM Handbook (PDF) .	Refer to About PMP Certification and PMP Handbook (PDF) .

What is PMI?

- Establishes PM **standards**, provide seminars, educational programs and **professional certification**.
- Founded in 1969.
- 500,000+ members representing 185 countries

- **Over 375 organizations participating in the Group Billing Plan**
- **Almost 230 chartered & potential chapters**
- **25 chartered Specific Interest Groups (SIG)**

- **Computers/Software/
Data Processing**
- **Information Technology**
- **Telecommunications**
- **Business Management
Services**
- **Financial Services**





- **1984: 1st Published**
- **1996: 1996 Edition**
- **2000: 2000 Edition**
- **2004: 3rd Edition**
- **2009: 4th Edition**
- **2013: 5th Edition**

A Guide to the
**PROJECT MANAGEMENT
BODY OF KNOWLEDGE
(PMBOK® GUIDE)**

Fifth Edition

What is the PMBOK® Guide?

- Consensus **standard**
- Proven traditional and innovative, emerging best practices
- Constantly evolving
- Provides **common terminology**
- Foundation for PMI®'s professional development programs and certifications



A Guide to the
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Fifth Edition

PMBOK® Guide – Structure

- **Section 1 – PM Framework**
 - **Chapters 1**
- **Section 2 – PM Standards**
 - **Chapter 2**
- **Section 3 – PM Knowledge Areas**
 - **Chapters 3-13**

PMBOK: Framework

Chapter 1

INTRODUCTION

What is a project?

- **Temporary** endeavor (**work**) undertaken to create a unique product, service or result
- Has a definite **beginning** & **end**

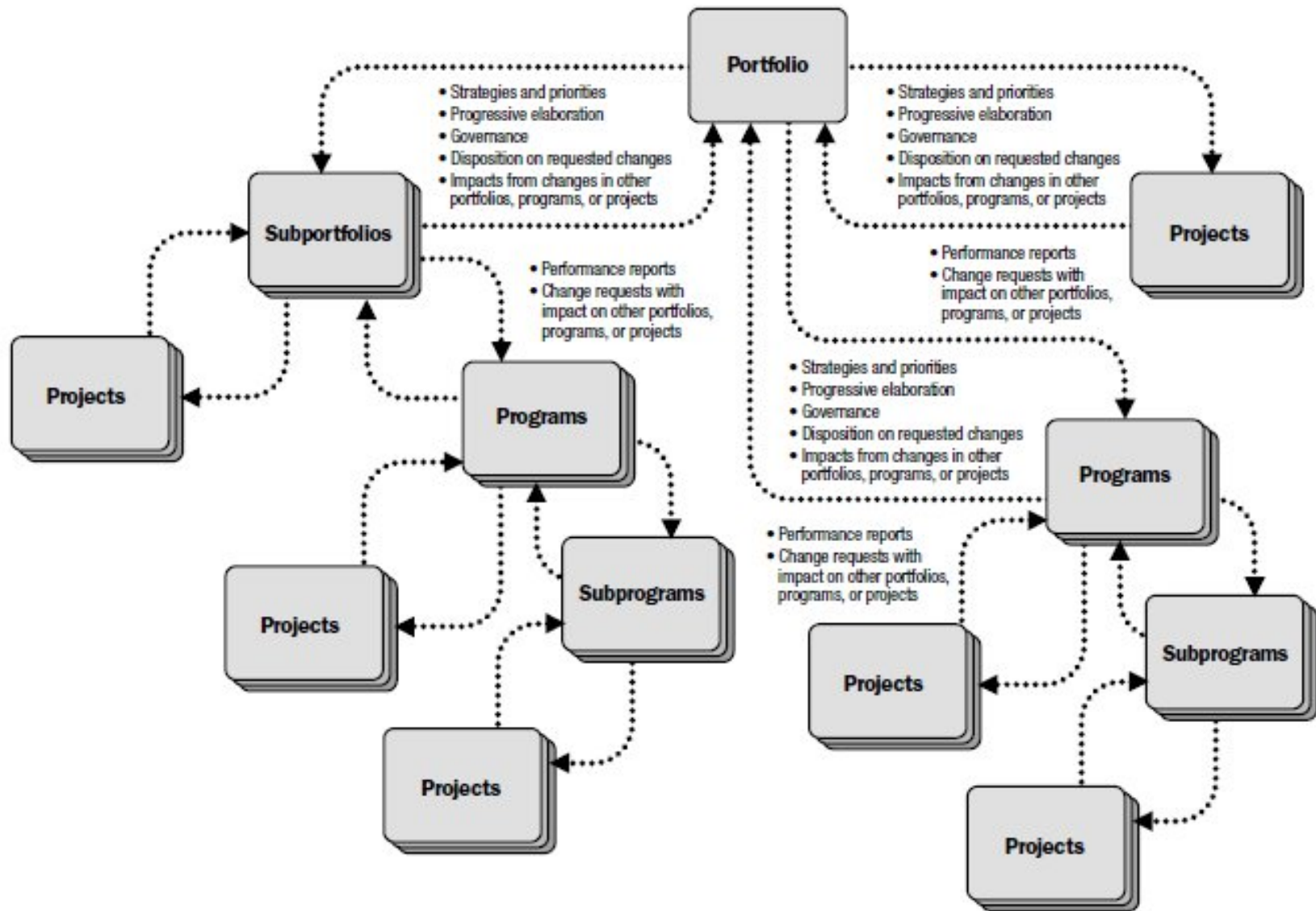


Portfolios, Programs and Projects

- **The Relationships Among Portfolios, Programs, and Projects**

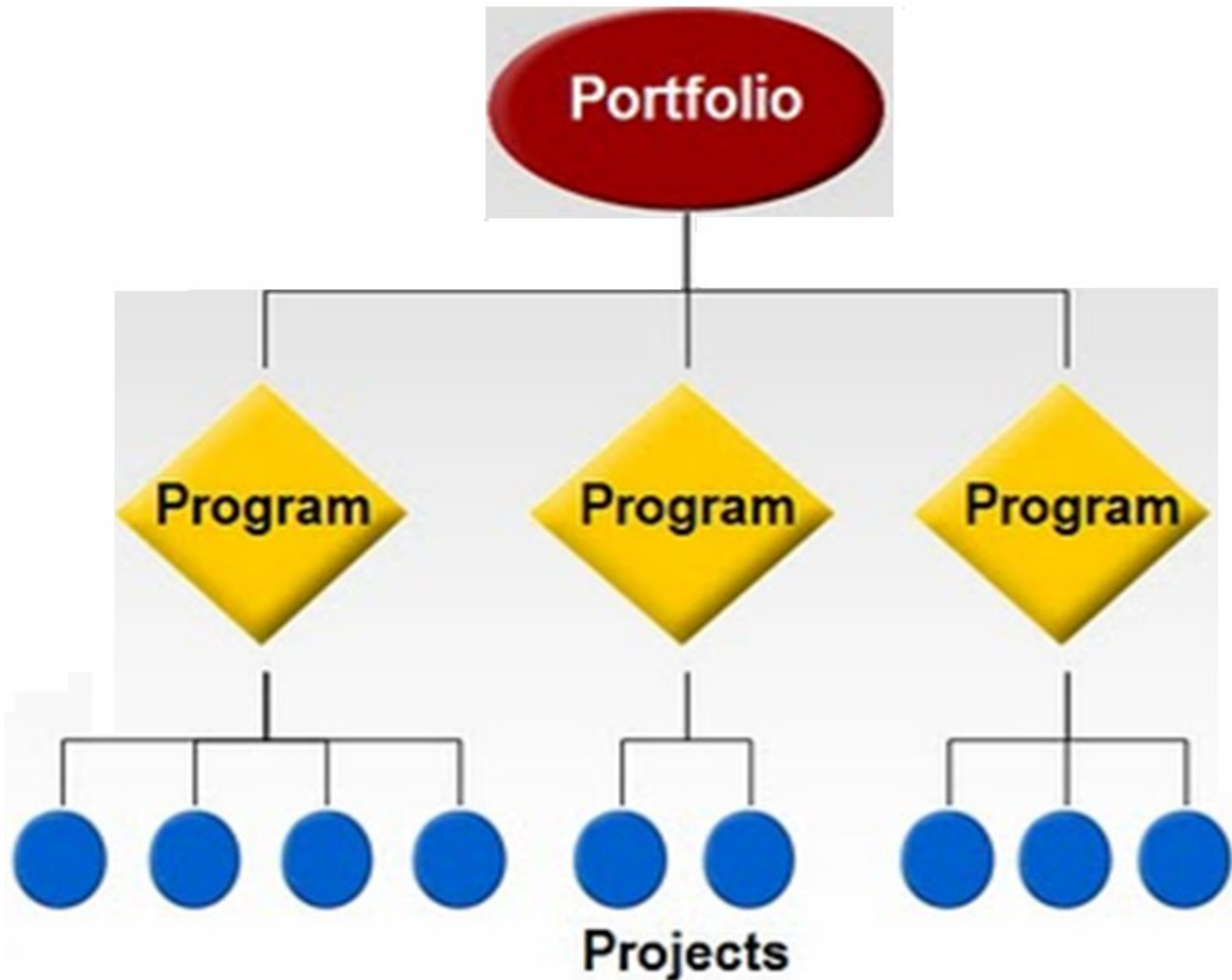
Portfolio refers to a collection of projects, programs, sub-portfolios, and operations managed as a group to achieve strategic objectives

Portfolios, Programs and Projects



Portfolios, Programs, and Projects Management Interactions

Portfolios, Programs and Projects



Project Management

- The application of:
 - **knowledge,**
 - **skills,**
 - **tools & techniques**
- ...to meet the project requirements.



Projects Management

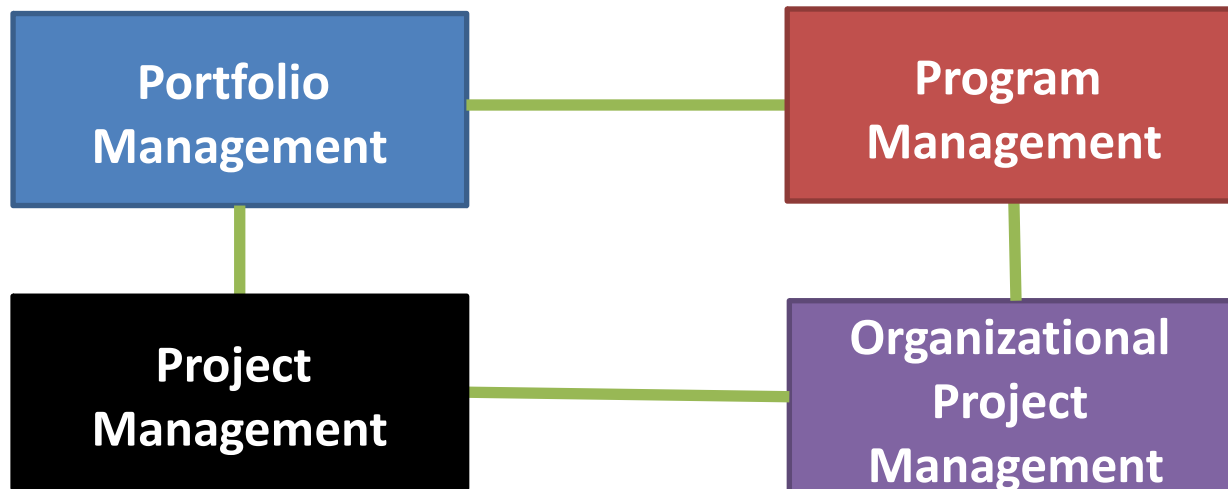
Five Process Groups

- Initiating
- Planning
- Executing
- Monitoring and Controlling
- Closing

Relationships Among...

A portfolio refers to projects, programs, subportfolios, and operations managed as a group to achieve strategic objectives.

Group of related projects, subprograms, and program activities managed in a coordinated way



Projects and Strategic Planning

- **Projects – used to achieved Strategic Plans**
- **Strategic considerations:**
 - **Market Demand**
 - **Strategic Opportunity/Business needs**
 - **Social Need**
 - **Environmental Consideration**
 - **Customer Request**
 - **Technological Advancement**
 - **Legal/Regulatory/Compliance**

Projects and Strategic Planning



Projects Management Office (PMO)

- Standardizes the project-related governance processes
- Manages shared resources
- Manages PM methodology and best practices
- Coaches, Mentors & Trains
- Develop Policies
- Communicates



Projects Management Office (PMO)

- Supportive
- Controlling
- Directive



Projects

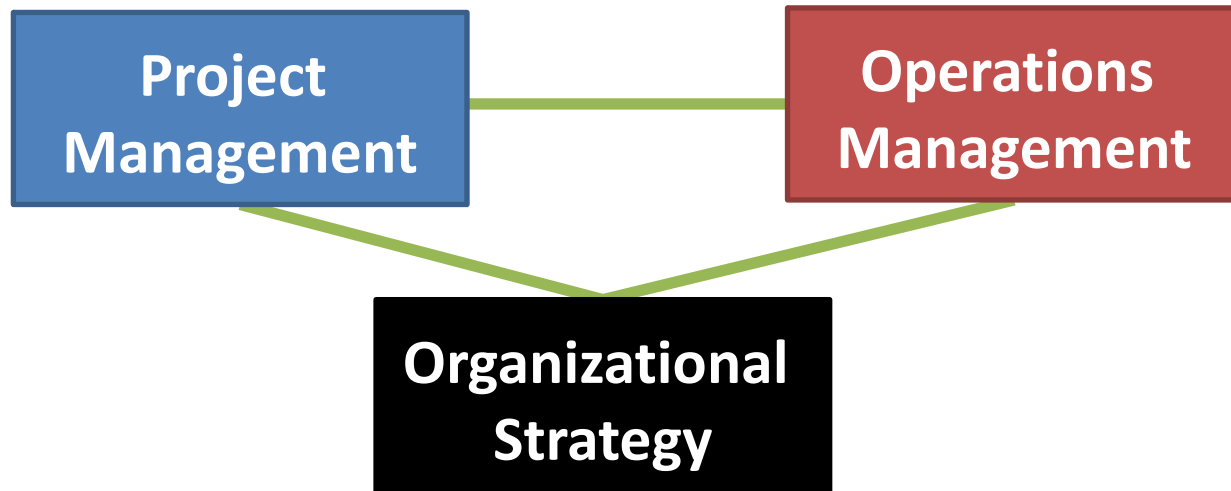


V.S.

Operations



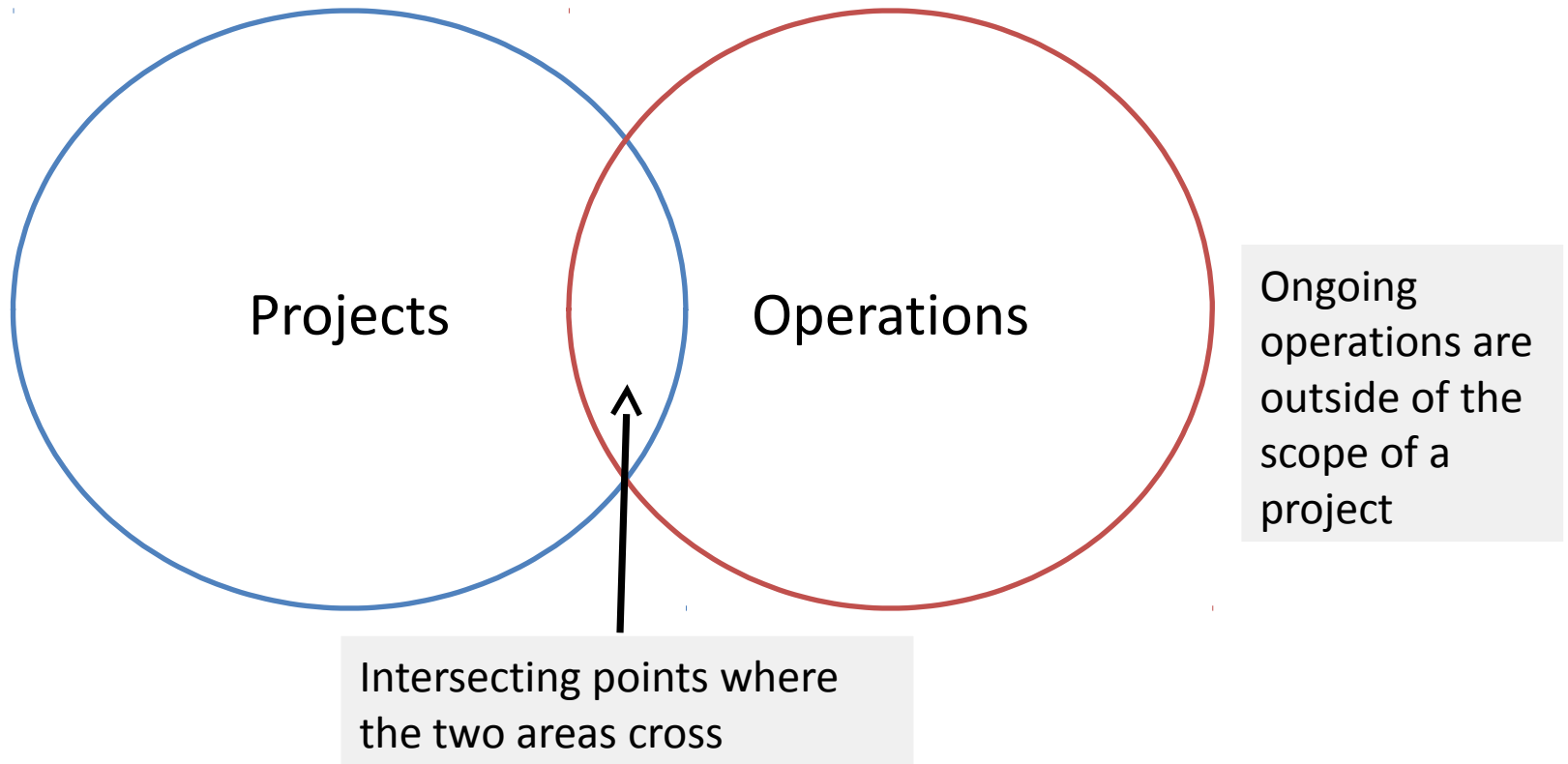
Relationship Between...



Operations and Project Management

- Ongoing operations are outside of the scope of the project.
- There are intersecting points where the two areas cross.
- **Operations Management**
 - Ongoing production of goods and/or services.
- **Operational Stakeholders in Project Management**
 - Should be engaged and needs identified

Operations and Project Management



Operational Management



Ongoing production of goods and/or services

Organizations and Project Management

- Organizations use governance to establish strategic direction and performance parameters.
- **Project-Based Organizations**
 - Create temporary systems for carrying out their work.
- **The Link Between Project Management and Organizational Governance**
 - Project success may be judged on the basis of supporting organizational governance
- **The Relationship Between Project Management and Organizational Strategy**
 - Organizational strategy should provide guidance and direction to project management

Business Value

- The entire value of the business
- The total sum of all **tangible** and **intangible** elements

Quick Questions

1. A software game company wanted to build up its online presence. So, it started several marketing and sales initiatives, created some new games, and re-wrote some old ones in order to reach more gamers online.
2. A company wanted to build a better reporting interface so that it could have more accurate data on yearend goals.
3. A construction company bid on several parking garage projects at the same time. They won one of the bids and built the garage a month under schedule and \$5000 under budget.
4. A university wanted to build admissions web sites for all of their departments. They realized that all of the sites would be feeding into the same registration interface and decided to manage all of them together in order to save time.

Quick Questions

- Which of these scenarios are operations, and which are projects?
 1. Building an extension on a house
 2. Baking a wedding cake
 3. Changing your air filters every six months
 4. Going to the gym three times a week

The Role of the Project Manager



The Role of the Project Manager

- Responsible for accomplishing the **project objectives**
- **Leads** the team that is responsible for achieving the project objectives
- Strives to balance constraints, including project **scope**, **time**, and **cost** goals

Responsibilities and Competencies of the Project Manager

- **Knowledge**
- **Performance**
- **Personal**

Skills of a Project Manager

Budgeting

Communication

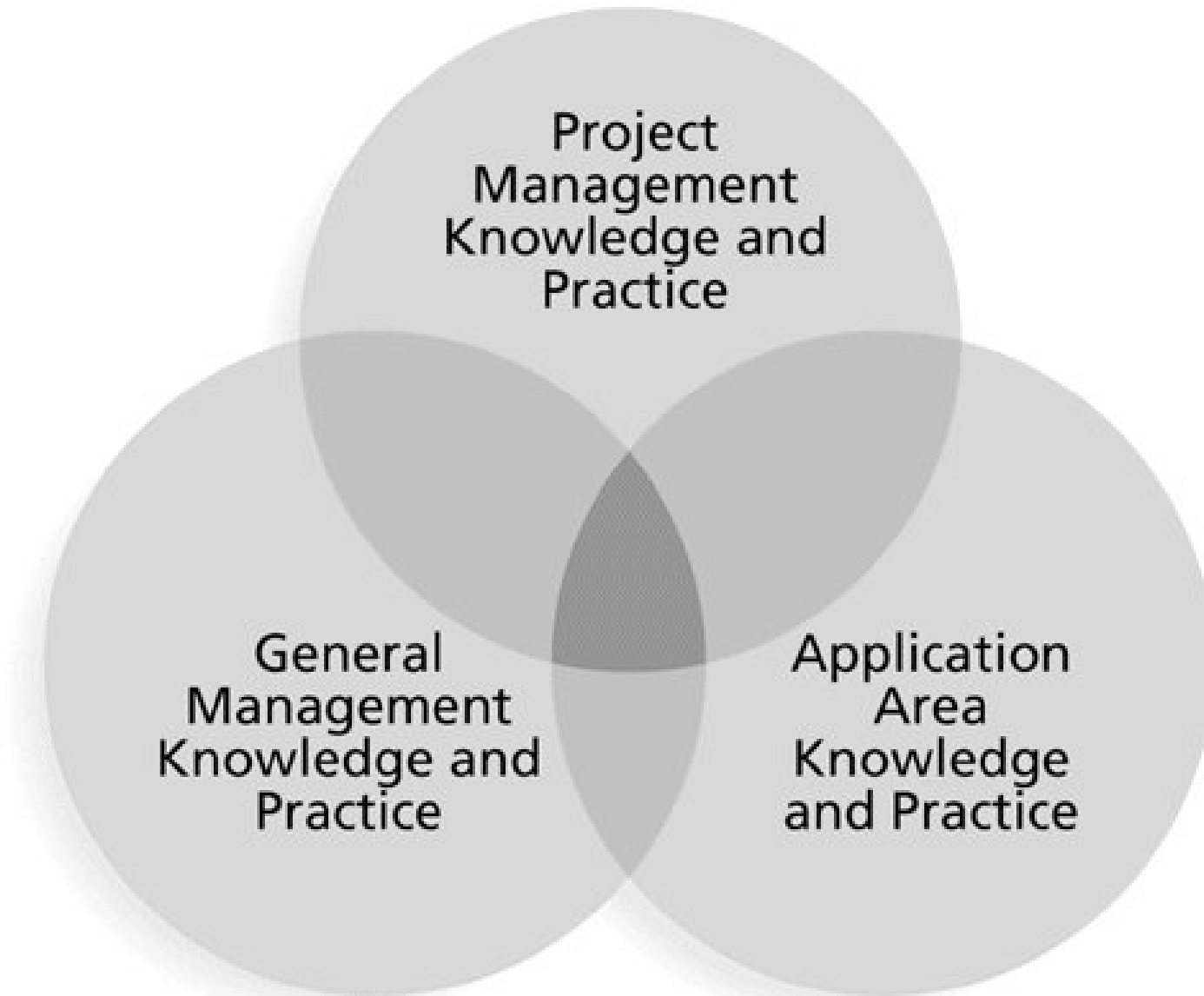
Team Building

Leadership

Political & Cultural Awareness



Project Management & Other Disciplines



Project Manager Skills

Skills every good project manager should have:

- **Communication skills**
- **Integration Skills**
- **Planning and Organizational skills**
- **Leadership Skills**
- **Team Building and Motivational Skills**
- **Budgeting Skills**
- **Conflict Management Skills**
- **Negotiation and Influencing Skills**
- **Political and Cultural Awareness**

PM Skills

- **Communication Skills**
 - Written and oral communication skills are the backbone of all successful projects.
 - Takes on many forms of communication – project documents, meeting updates, status reports etc
 - Must be explicit, clear, and complete (so that the audience has no trouble understanding what has been communicated)

Quality of Information

- *Relevant* for its purpose
- Sufficiently *accurate* for its purpose
- *Complete* enough for the problem
- Communicated to the *right* person
- Communicated in *time* for its purpose
- Communicated by an appropriate *channel of communication*
- That which is *understandable* by the stakeholder

PM Skills

- **Planning and Organizational Skills**
 - Probably the second most important skill
 - Must be able to record, track and locate information at a moments notice - including memos, project reports, personnel records, vendor /supplier quotes contracts etc.
 - Organize events e.g. meetings, workshops
 - Put together and manage teams, media releases
 - Prioritize and manage problems, the day, time and interruptions.

PM Skills

- **Leadership Skills**

- Leadership & Management are not synonymous
- Leaders impart vision, gain consensus for strategic goals, establish direction, inspire and motivate others.
- Managers focus on results and are concerned with getting the job done according to requirements.
- PMs need to exhibit both

PM Skills

- **Team Building and Motivational Skills**
 - PMs rely heavily on their team
 - The team members may or may not have worked together
 - The PM must set the tone and help them through different team forming –stages
 - Help the team to become fully functional
 - Many times PMs are responsible for motivating persons who do not report to them directly (ask functional managers to allow you to participate in the performance reviews)

PM Skills

- **Budgeting Skills**
 - Establish and manage budgets and therefore need some knowledge of finance and accounting principles
 - Need to perform cost estimates for budgeting
 - To be able to read and understand vendor quotes, preparing or overseeing purchase orders, reconciling invoices
 - Linking project costs back to project activities and expense items

PM Skills

- **Conflict Management Skills** (or Problem-solving Skills)
 - This is a Two-fold process
 - Define the problem by separating the causes from the symptoms
 - Ask questions – is it external or internally based? A technical problem? Inter-personal? Managerial? What are potential impacts or consequences?
 - Examine and analyze the situation causing the problem and alternatives available
 - The PM must make a decision – determine the best course of action and implement the decision (not too late though).

PM Skills

- **Negotiation and Influencing Skills**
 - To be effective at problem solving – requires negotiating and influencing skills
 - Negotiating is working with others to come to an agreement i.e. One-on-one or in teams
 - Required in almost every area of the project – budgets, contacts, resource assignments, scope definition
 - Influencing is convincing the other party that one thing is better than another
 - Required that you understand the formal and informal structure of all organizations involved.
 - Power and Politics -techniques used to influence people to perform

PM Skills

- **Power (influence) and Politics**
 - Power –the ability to get people to do things that they wouldn't do otherwise. The ability to change minds and the course of events and to influence outcomes.
 - Politics –involves getting groups of people with different interest to cooperate creatively even in the midst of conflict and disorder.

PMBOK: Framework

END OF

Chapter 1

INTRODUCTION

PMBOK: Framework

Chapter 2

ORGANIZATIONAL INFLUENCES AND PROJECT LIFE CYCLE

Organizational Influences And Project Life Cycle

- **Organizational Influences on Project Management**
- **Project Stakeholders and Governance**
- **Project Team**
- **Project Life Cycle**

Organizational Influences on Project Management

- **An organization's culture, style, and structure influence how its projects are performed.**

Organizational Culture and Styles

- **Systematic arrangements of entities**
- **Aimed at accomplishing a purpose**
- **May involve undertaking projects**

Organizational Communication

- **Effective organizational communication**
 - **PM Success**
 - **Influence on how projects are conducted**

Organizational Structures

- **Affect the availability of resources**
- **Influences how projects are conducted**

Organization Structure

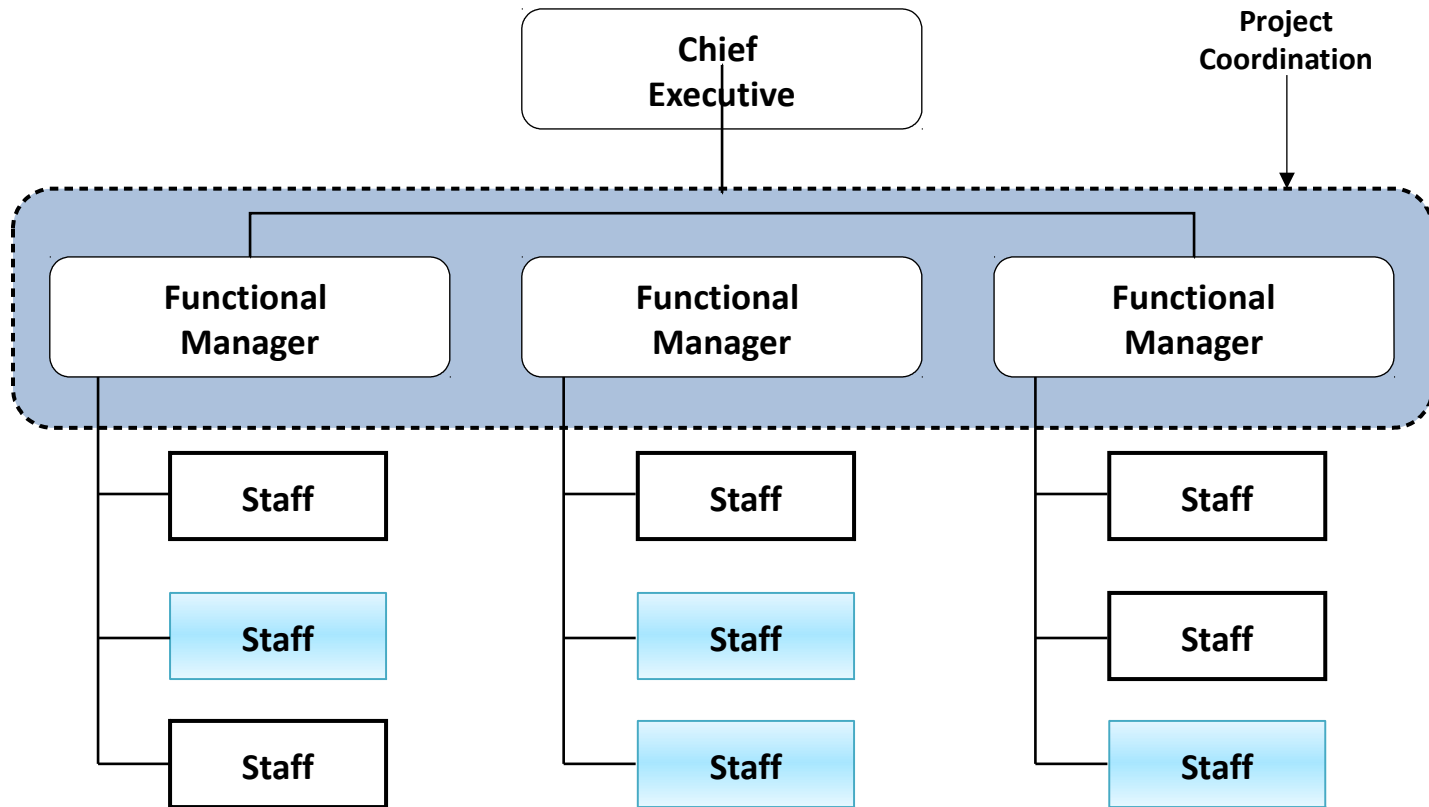
- **Functional**
- **Matrix**
- **Projectized**

Organisational Structure

Influence of Organizational Structures on Projects

Org Structure	Functional			Matrix		Projectized
	Weak Matrix	Balanced Matrix	Strong Matrix	Weak Matrix	Balanced Matrix	
Project Characteristics						
PM's Authority	Little or none	Limited	low to moderate	Moderate to High	High to almost Total	High to almost Total
Resource Availability	Little of none	Limited	low to moderate	Moderate to High	High to almost Total	High to almost Total
Who controls the project budget?	Functional Mgr	Functional Mgr	Mix	Project Mgr	Project Mgr	Project Mgr
Project Manager's Role	P/Time	Part Time	Full-Time	Full Time	Full Time	Full Time
Project Management Administrative Staff	Part Time	Part Time	Part time	Full Time	Full Time	Full Time

Functional Organization

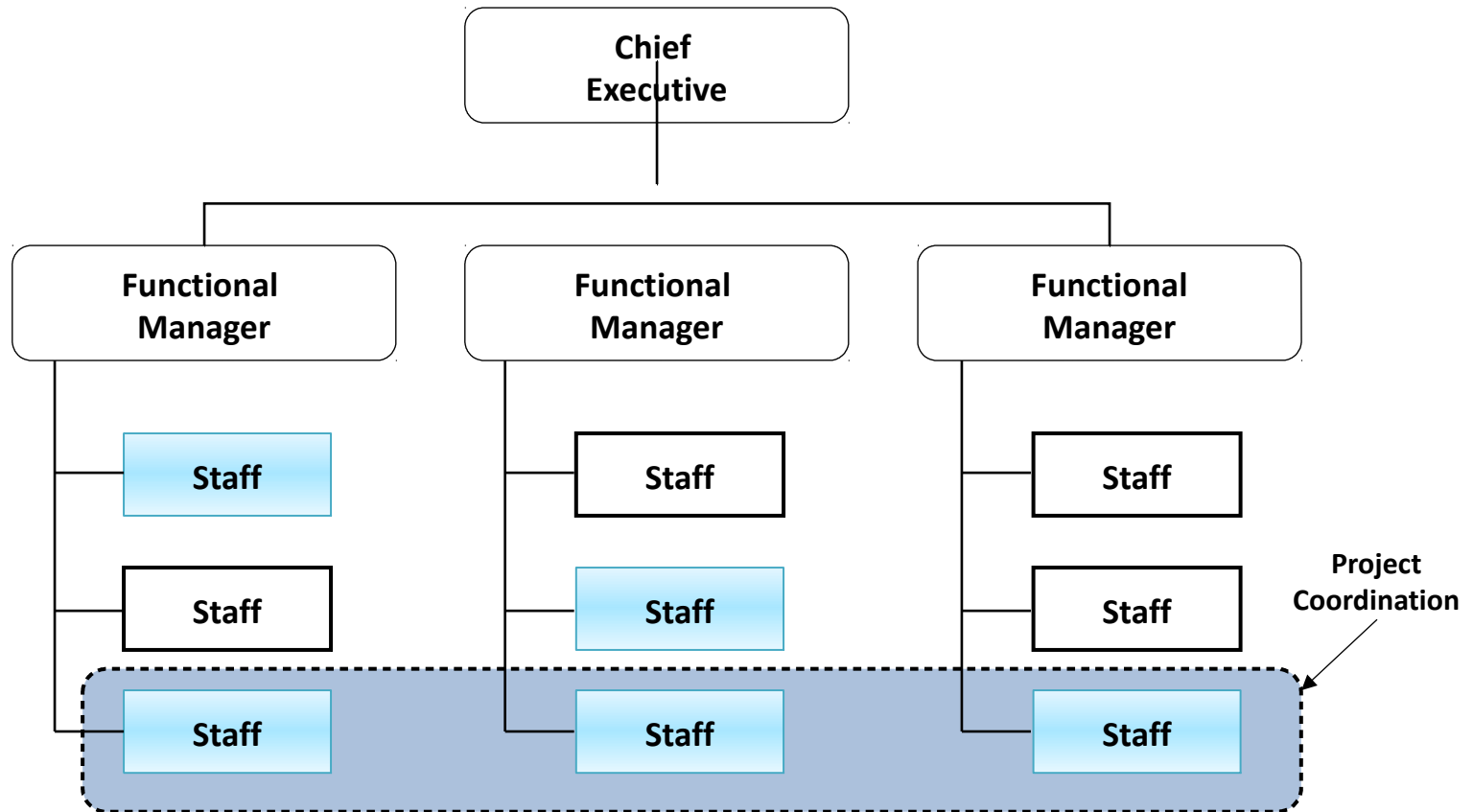


The Classic Functional Organization

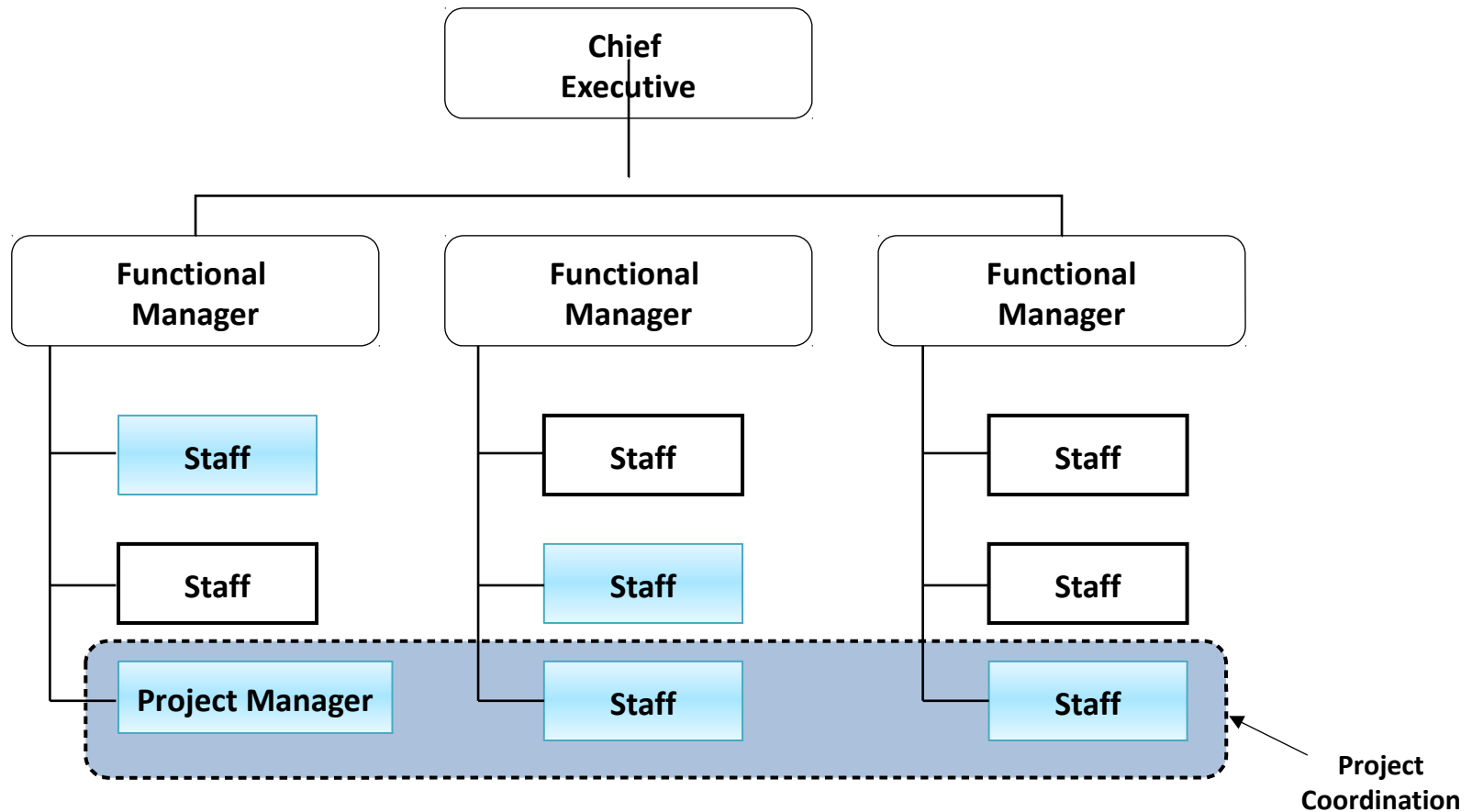
Matrix Organizations

- **Weak**
- **Balanced**
- **Strong**

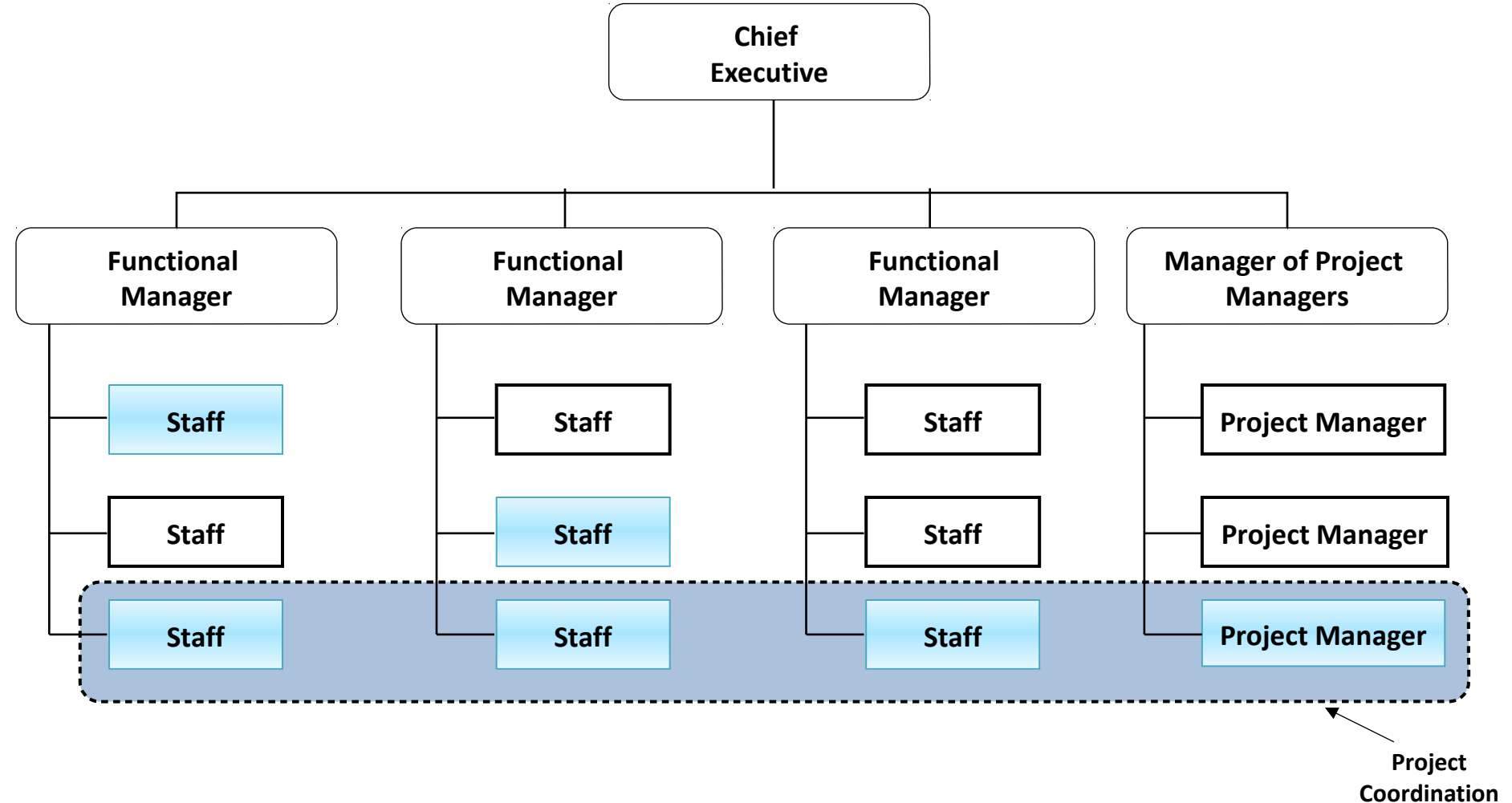
Weak Matrix Organization



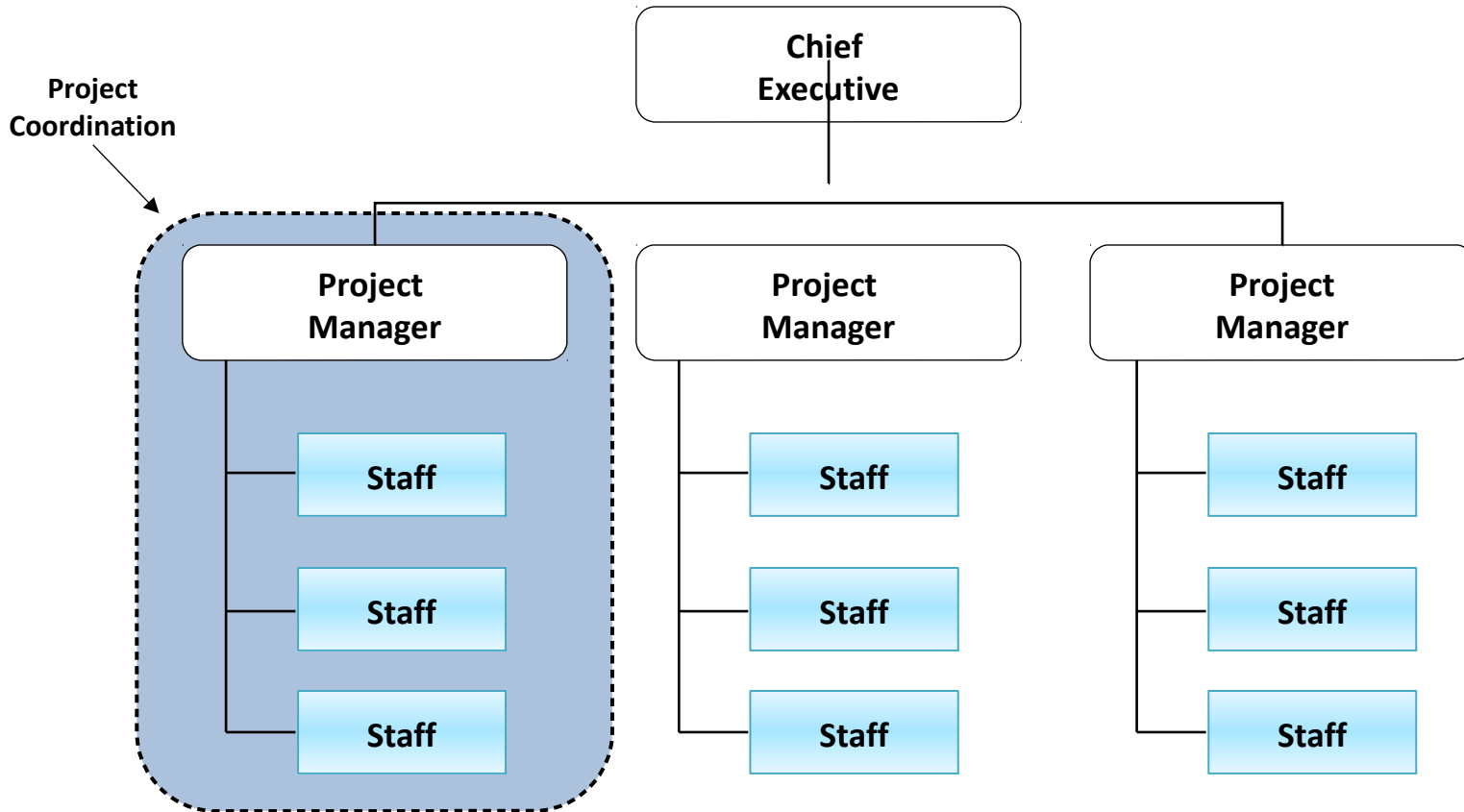
Balanced Matrix Organization



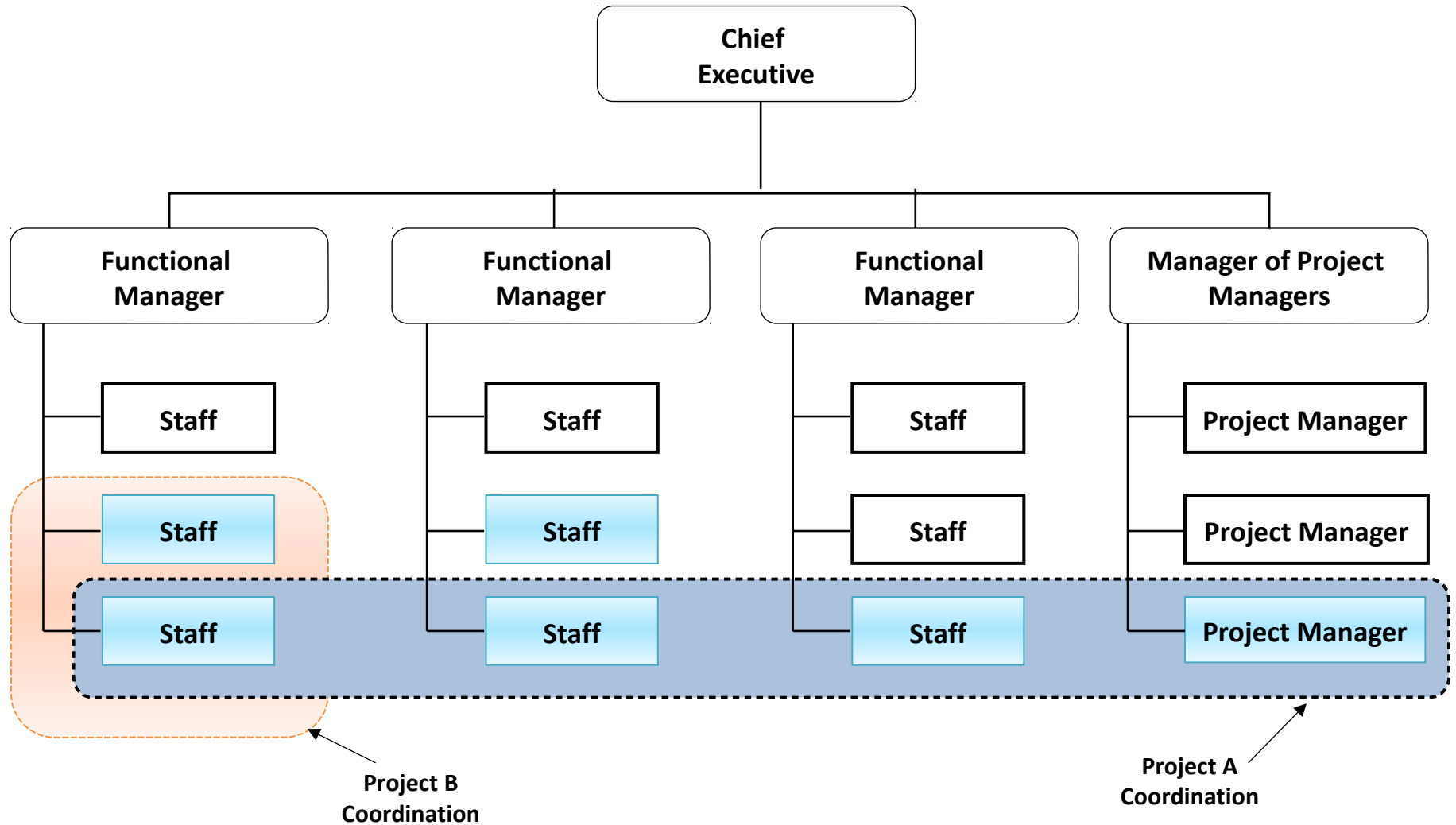
Strong Matrix Organization



Projectized Organization



Composite Organization



Project Management Context

Organization Structure Pro's & Con's

- **Projectized**

- Efficient Organization – No “home”
- Loyalty – Lack of Professionalism
- Effective Communication – Duplication of functions, less efficient resource usage

- **Matrix**

- Visible Objectives – not cost effective
- PM Control – More than 1 boss
- More support – More complex to control
- Utilize scarce resources – Tough resource allocation
- Information distribution – Competition of priorities
- Coordination – Policies & Procedures
- Home based – Potential for conflict

Project Expediter and Coordinator

- **Project Expediter-** The project expediter acts primarily as a staff assistant and communications coordinator. The expediter cannot personally make or enforce decisions.
- **Project Coordinator-** This position is similar to the project expediter except the coordinator has some power to make decisions, have some amount of authority and reports to a higher- level manager.

Organizational Process Assets

- **Plans, processes, policies, procedures, and knowledge bases**
- **Includes:**
 - **Artifact**
 - **Practice**
 - **Knowledge**

Organizational Process Assets

- **Process and Procedures**
 - Initiating and planning
 - Executing, Monitoring and Controlling
 - Closing
- **Corporate Knowledge Base**
 - Configuration management knowledge bases
 - Financial databases
 - Historical information
 - Issue and defect management databases
 - Process measurement databases
 - Project files from previous projects

Enterprise Environmental Factors

- **Conditions...**
 - **Not under the control of the project team**
 - **Influence / constrain the project**
 - **Direct the project**

Project Stakeholders and Governance



Individual, group or organization that may affect, be affected by or perceived itself to be affected by a decision, activity, or outcome of a project

Project Stakeholders

- **Project Team**
- **Interested Entities**

Project Stakeholders

- **Sponsor**
- **Customers & Users**
- **Sellers**
- **Business Partners**
- **Organizational Groups**
- **Functional Managers**
- **Other Stakeholders**

Project Governance

- **Oversight Function**
- **Critical element of any project**

Project Success

- **Measured in terms of completing the project within the constraints of:**

- **Scope**
- **Time**
- **Cost**
- **Quality**
- **Resources**
- **Risk**

Project Team

- **Acts together in performing the work of the project to achieve its objectives.**
- **Includes**
 - Project Manager
 - Project Management Staff
 - Other Team Members

Project Team Roles

- **Project Management Staff**
- **Project Staff**
- **Supporting Experts**
- **User or Customer Representatives**
- **Sellers**
- **Business Partner Members**
- **Business Partners**

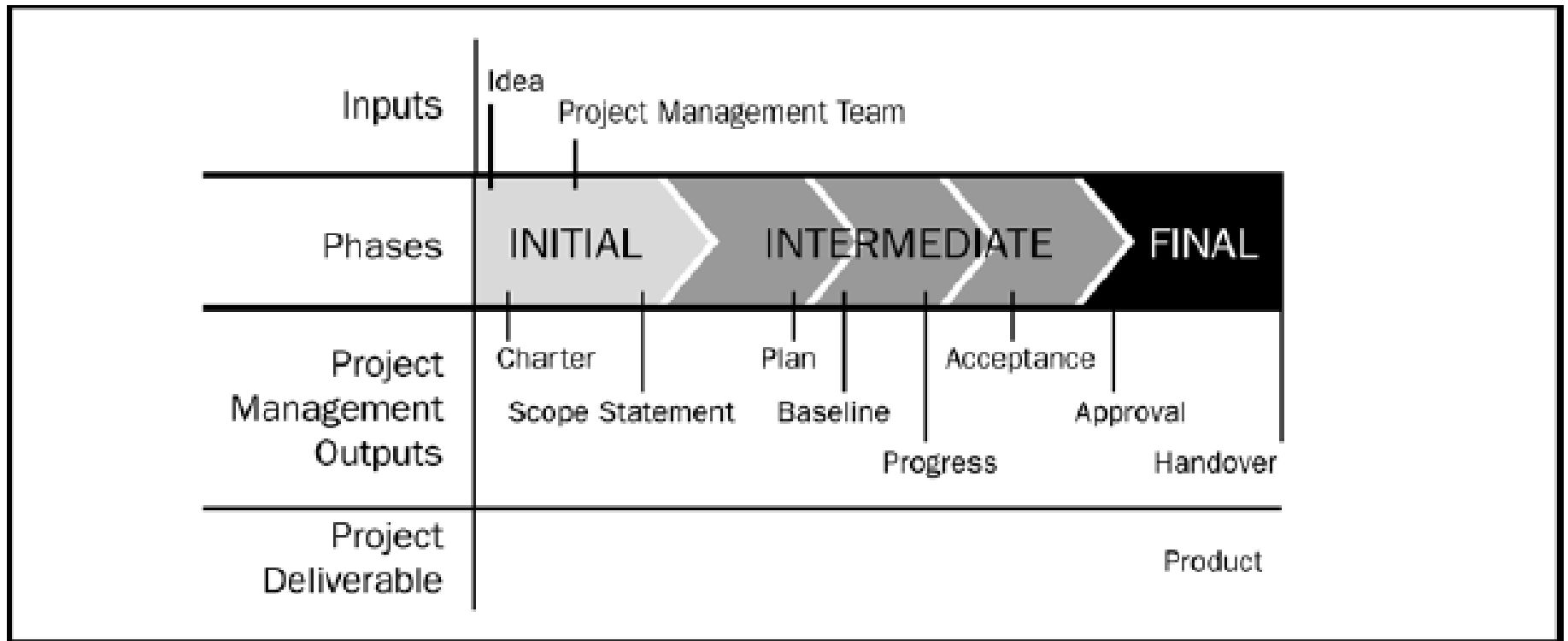
Composition of Project Teams

- **Dedicated**
- **Part-Time**

Project Life Cycle

- **The series of phases that a project passes through from its initiation to its closure**

Project Life Cycle

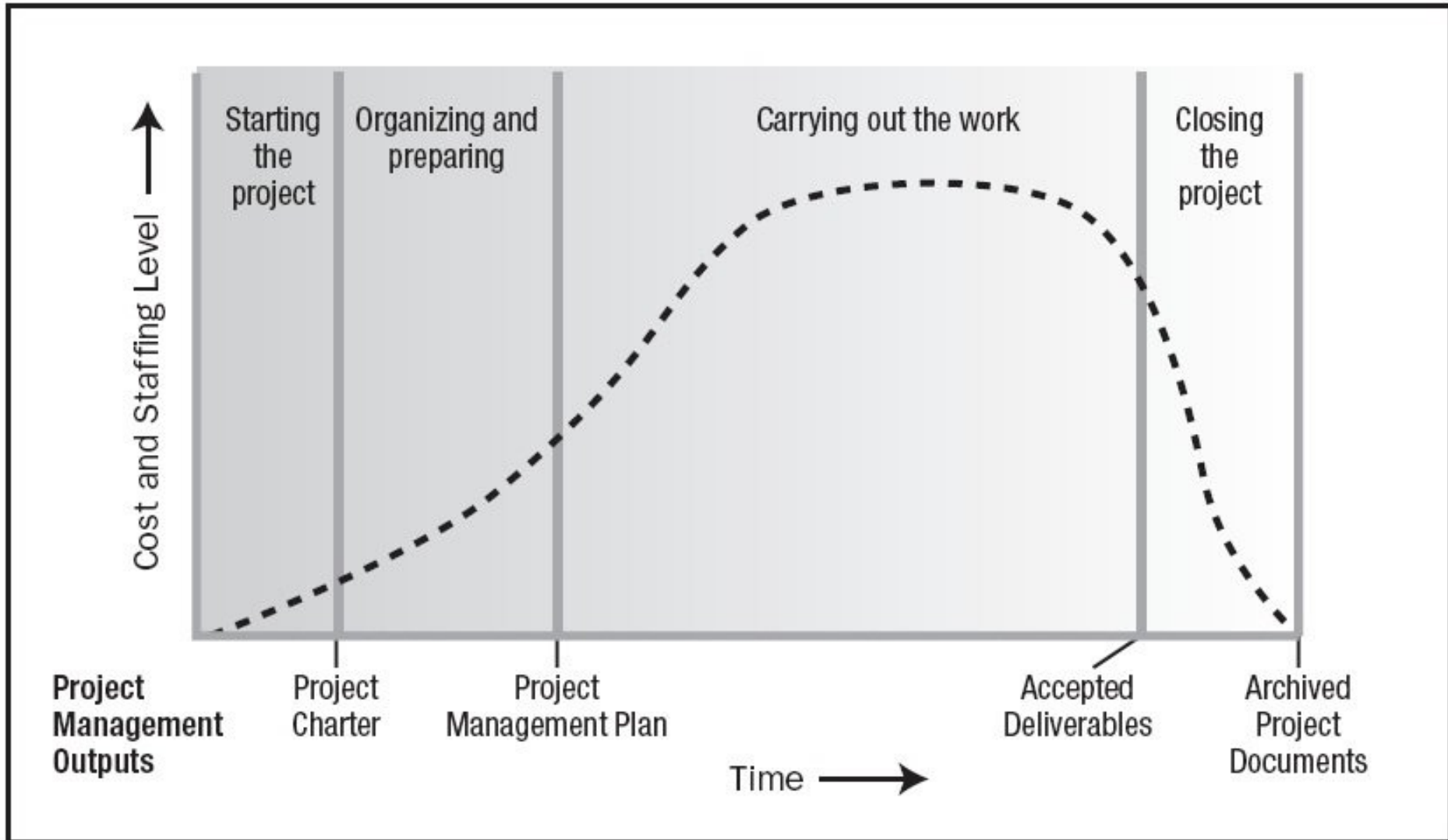


Typical Sequence of Phases in a Project Life Cycle

Characteristics of the Project Life Cycle

- **Projects vary in size and complexity**
- **Generic life cycle structure**
 - Starting the project
 - Organizing and preparing
 - Carrying out the project work
 - Closing the project

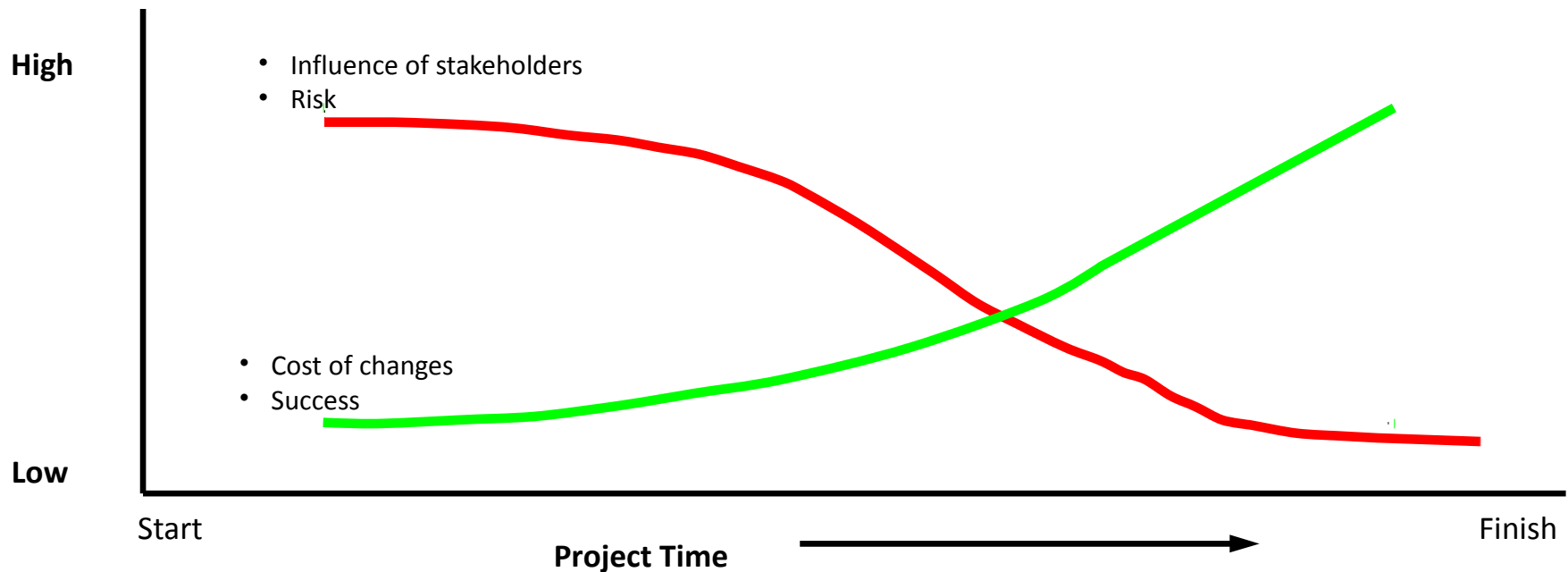
Characteristics of the Project Life Cycle



Characteristics of the Project Life Cycle

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

	Start	End
Stakeholder	Highest	Lowest
Cost	Lowest	Highest
Risk	Highest	Lowest
Success	Lowest	Highest



PM Phases and the Project Life Cycle

- **Deliverables**

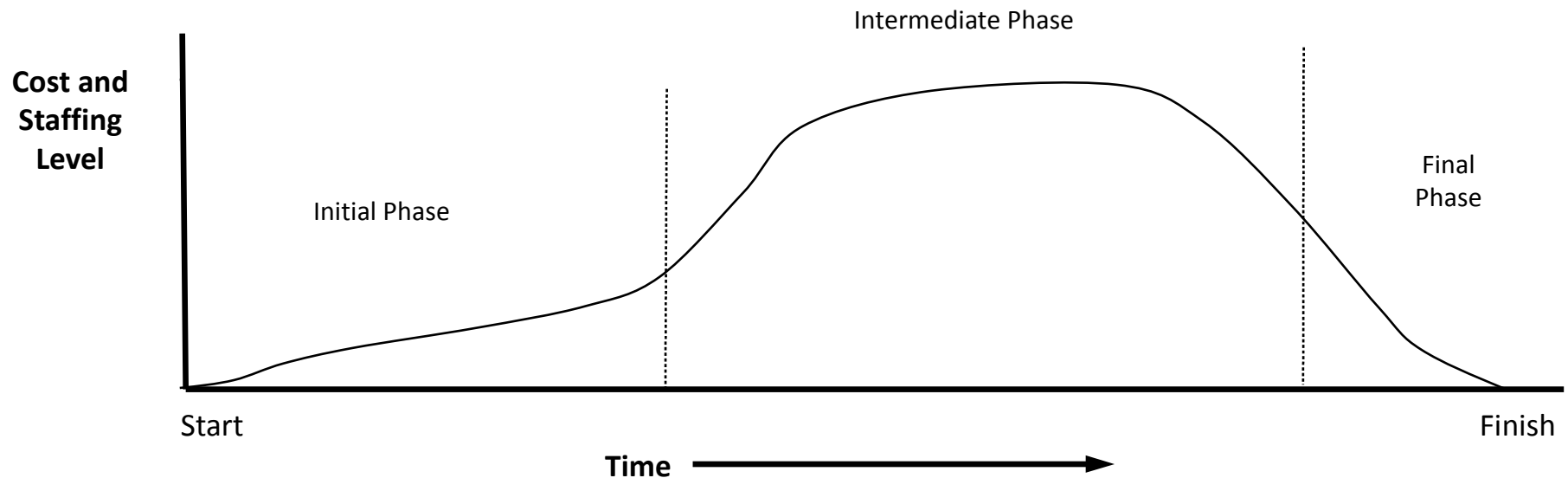
- Tangible, verifiable work product
- Review of deliverables & approval/denial are “phase exits, stage gates, or kill points”

- **Phase**

- Set of defined work procedures to establish management control

PM Phases and the Project Life Cycle

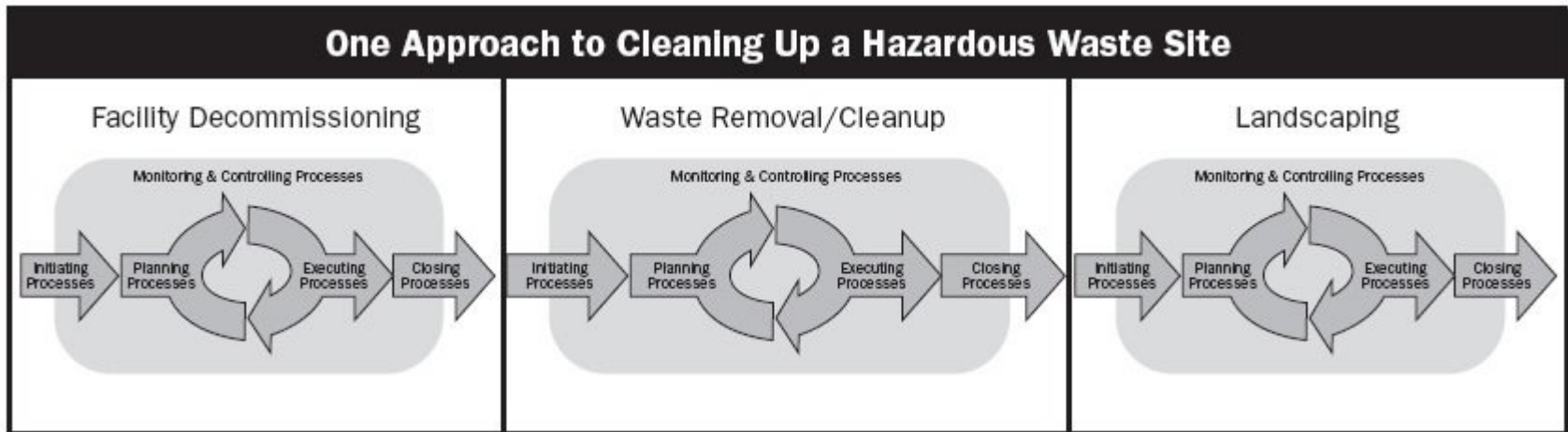
- A project can be divided up into any number of phases
- Phase structure allows the project to be segmented
- No single ideal structure exists



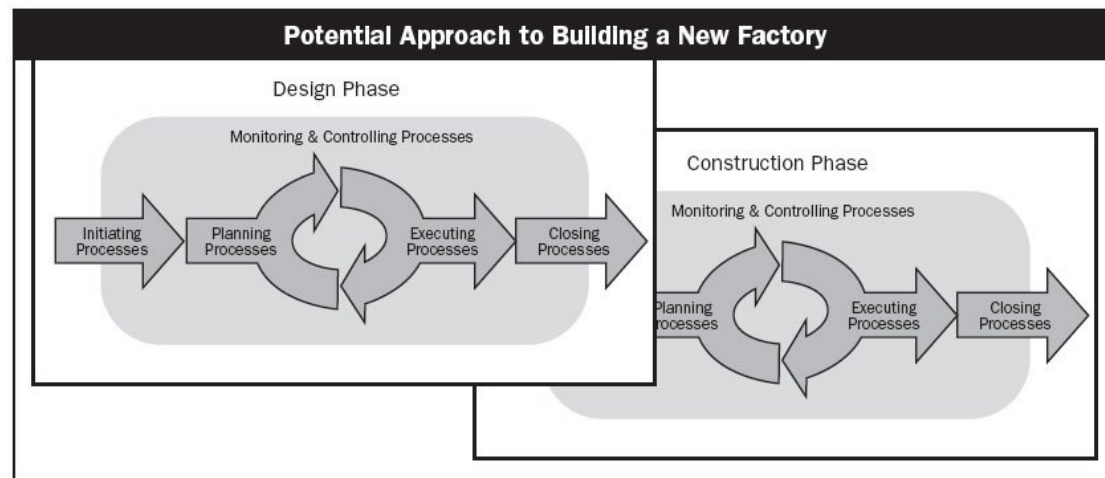
Phase-to-Phase Relationships

Two basic types of phase-to-phase relationships:

- **Sequential Relationship**



- **Overlapping Relationship**



Other Life Cycles

- **Predictive Life Cycle**
 - Scope, Time, and Cost determined early in the project life cycle as practically possible
- **Iterative and Incremental Life Cycles**
 - Phases intentionally repeat one or more project activities
 - Iterations develop the product through a series of repeated cycles
 - Increments successively add to the functionality of the product
- **Adaptive Life Cycles**
 - respond to high levels of change and ongoing stakeholder involvement

PMBOK: Framework

END OF

Chapter 2

ORGANIZATIONAL INFLUENCES AND
PROJECT LIFE CYCLE

PMBOK: Standards

Chapter 3

PROJECT MANAGEMENT

PROCESSES

Project Management Processes



Project Management requires active management of Project Processes

- **Series of actions that achieve a result**
- **Project Management Processes**
 - **Describing & organizing the work**
- **Product-Oriented Processes**
 - **Specifying & creating the product**

Process Elements

Inputs



**Tools &
Techniques
(Transformation)**



Outputs

- Documents or documentable items that will be acted upon.

- Mechanisms applied to the inputs to create the outputs.

- Documents or documentable items that are a result of the process.

Process Groups – Categorizing Processes



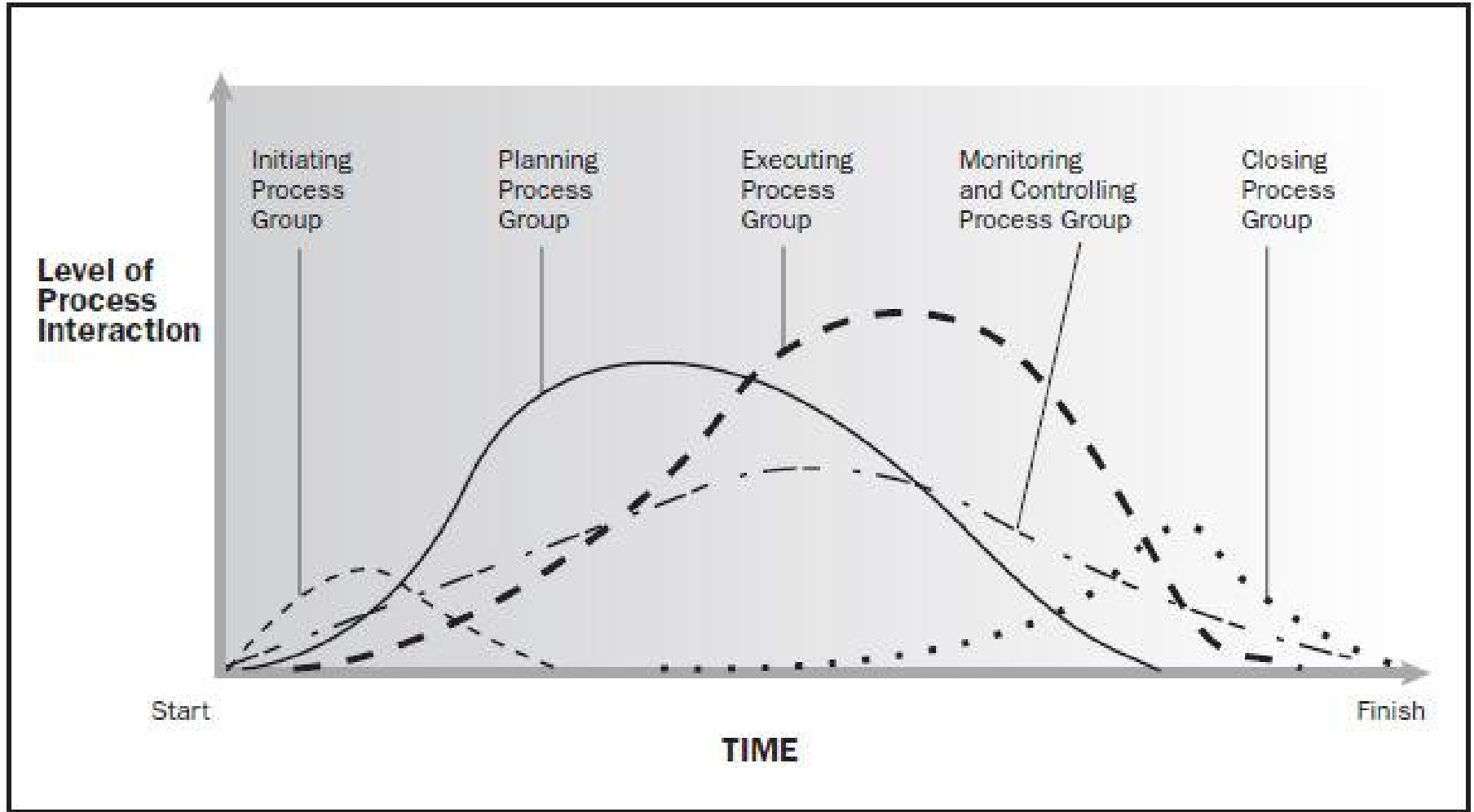
Project Management Process Groups

- **Initiating** : recognizing a project or phase should begin
- **Planning** : devising & maintaining a workable plan
- **Executing** : coordinating resources to execute the plan
- **Monitoring & Control** : ensuring project objectives are met; monitoring, correcting & measuring progress
- **Closing** : formalized acceptance

Common Project Management Process Interactions

- **Discrete elements with well-defined interfaces**
- **Elements overlap and interact in practice**

Process Groups Interact in a Phase or Project



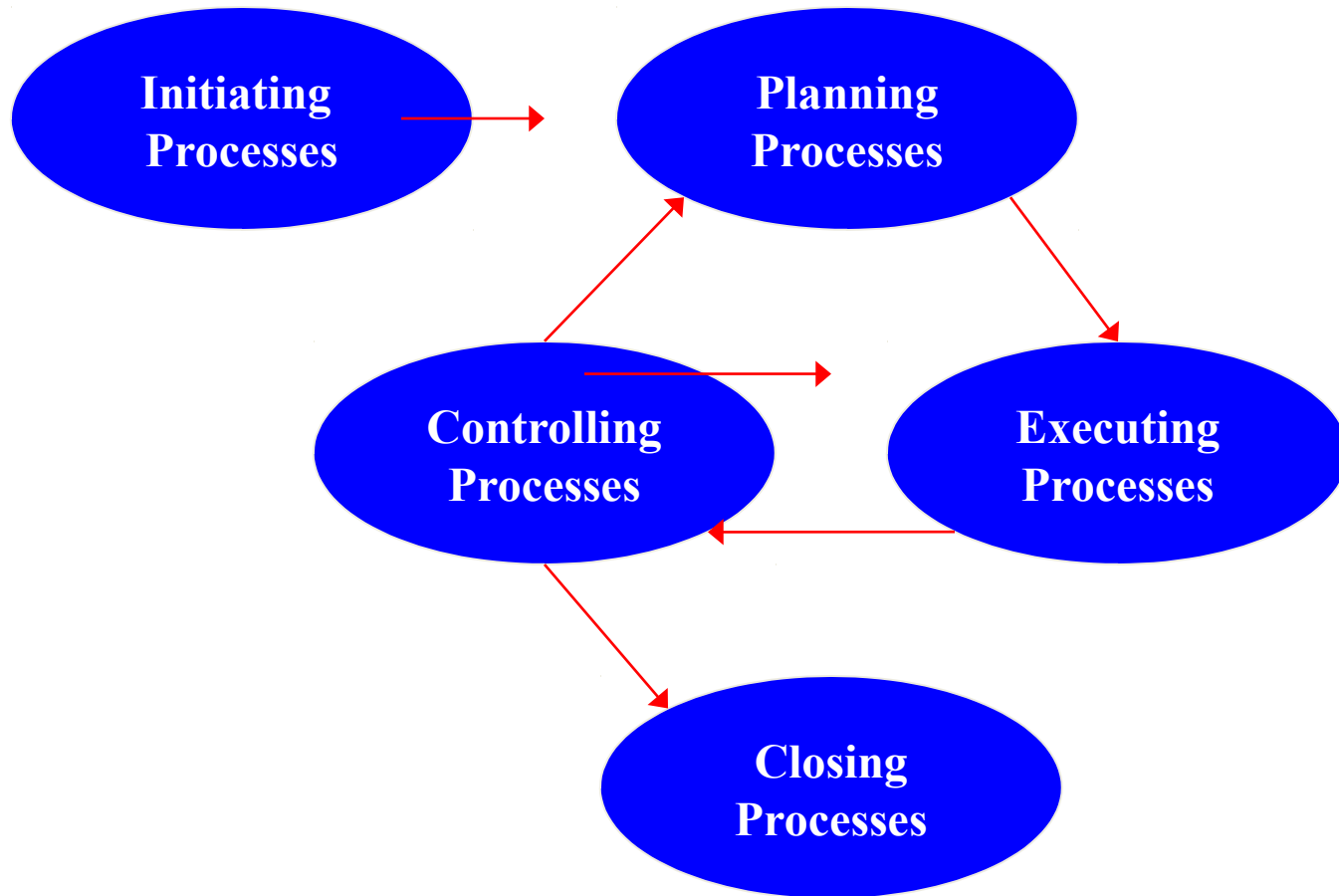
Project Management Processes

- Process Groups...
 - are linked by the results each produces
 - are overlapping activities with various levels of intensity
 - interactions cross phases – “rolling wave planning”
 - Provides details of work to complete current phase & provide preliminary description of work for subsequent phases
- Individual processes have inputs, tools & techniques, & outputs (deliverables)

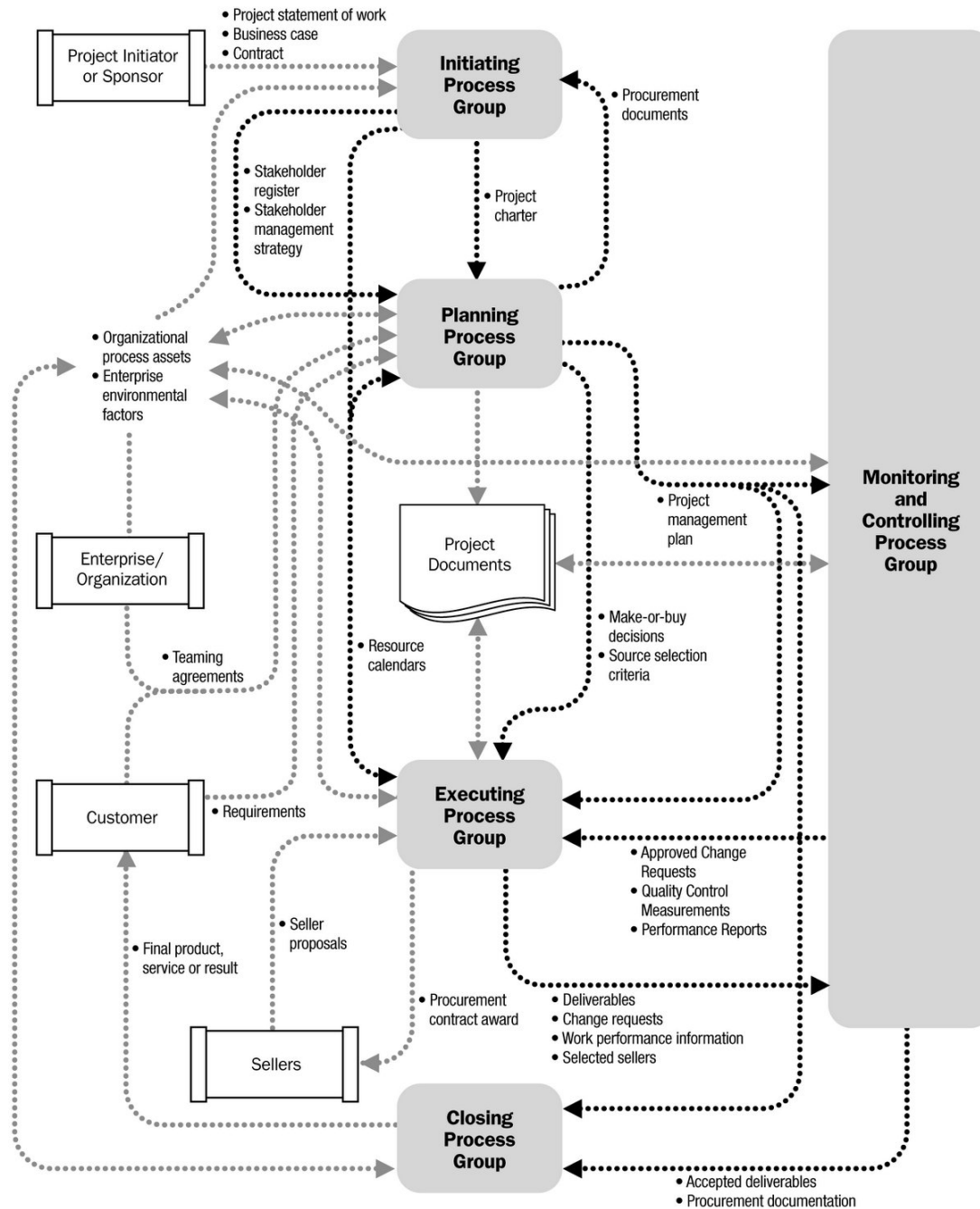
Project Management Process Groups

- **Five (5) Project Management Process Groups**
- **Groups are not project life cycle phases**

Links among Process Groups in a Phase



Project Management Process Interactions



NOTE: The darker dotted lines represent relationships between Process Groups; the lighter dotted lines are external to the Process Groups.

Initiating Process Group

- **Processes performed to define a new project or a new-phase of an existing project**

Planning Process Group

- **Processes performed to**
 - **Establish the total scope of the effort**
 - **Define and refine the objectives**
 - **Develop the course of action**

Executing Process Group

- **Processes performed to complete the work defined in the project management plan**

Monitoring and Controlling Process Group

- **Processes required to**
 - **Track**
 - **Review**
 - **Orchestrate****project progress and performance.**

Closing Process Group

- **Processes performed to**
 - **Conclude all activities**
 - **Formally complete the project, phase, or contractual obligations**

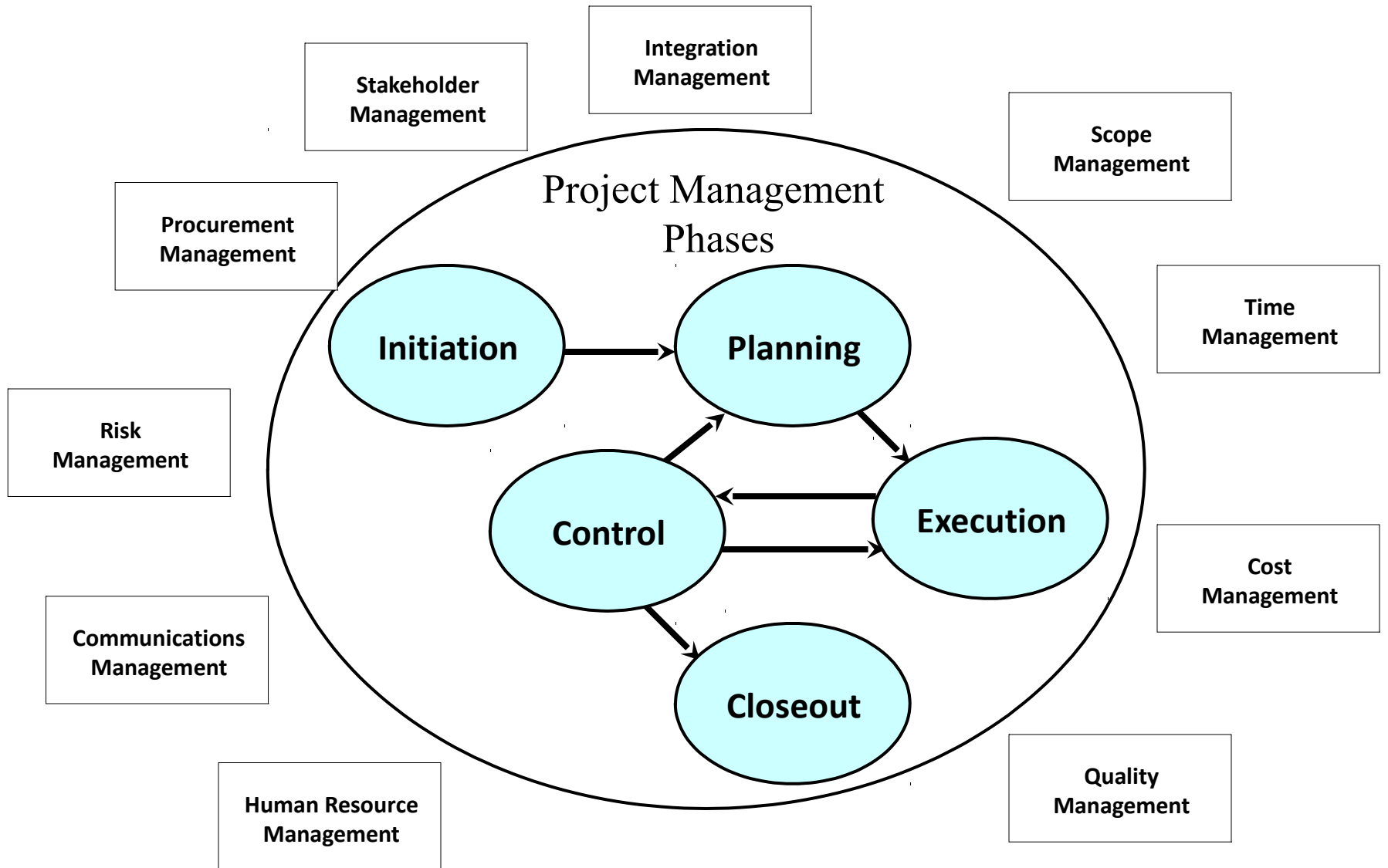
Project Information

- **Project data are continuously collected and analyzed during project execution**
- **Guidelines**
 - **Work Performance Data**
 - **Work Performance Information**
 - **Work Performance Reports**

Role of the Knowledge Areas

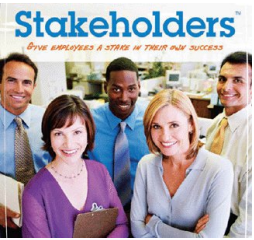
- **47 project management processes**
- **Grouped into 10 separate knowledge areas**

Processes & Knowledge Areas

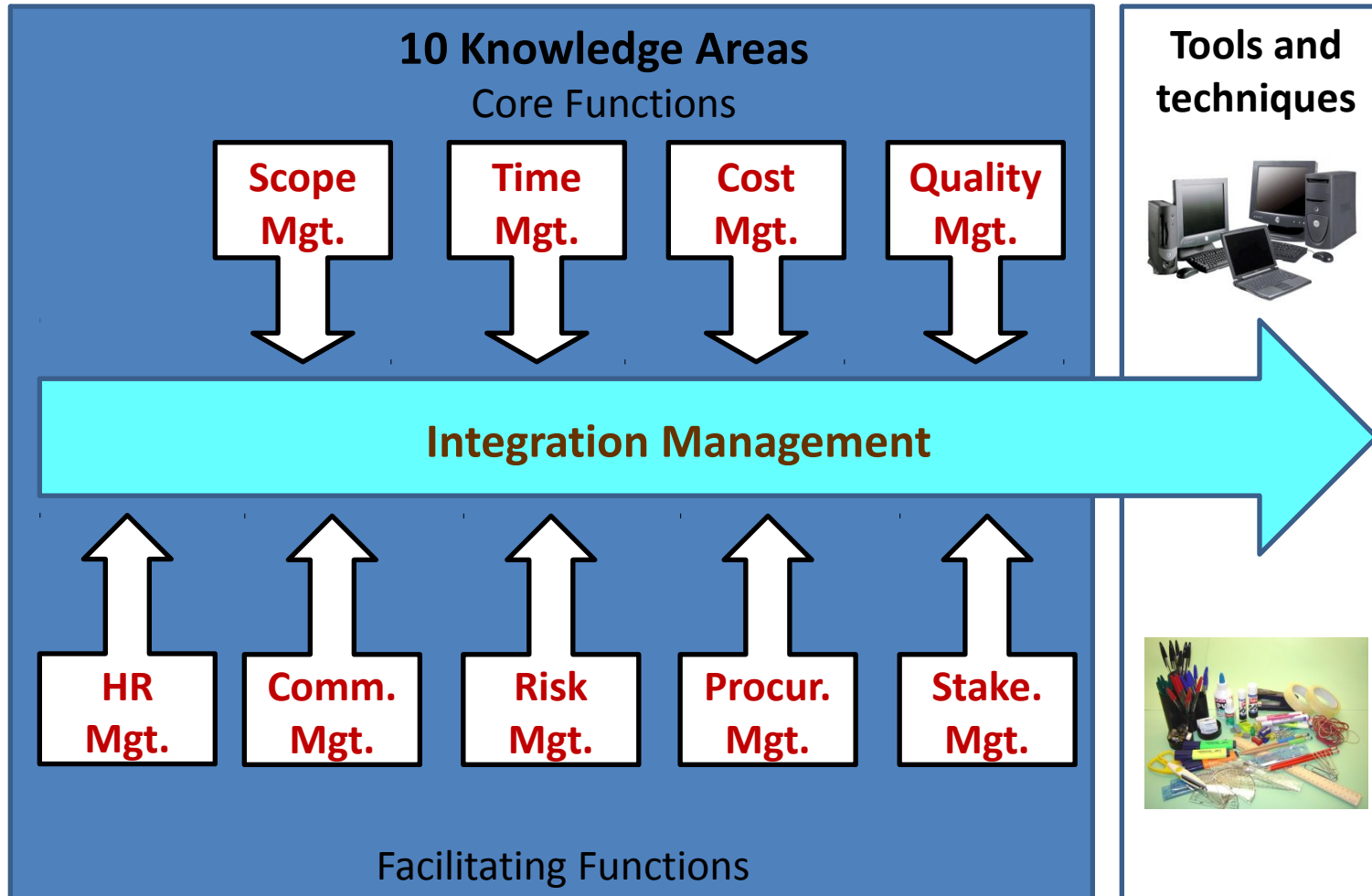


Knowledge Areas

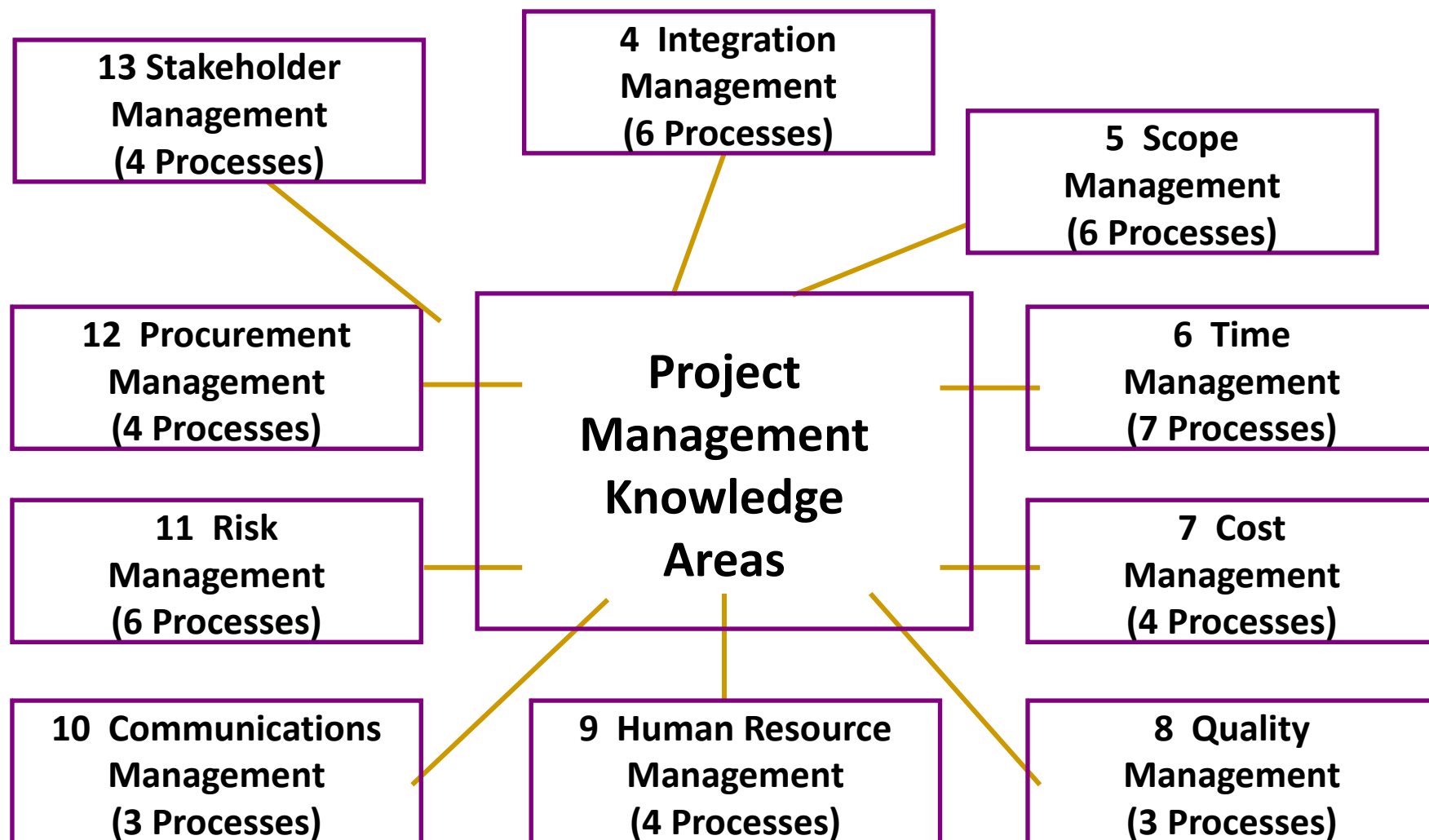
Project Management Framework



Needs and expectations



PMBOK- 10 Knowledge Areas – 47 Individual Sub-processes



Project Management Process Group and Knowledge Area Mapping

Initiating	Planning	Executing	Monitor / Controlling	Closing
<ul style="list-style-type: none"> • Develop Project Charter • Identify Stakeholders 	<ul style="list-style-type: none"> • Develop Project Management Plan • Collect Requirements • Define Scope • Create WBS • Define Activities • Sequence Activities • Estimate Activity Resources • Estimate Activity Durations • Develop Schedule • Estimate Costs • Determine Budget • Plan Quality • Develop Human Resource Plan • Plan Communications • Plan Risk Management • Identify Risks • Perform Qualitative Risk Analysis • Perform Quantitative Risk Analysis • Plan Risk Responses • Plan Procurements 	<ul style="list-style-type: none"> • Direct and Manage Project Execution • Perform Quality Assurance • Acquire Project Team • Develop Project Team • Manage Project Team • Distribute Information • Manage Stakeholder Expectations • Conduct Procurements 	<ul style="list-style-type: none"> • Monitor and Control Project Work • Perform Integrated Change Control • Verify Scope • Control Scope • Control Schedule • Control Costs • Perform Quality Control • Report Performance • Monitor and Control Risks • Administer Procurements 	<ul style="list-style-type: none"> • Close Project or Phase • Close Procurements

Knowledge Area	Process Groups				
	Initiating	Planning	Executing	Monitor & Controlling	Closing
Integration	4.1 Develop Project Charter	4.2 Develop Project Management Plan	4.3 Direct and Manage Project Work	4.4 Monitor and Control Project Work 4.5 Perform Integrated Change Control	4.6 Close Project or Phase
Scope		5.1 Plan Scope Management 5.2 Collect Requirements 5.3 Define Scope 5.4 Create WBS		5.5 Validate Scope 5.6 Control Scope_	
Time		6.1 Plan Schedule Management 6.2 Define Activities 6.3 Sequence Activities 6.4 Estimate Activity Resources 6.5 Estimate Activity Durations 6.6 Develop Schedule		6.7 Control Schedule	
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Quality		8.1 Plan Quality Management	8.2 Perform Quality Assurance	8.3 Control Quality	
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Procurement		12.1 Plan Procurement Management	12.2 Conduct Procurements	12.3 Control Procurements	12.4 Close Procurements
Stakeholder	13.1 Identify Stakeholders	13.2 Plan Stakeholder Management	13.3 Manage Stakeholder Engagement	13.4 Control Stakeholder Engagement	

PMBOK: Standards

END OF

Chapter 3

PROJECT MANAGEMENT
PROCESSES

PMBOK: Knowledge Areas

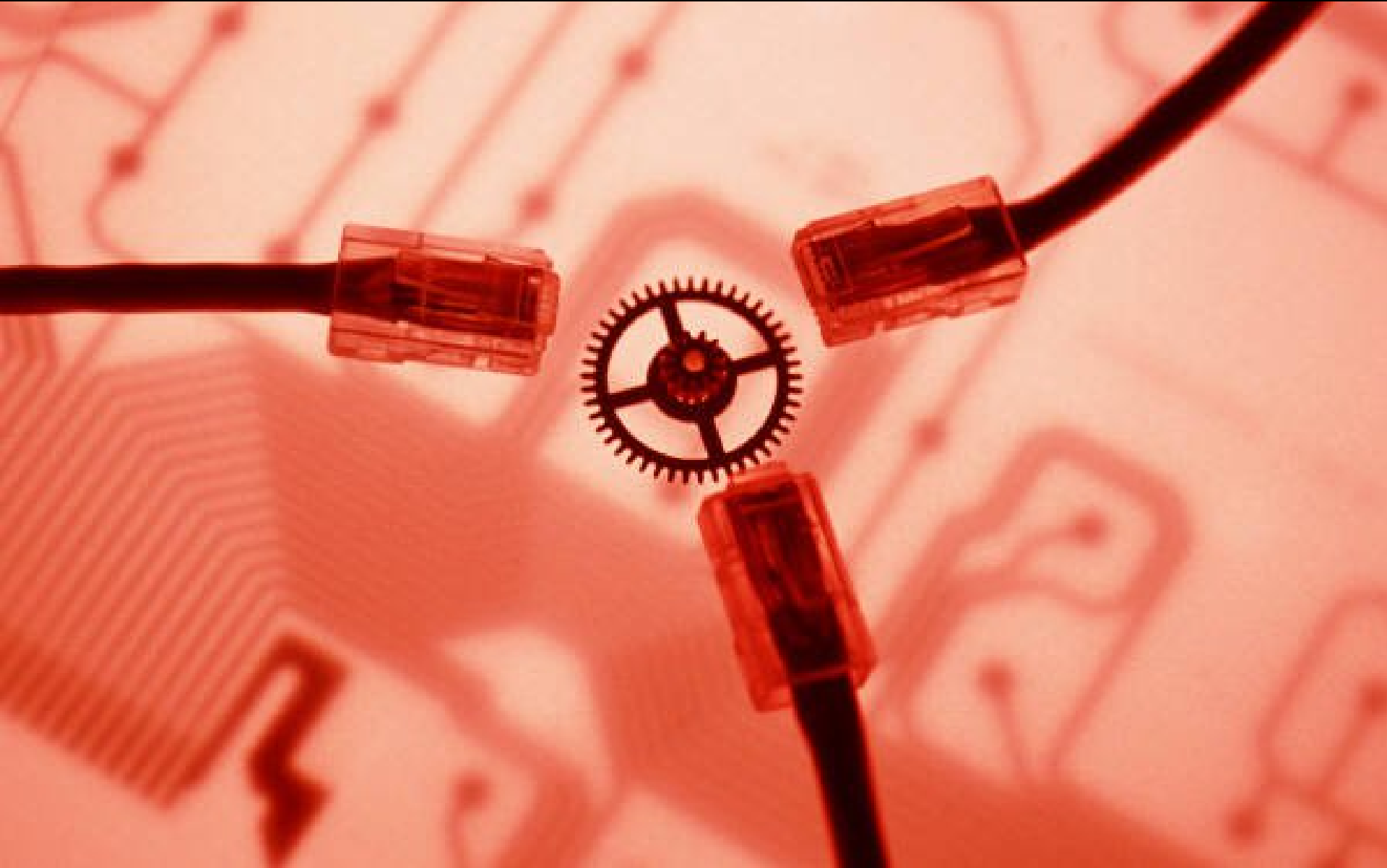
Chapter 4

PROJECT INTEGRATION

MANAGEMENT

Knowledge Area	Process Groups				
	Initiating	Planning	Executing	Monitor & Controlling	Closing
Integration	4.1 Develop Project Charter	4.2 Develop Project Management Plan	4.3 Direct and Manage Project Work	4.4 Monitor and Control Project Work 4.5 Perform Integrated Change Control	4.6 Close Project or Phase
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Project Integration Management



Project Integration Management

- **Develop Project Charter** – Developing a document that formally authorizes a project or phase and documenting the initial requirements that satisfy the stakeholder’s needs and expectations
- **Develop Project Plan** – Documenting the actions necessary to define, prepare, integrate and coordinate all sub plans
- **Direct and Manage Project Work** –Performing the work defined in the project management plan to achieve the project’s objectives
- **Monitor and Control Project Work** – Tracking, reviewing and regulating the progress. Actual vs. Planned
- **Perform Integrated Change Control** – Reviewing change requests, approving change requests and managing changes to the deliverables, organizational processes assets etc.
- **Close project or phase** – Finalizing all activities across ALL PMGs to formally complete the project or phase

Why have a Project Charter?

- It formally recognizes (authorizes) the existence of the project, without it a project does not exist.
- It gives the project manager authority to apply organizational resources.
- It provides high level requirements for the project. The project charter is broad enough so it does not need to change as the project changes.

Develop Project Charter

Developing a document that formally authorizes the existence of a project and provides the project manager with the authority to apply organizational resources to project activities.

Inputs

1. Project statement of work
2. Business case
3. Agreements
4. EEF
5. OPA

Tools & Techniques

1. Expert judgement
2. Facilitation Techniques

Outputs

1. Project Charter

A well-defined project start and project boundaries, creation of a formal record of the project, and a direct way for senior management to formally accept and commit to the project.

Develop Project Charter

The project charter documents :

Project purpose or justification

Measurable project objectives and related success criteria

High-level requirements

High-level project description

High-level risks

Summary milestone schedule

Summary budget

Project approval requirements

Assigned project manager, responsibility and authority level

Name and authority of the sponsor or other person(s) authorizing the project charter

Develop Project Charter: **Inputs**

- **Project Statement of Work**
 - **Narrative description of product, services, or results to be delivered**
 - **References:**
 - **Business need**
 - **Product scope description**
 - **Strategic Plan**

Develop Project Charter: **Inputs**

- **Business Case**
 - Determine whether or not the project is worth the required investment
 - Created due to:
 - Market demand
 - Organizational need
 - Customer request
 - Technological advance
 - Legal requirement
 - Ecological impact
 - Social need

Develop Project Charter: **Inputs**

- **Agreements**
 - Define initial intentions for a project
- **Enterprise Environmental Factors**
 - Governmental standards, industry standards, or regulations
 - Organizational culture and structure
 - Marketplace conditions

Develop Project Charter: **Inputs**

- **Organizational Process Assets**
 - Standard processes, policies, and process definitions
 - Templates
 - Historical information

Develop Project Charter: T&T

- **Expert Judgement**
 - Used to assess the inputs used to develop the project charter
 - Provided by any group or individual

Develop Project Charter: **Output**

- **Project Charter**
 - **Formally authorizes the existence of a project**
 - **Provides the authority to apply organizational resources**

Develop Project Management Plan

Defining, preparing, and coordinating all subsidiary plans and integrating them into a comprehensive project management plan..

Inputs

1. Project Charter
2. Outputs from other processes
3. EEF
4. OPA

Tools & Techniques

1. Expert judgement
2. Facilitation Techniques

Outputs

1. Project Management Plan

Central document that defines the basis of all project work.

Develop Project Management Plan: T&T

- **Expert Judgement – utilized to:**
 - Tailor the process regarding project needs
 - Develop technical and management details
 - Determine resources and skill levels
 - Define level of configuration management
 - Determine project documents for change control
 - Prioritize project work

Develop Project Management Plan: T&T

- **Facilitation Techniques**
 - **Guide the development of the project management plan**
 - **Key Techniques**
 - Brainstorming
 - Conflict resolution
 - Problem solving
 - Meeting management

Develop Project Management Plan: **Outputs**

Baselines
Subsidiary
Management Plans



Develop Project Management Plan: **Outputs**

Baselines: The project plan includes the project scope, schedule, and cost baselines. These baselines are collectively known as the **performance measurement baseline**. A baseline is what was originally planned for with any approved changes incorporated into it.

Develop Project Management Plan: **Outputs**

- **Scope baseline**

The project scope statement, work breakdown structure (WBS), and WBS dictionary.

- **Schedule baseline**

The agreed-upon schedule, including the start and stop times.

- **Cost baseline**

The time-phased cost budget.

Develop Project Management Plan: **Outputs**

Subsidiary Management Plan

Project scope management plan

Schedule management plan

Cost management plan

Quality management plan

Process improvement plan

Staffing management plan

Communication management plan

Risk management plan

Procurement management plan

Direct & Manage Project Work



- **The products of the project are produced during project execution.**
- work described in the project management plan.

Direct & Manage Project Work

Leading and performing the work defined in the project management plan and implementing approved changes to achieve the project's objectives.

Inputs

1. Project management plan
2. Approved change requests
3. EEF
4. OPA

Tools & Techniques

1. Expert judgement
2. Project management information system
3. Meetings

Outputs

1. Deliverables
2. Work performance data
3. Change requests
4. Project management plan updates
5. Project documents updates

Provides overall management of the project work.

Direct & Manage Project Work: **Inputs**

- **Project Management Plan**
 - **Scope Management Plan**
 - **Requirements Management Plan**
 - **Schedule Management Plan**
 - **Cost Management Plan**
 - **Stakeholder Management Plan**

Direct & Manage Project Work: **Inputs**

- **Enterprise Environment Factors**
 - **Organizational, company, or customer culture and structure**
 - **Infrastructure**
 - **Personnel administration**
 - **Stakeholder risk tolerances**
 - **Project management information system**

Direct & Manage Project Work: **Outputs**

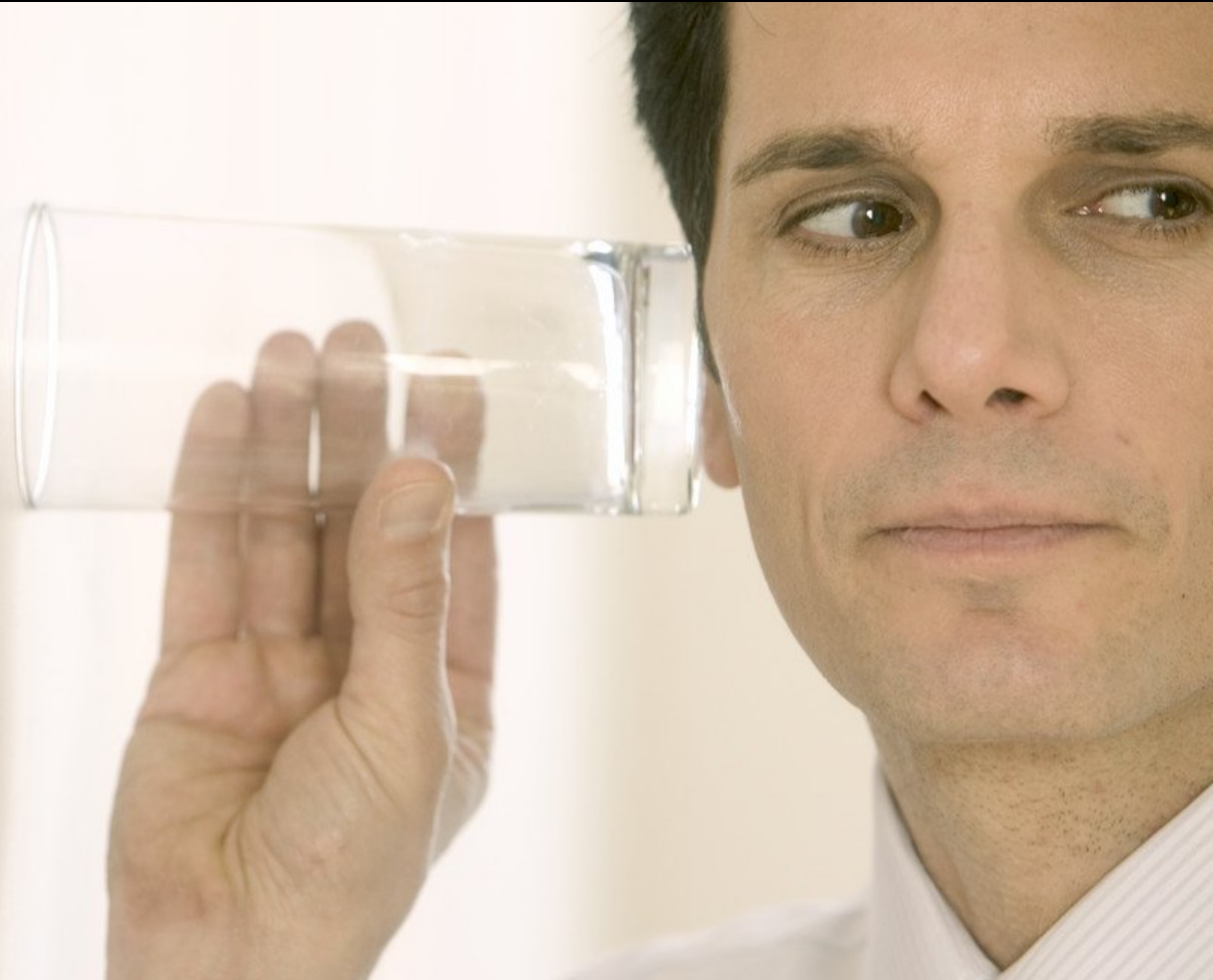
- **Deliverables**

Any unique and verifiable product, result or capability to perform a service that is required to be produced to complete a process, phase, or project.

Direct & Manage Project Work: **Outputs**

- **Change Requests**
 - **Corrective Action**
 - **Presentation Action**
 - **Defect Repair**
 - **Updates**

Monitor & Control Project Work



Monitoring – collecting, measuring, and distributing performance information, and assessing measurements and trends to effect process improvements.

Monitor & Control Project Work



- **Project Performance vs. Project Mg't Plan**
- **Risk**

Monitor & Control Project Work

Tracking, reviewing, and reporting the progress to meet the performance objectives defined in the project management plan.

Inputs

1. Project management plan
2. Schedule forecasts
3. Cost forecasts
4. Validated changes
5. Work performance information
6. EEF
7. OPA

Tools & Techniques

1. Expert judgement
2. Analytical techniques
3. Project management information system
4. Meetings

Outputs

1. Change requests
2. Work performance reports
3. Project management plan updates
4. Project documents updates

Allows stakeholders to understand the current state of the project, the steps taken, and budget, schedule, and scope forecasts.

Monitor & Control Project Work: **Inputs**

- **Validated Changes**
 - **Approved changes**
- **Work Performance Information**
 - **Collected performance data**

Monitor & Control Project Work: T&T

- **Expert Judgement**
- **Analytical Techniques**
 - Regression analysis
 - Grouping methods
 - Causal analysis
 - Root cause analysis
 - Forecasting methods
 - Failure mode and effect analysis (FMEA),
 - Fault tree analysis (FTA),
 - Reserve analysis,
 - Trend analysis,
 - Earned value management
 - Variance analysis.

Monitor & Control Project Work: **Outputs**

- **Change Requests**
 - **Corrective Action**
 - **Presentation Action**
 - **Defect Repair**

Integrated Change Control

- Three main objectives:
 - Influence the factors that create changes to ensure that changes are beneficial.
 - Determine that a change has occurred.
 - Manage actual changes as they occur.



**CHANGE
AHEAD**

Perform Integrated Change Control

Reviews all requests for changes or modifications to project documents, deliverables, baselines, or the project management plan and approves or rejects the changes.

Inputs

1. Project management plan
2. Work performance reports
3. Change requests
4. EEF
5. OPA

Tools & Techniques

1. Expert judgement
2. Meetings
3. Change control tools

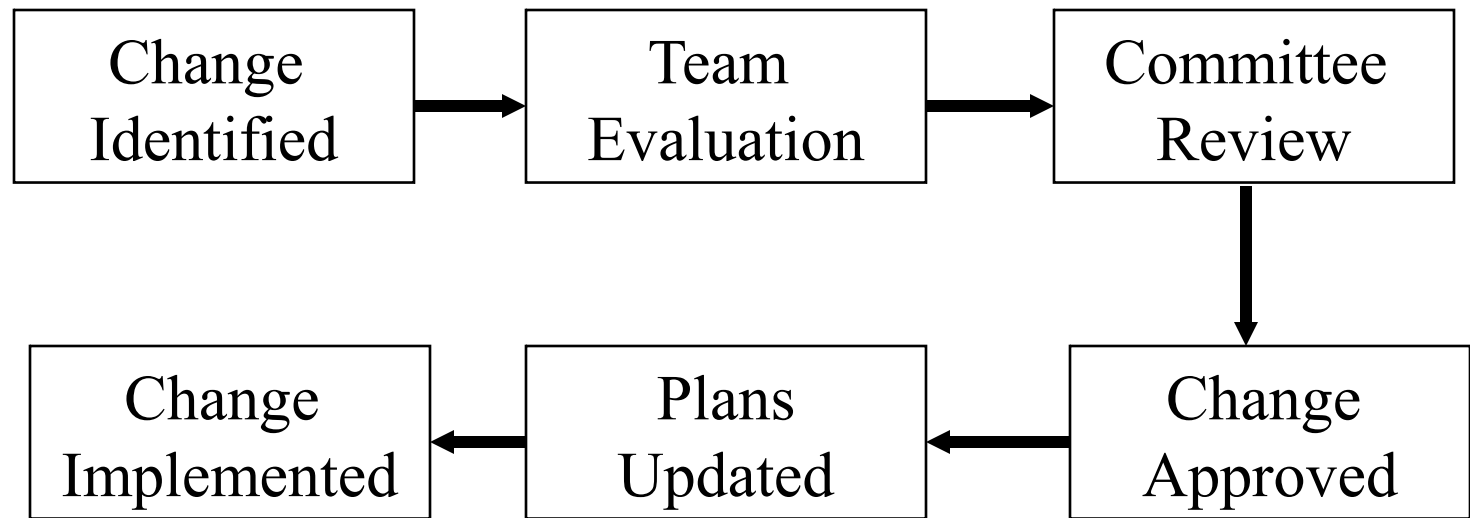
Outputs

1. Approved change requests
2. Change log
3. Project management plan updates
4. Project documents updates
5. Project documents updates

Allows for documented changes within the project to be considered in an integrated fashion while reducing project risk, which often arises from changes made without consideration to the overall project objectives or plans.

Perform Integrated Change Control

STEPS upon receiving a Change Requests



Perform Integrated Change Control

- **Configuration management activities**
 - **Configuration identification**
 - **Configuration status accounting**
 - **Configuration verification and audit**

Perform Integrated Change Control: **Inputs**

- **Project Management Plan**
 - **Scope Management Plan**
 - **Scope Baseline**
 - **Change Management Plan**

Perform Integrated Change Control: T&T

- **Expert Judgement**
- **Meetings**
- **Change Control Tools**

Perform Integrated Change Control: **Outputs**

- **Approved Change Requests**
 - **Change Log.** Document changes that occur during a project
 - **Project Management Plan Updates**
 - **Subsidiary plans**
 - **Baselines**
 - **Project Document Updates** – due to Perform Integrated Change Control process

Close Project or Phase



Close Project or Phase

Projects come to an end for several reasons:

- **They are completed successfully.**
- **They are canceled or **killed** prior to completion.**
- **They evolve into ongoing operations and no longer exist as projects.**

Close Project or Phase

Finalizing all activities across all of the Project Management Process Groups to formally complete the project or phase.

Inputs

1. Project management plan
2. Accepted deliverables
3. OPA

Tools & Techniques

1. Expert judgement
2. Analytic techniques
3. Meetings

Outputs

1. Final product, service, or result transition
2. Organizational process assets updates

Provides lessons learned, the formal ending of project work, and the release of organization resources to pursue new endeavors.

Close Process of Phase: **Inputs**

- **Organizational Process Assets**
 - **Closure guidelines or requirements**
 - **Historical information**

Close Project or Phase: T&T

- **Expert Judgement**
 - Other project managers within the organization
 - Project management office
 - Professional and technical associations
- **Organizational Process Assets Update**
 - Project Files
 - Project or phase closure documents
 - Historical information

PMBOK: Knowledge Areas

END OF

Chapter 4
PROJECT INTEGRATION
MANAGEMENT

PMBOK: Knowledge Areas

Chapter 5

PROJECT SCOPE MANAGEMENT

Knowledge Area	Process Groups				
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How the customer explained it



How the Project Leader understood it



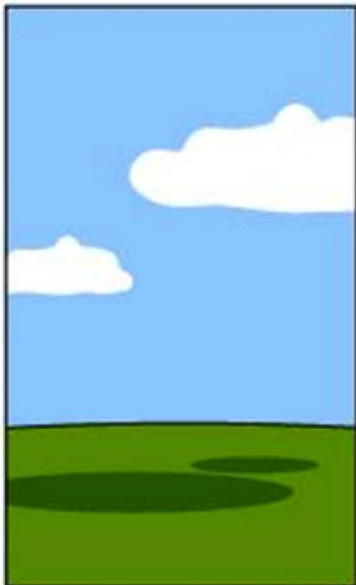
How the Analyst designed it



How the Programmer wrote it



How the Business Consultant described it



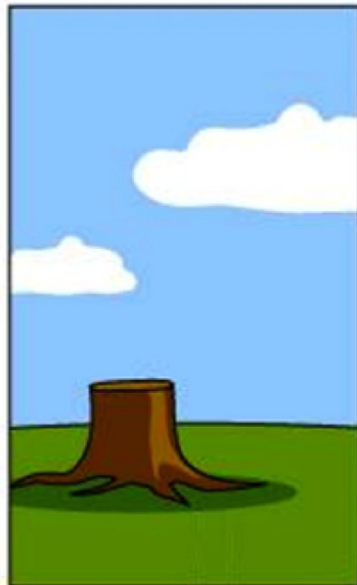
How the project was documented



What operations installed



How the customer was billed



How it was supported



What the customer really needed

PROJECT SCOPE MANAGEMENT

Project Scope Management includes the processes required to ensure that the project includes **all the work required**, and **only the work required**, to complete the project successfully.

Managing the project scope is primarily concerned with defining and controlling what is and is not included in the project.

Project Scope Management

- **Plan Scope Management**
- **Collect Requirements**
- **Define Scope**
- **Create WBS**
- **Validate Scope**
- **Control Scope**

Product & Project Scope

Describe some of the items in this picture

Describe some of the work that had to be done to produce these items



Product & Project Scope

Scope can refer to:

- **Product Scope** – The features and functions that characterizes a product, services or result
- **Project Scope** – The work that is required to be accomplish to deliver a product, service, or result with the specific functions and features defined

Plan Scope Management

Documenting how the project scope will be defined, validated, and controlled

Inputs

1. Project management plan
2. Project Charter
3. EEF
4. OPA

Tools & Techniques

1. Expert judgement
2. Meetings

Outputs

1. Scope management plan
2. Requirements management plan

Provides guidance and direction on how scope will be managed throughout the project

Plan Scope Management – **Inputs**

- **Project Charter**
 - Provides project context
 - High-level project description and product characteristics
- **Enterprise Environmental Factors:**
 - Organization's culture,
 - Infrastructure,
 - Personnel administration, and
 - Marketplace conditions

Plan Scope Management – **Inputs**

- **Organizational Process Assets**
 - Policies and procedures
 - Historical information

Plan Scope Management – T&T

- **Expert Judgment**
 - Input received from knowledgeable and experienced parties
- **Meetings**
 - Meetings attended by project teams

Plan Scope Management – Output

- **Scope Management Plan**
 - Describes how the scope will be defined, developed, monitored, controlled, and verified
- **The Requirements Management Plan:**
 - How requirements will be analyzed, documented, and managed

PMBok Guide Definitions

- **Product Scope:** The features and functions that characterize a product, service, or result.
- **Project Scope:** The work that must be performed to deliver a product, service, or result with the specified features and functions.
- **Requirement:** A condition or capability that must be met or possessed by a system, product, service, result, or component to satisfy a contract, standard, specification, or other formally imposed document. Requirements include the quantified and documented needs, wants, and expectations of the sponsor, customer, and other stakeholders.

Simplified Definitions

- **Product Scope:** The requirements that specifically relate to the "product" of the Project.
- **Project Scope:** All the work that goes in producing the product.
- **Requirement:** "What" the customer needs. Requirements can be of many types. For example, product related requirements, performance requirements, quality requirements, project management requirements etc.

An Example

Let's say you have a plot of land and you want to build a house on it.

- **Product:** The House
- **Product Scope:**
 - The house should have 3 storeys, 1000 sq.m. of built-up area
 - 4 bedrooms with attached baths
 - 2 living rooms
 - Kitchen
 - Basement
 - Garage
 - White exteriors

An Example

Let's say you have a plot of land and you want to build a house on it.

- **Project Scope**
 - Hiring a building contractor, an architect and an interior designer
 - Estimating the cost
 - Planning for risks such as rain
 - Designing the house
 - Buying construction material
 - Constructing the house
 - Conducting inspections
 - Making payments
 - Closing contracts

An Example

Let's say you have a plot of land and you want to build a house on it.

- **Requirement**
 - Using a particular grade of cement could be your quality requirement
 - Making the house earth-quake proof could be a performance requirement
 - Getting a weekly progress update from your contractor, and making monthly payments could be your project management requirements.

Collect Requirements

Determining, documenting, and managing stakeholder needs and requirements to meet project objectives.

Inputs

- 1.Scope management plan
- 2.Requirements management plan
- 3.Stakeholder management plan
- 4.Project charter
- 5.Stakeholder register

Tools & Techniques

- 1.Interviews
- 2.Focus groups
- 3.Facilitated workshops
- 4.Group creativity techniques
- 5.Group decision-making techniques
- 6.Questionnaires and surveys
- 7.Observations
- 8.Prototypes
- 9.Benchmarking
- 10.Context diagrams
- 11.Document analysis

Outputs

- 1.Requirements documentation
- 2.Requirements traceability matrix

Provides the basis for defining and managing the project scope including product scope

Types of Requirements

- Business Requirements
- Stakeholder Requirements
- Solution Requirements
- Transition Requirements
- Project Requirements
- Quality Requirements

Collect Requirements: T&T

Interviews :

- Formal or informal approach to elicit information from stakeholders by talking to them directly



Collect Requirements: T&T

Focus Groups :

- Includes:
 - Prequalified stakeholder
 - Subject matter experts
 - Trained moderator
- Interactive discussion
- More conversational



Collect Requirements: T&T

Facilitated workshops:

- Focused session
- Key stakeholders to discuss and define product requirements that affect more than one department.

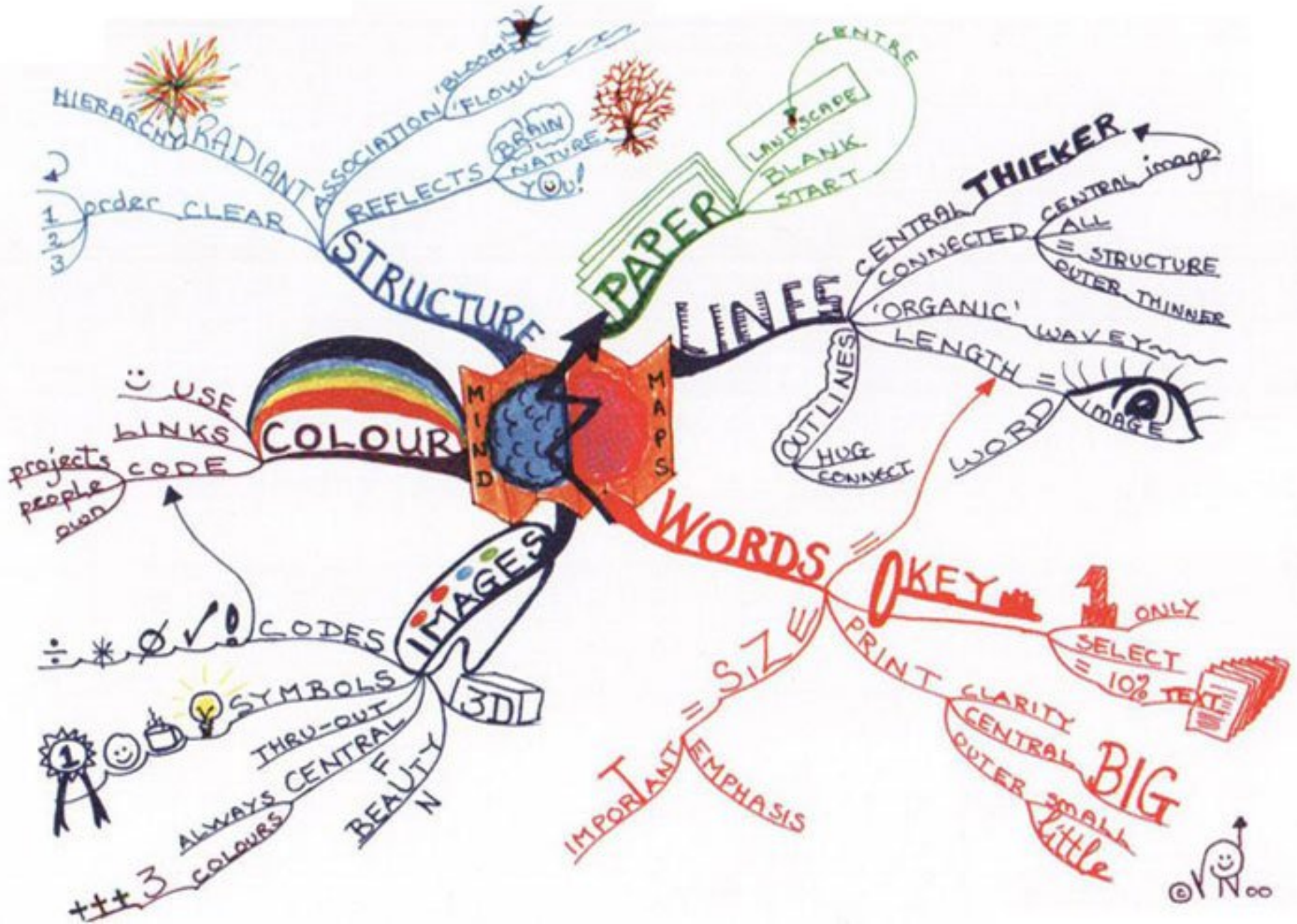


Collect Requirements: T&T

- **Group Creativity Techniques :**
 - Brainstorming
 - Nominal group technique
 - Idea/Mind Mapping
 - Affinity Diagrams
 - Murticriteria decision analysis



Idea/Mind Mapping (example)



Collect Requirements: T&T

- **Group Decision-Making Techniques:**

- Unanimity

- Majority

- Plurality

- Dictatorship



Collect Requirements: T&T

- **Questionnaires and Surveys**
 - Written sets of questions
 - Quickly accumulate information
 - Entails a large number of respondents
- **Observations**
 - Direct way of viewing individuals
 - particularly helpful for detailed processes



Collect Requirements – T&T

- **Prototypes**
 - Provides a working model
- **Benchmarking**
 - Comparing actual or planned practices
- **Context Diagrams**
 - Visually depict the product scope
 - Shows how people and other systems (actors) interact with it
- **Document Analysis**
 - Elicit requirements by analyzing existing documentation

Collect Requirements – Output

- **Requirements Traceability Matrix**
 - It is a matrix (table) that links requirements to their origin and traces them throughout the project life cycle

Define Scope

Developing a detailed description of the project and product

Inputs

1. Scope management plan
2. Project charter
3. Requirements documentation
4. Organizational process assets

Tools & Techniques

1. Expert judgment
2. Product analysis
3. Alternatives generation
4. Facilitated workshops

Outputs

1. Project scope statement
2. Project documents updates

Describes the project, service, or result boundaries by defining which of the requirements collected will be included in and excluded from the project scope.

Define Scope – T&T

- **Expert Judgment**

- Other units within the organization
- Consultants
- Stakeholders, including customers or sponsors
- Professional and technical associations
- Industry groups
- Subject matter experts
- Benchmarking

Define Scope – T&T

- **Product Analysis**
- **Alternatives Generation**
 - Used to develop as many potential options as possible
 - Includes: brainstorming, lateral thinking and analysis of alternatives
- **Facilitated Workshops**

Define Scope – Outputs

- **Project Scope Statement**
 - Description of the project scope, major deliverables, assumptions, and constraints.
- **Project Documents Updates**
 - Stakeholder register
 - Requirements documentation
 - Requirements traceability matrix

Define Scope – Outputs

The project scope statement contains the following:

- Product scope description
- Acceptance criteria
- Deliverable
- Project exclusion
- Constraints
- Assumptions



Create WBS

Subdividing project deliverables and project work into smaller, more manageable components.

Inputs

1. Scope management plan
2. Project scope statement
3. Requirements documentation
4. Enterprise environmental factors
5. Organizational process assets

Tools & Techniques

1. Decomposition
2. Expert judgment

Outputs

1. Scope baseline
2. Project documents updates

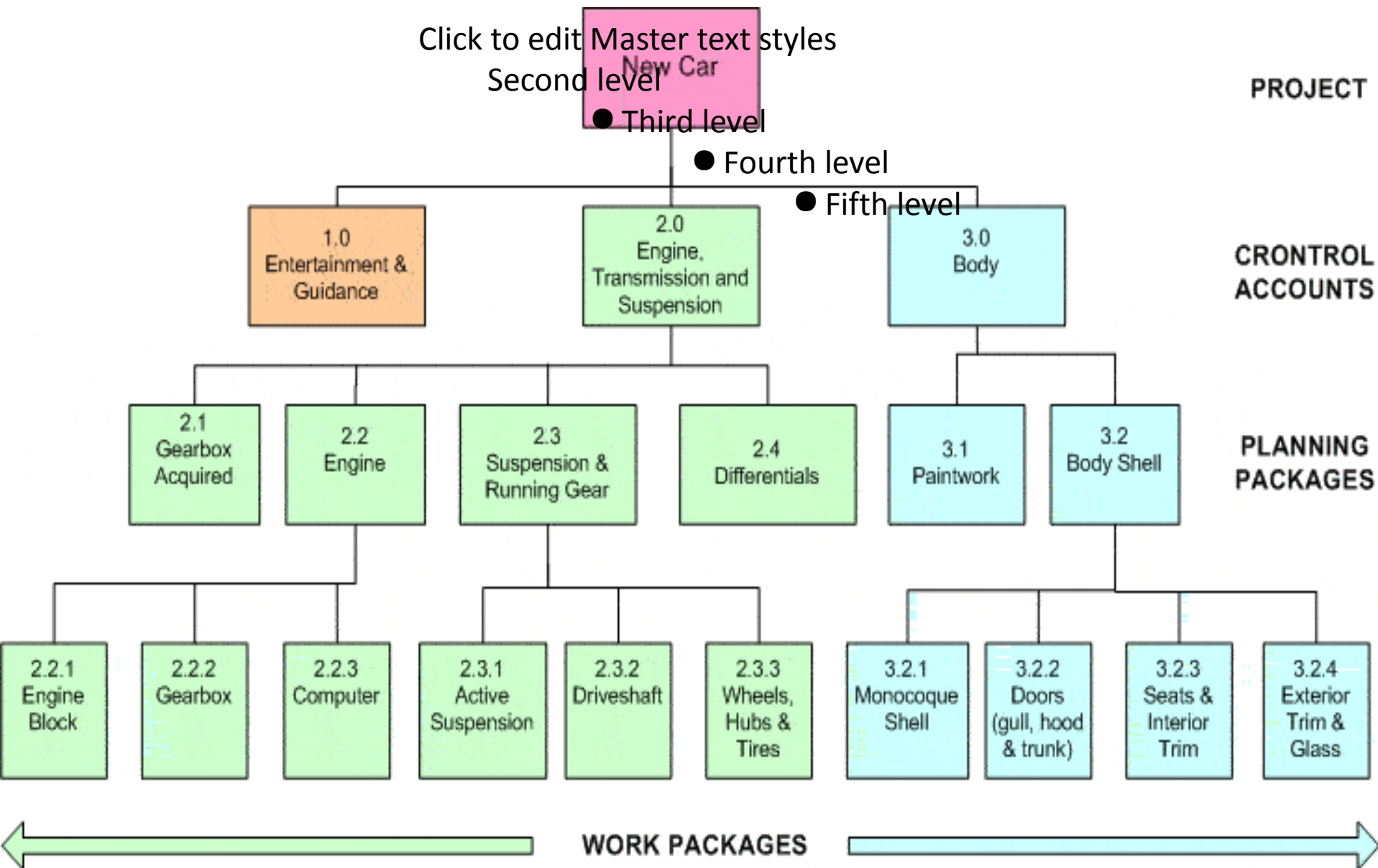
Provides a structured vision of what has to be delivered

Create WBS

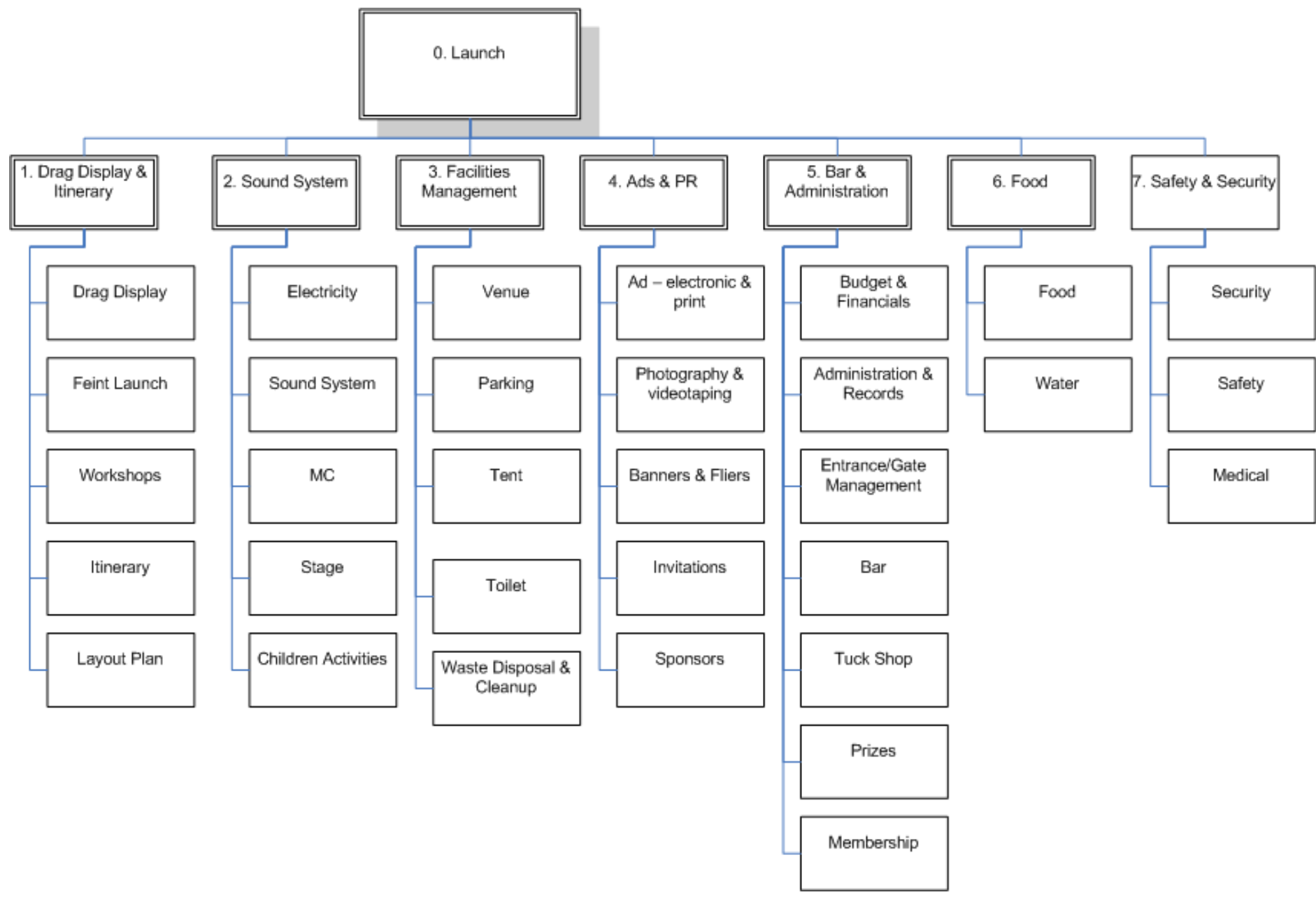
- Process of subdividing project deliverables and project work into smaller, more manageable components.
- WBS is a **deliverable-oriented hierarchical** decomposition of the work to be executed by the project team to accomplish the project objectives and create the required deliverables.
- The WBS organizes and defines the total scope of the project.

Create WBS

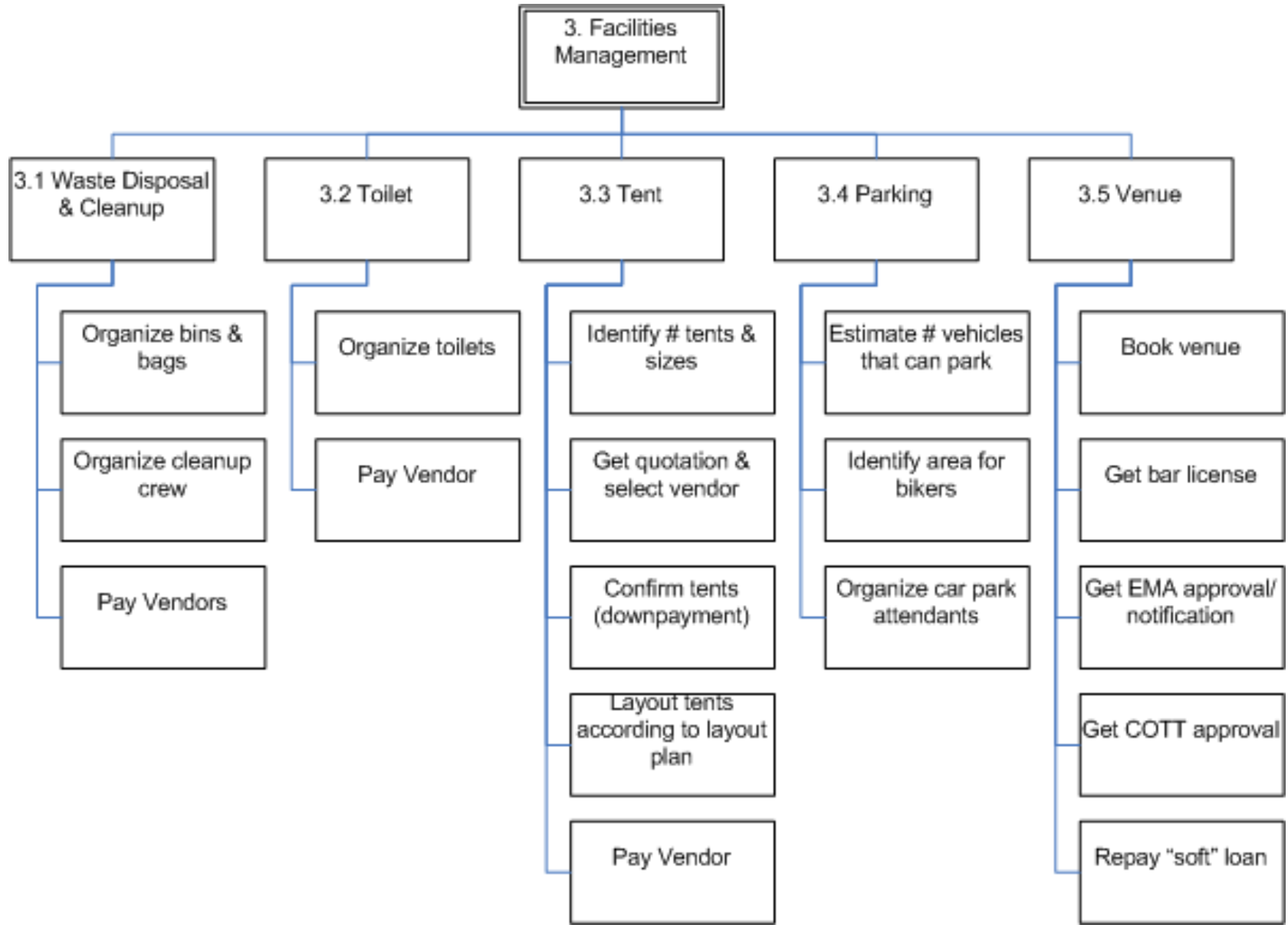
- The planned work is contained within the lowest level WBS components, which are called work packages.
- A work package can be scheduled, cost estimated, monitored, and controlled.
- **Work that doesn't fit into the WBS does not fit within the project.**



Car Show Event WBS



Car Show Event WBS



Create WBS – Inputs

- **Project Scope Statement**
 - Describes the work that will be performed and the work that is excluded.

Create WBS – T&T

- **Decomposition**

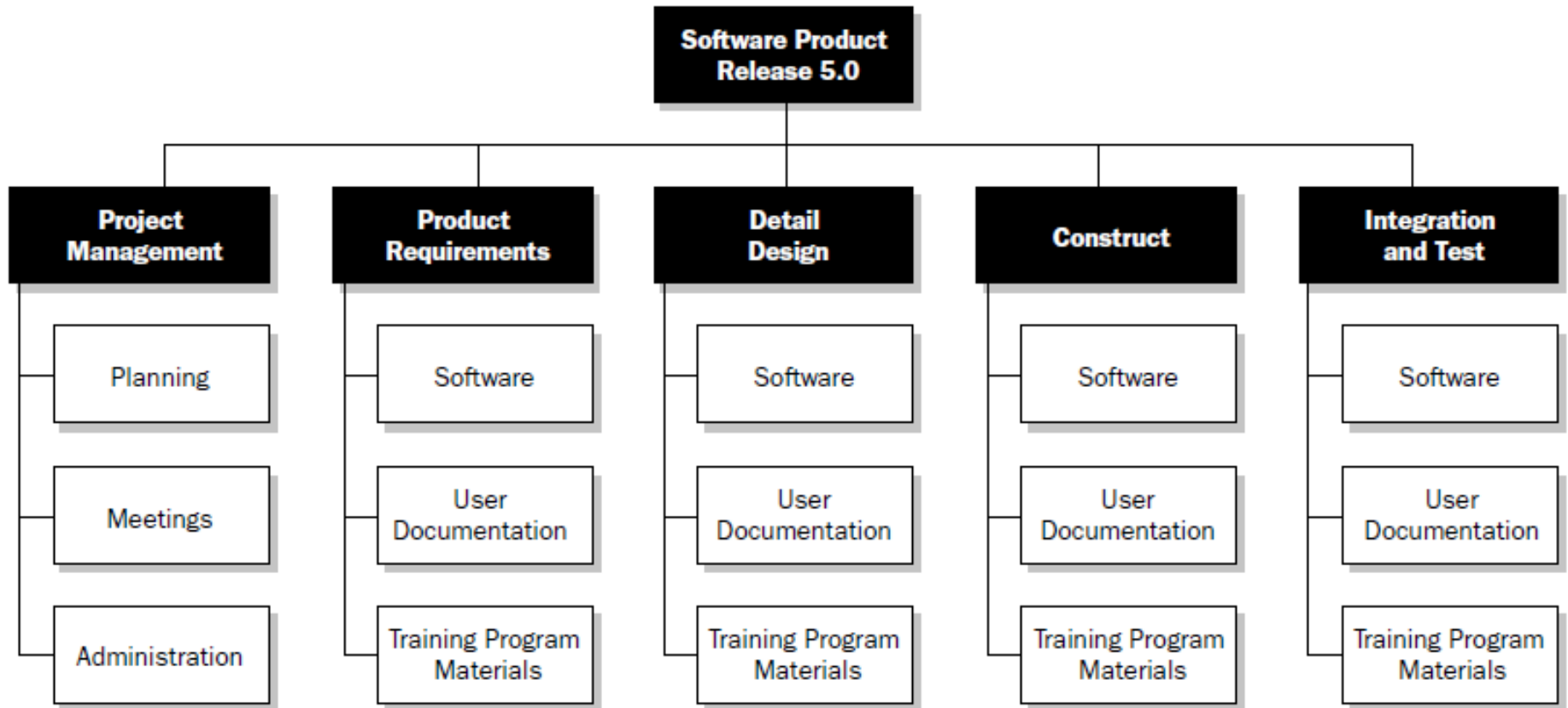
- Dividing and subdividing the project scope and project deliverables
- Identifying and analyzing the deliverables and related work
- Structuring and organizing the WBS
- Decomposing
- Developing and assigning
- Verifying

Create WBS – T&T

- **Expert Judgement**

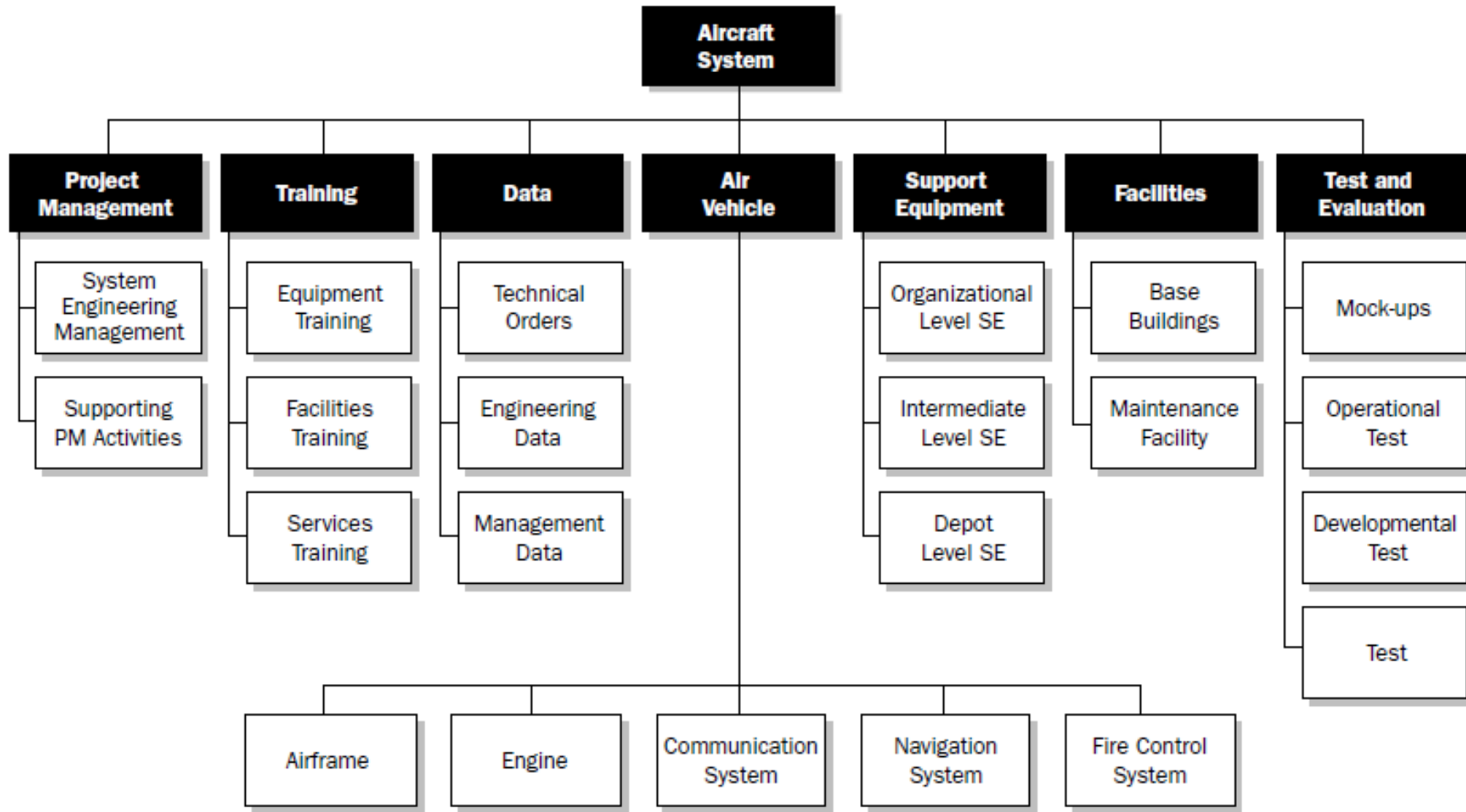
- Required in order to create an effective WBS

Create WBS – T&T



Sample WBS Organized by Phase

Create WBS – T&T



Sample WBS with Major Deliverables

Define Scope – Outputs

- **Scope Baseline**

- **Project scope statement**
- **Work Breakdown Structure (WBS)**
- **WBS Dictionary**

- **Project Document Update**

WBS Dictionary

Level	WBS Code	Element Name	Definition	Cost Control Number	Responsible Organization
1	1	Bicycle WBS	All components and subassemblies required to specify design, assembly and testing of a custom bicycle.		Customer Sales and Support
2	1.1	Frame Set	The individual components that together constitute the frame once assembled		Customer Sales and Support
3	1.1.1	Frame	The unit tubular steel structure to which other components are attached. Provides basic design and strength.		Customer Sales and Support
3	1.1.2	Handlebar	Used by rider to steer bicycle. Also serves as point of attachment for hand brakes, lights, and other accessories. Style to be selected by customer.		Customer Sales and Support

Semantic Check

- The verb “**validate**” means *to confirm*.
- The verb “**verify**” means *to prove the truth of*.
- So one *validates* a computer program to *confirm* that it works as designed.
- In contrast, one *verifies* a person’s identity to *prove* that the person is who he says that he is.
- **Solution:**
Use the verb “validate” when confirming that something behaves as designed. Use the verb “verify” when focusing on the truth.

Validate Scope

Formalizing acceptance of the completed project deliverables

Inputs

1. Project management plan
2. Requirements documentation
3. Requirements traceability matrix
4. Verified deliverables
5. Work performance data

Tools & Techniques

1. Inspection
2. Group decision-making techniques

Outputs

1. Accepted deliverables
2. Change requests
3. Work performance information
4. Project documents updates

Brings objectivity to the acceptance process and increases the chance of final product, service, or result acceptance by validating each deliverable.

Validate Scope – **Inputs**

- **Project Management Plan**
 - Contains the scope management plan and the scope baseline

Validate Scope – T&T

- **Inspection**
 - Measuring
 - Examining
 - Validating

Validate Scope – Output

- **Accepted Deliverables**
 - Meet the acceptance criteria



Control Scope

Monitoring the status of the project and product scope and managing changes to the scope baseline.

Inputs

1. Project management plan
2. Requirements documentation
3. Requirements traceability matrix
4. Work performance data
5. Organizational process assets

Tools & Techniques

1. Variance analysis

Outputs

1. Work performance information
2. Change requests
3. Project management plan updates
4. Project documents updates
5. Organizational process assets updates

Allows the scope baseline to be maintained throughout the project.

Control Scope – Inputs

- **Project Management Plan**
 - Scope baseline
 - Scope management plan
 - Change management plan
 - Configuration management plan
 - Requirements management plan
- **Requirements Traceability Matrix**
 - Helps detect the impact of any change or deviation

Control Scope – T&T

- **Variance Analysis**

- difference between the baseline and actual performance

Control Scope – Outputs

- **Organizational Process Assets Updates**
 - Causes of variances
 - Corrective action chosen and the reasons
 - Other types of lessons learned from project scope control

Exercise

Create one more level in each of the WBS.

Playground Fence

Web Site Design

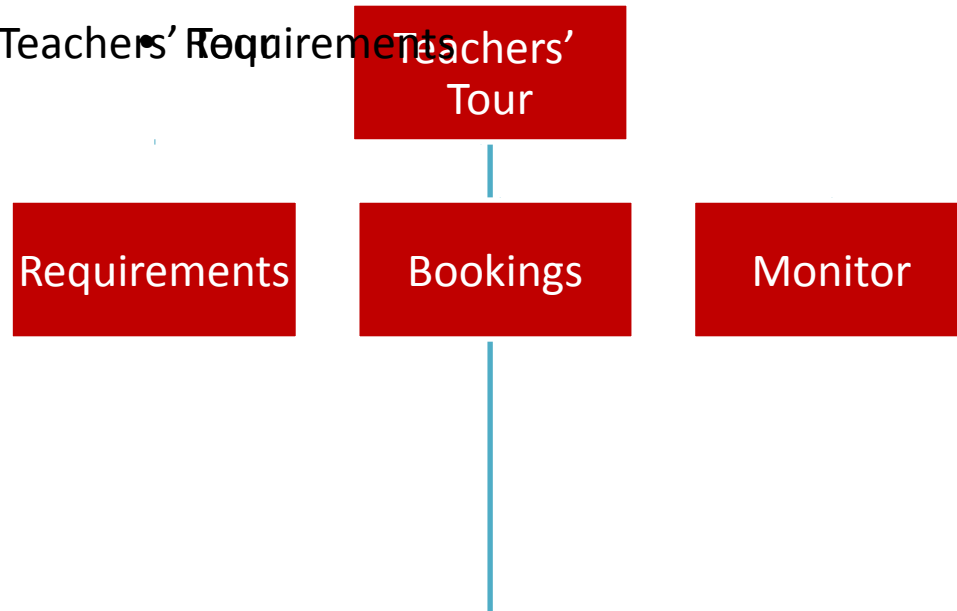
Teachers' Requirements

Teachers' Tour

Requirements

Bookings

Monitor



PMBOK: Knowledge Areas

END OF

Chapter 5
PROJECT SCOPE
MANAGEMENT

PMBOK: Knowledge Areas

Chapter 6

PROJECT TIME MANAGEMENT

Knowledge Area	Process Groups				
	Initiating	Planning	Executing	Monitor & Controlling	Closing
Integration	4.1 Develop Project Charter	4.2 Develop Project Management Plan	4.3 Direct and Manage Project Work	4.4 Monitor and Control Project Work 4.5 Perform Integrated Change Control	4.6 Close Project or Phase
Scope		5.1 Plan Scope Management 5.2 Collect Requirements 5.3 Define Scope 5.4 Create WBS		5.5 Validate Scope 5.6 Control Scope_	
Time		6.1 Plan Schedule Management 6.2 Define Activities 6.3 Sequence Activities 6.4 Estimate Activity Resources 6.5 Estimate Activity Durations 6.6 Develop Schedule		6.7 Control Schedule	
Cost		7.1 Plan Cost Management 7.2 Estimate Costs 7.3 Determine Budget		7.4 Control Costs	
Quality		8.1 Plan Quality Management	8.2 Perform Quality Assurance	8.3 Control Quality	
Human Resource		9.1 Plan Human Resource Management	9.2 Acquire Project Team 9.3 Develop Project Team 9.4 Manage Project Team		
Communications		10.1 Plan Communications Management	10.2 Manage Communications	10.3 Control Communications	
Risk		11.1 Plan Risk Management 11.2 Identify Risks 11.3 Perform Qualitative Risk Analysis 11.4 Perform Quantitative Risk Analysis 11.5 Plan Risk Responses		11.6 Control Risks	
Procurement		12.1 Plan Procurement Management	12.2 Conduct Procurements	12.3 Control Procurements	12.4 Close Procurements
Stakeholder	13.1 Identify Stakeholders	13.2 Plan Stakeholder Management	13.3 Manage Stakeholder Engagement	13.4 Control Stakeholder Engagement	



Five (5) reasons why Projects are normally late

Reasons for Projects being Late

- Bad multi-tasking,
- Student syndrome,
- Parkinson's law,
- Task dependency, and
- PM math where $2+2=5$

Reasons for Projects being Late

- Bad multi-tasking
 - A task is stopped and another task is worked on due to shifting priorities
 - Someone is waiting for the output of your task before they can do their work?

Any amount of time not working on a task means the task is being delayed longer than if you dedicated yourself to its completion.

Reasons for Projects being Late

- Parkinson's law
 - Work expands to fill the time available

Reasons for Projects being Late

- Student Syndrome
 - Putting off work until the last possible moment not because we are lazy.
 - This is not the same as procrastination which connotes being lazy or irresponsible.

Reasons for Projects being Late

- Task Dependency
 - Task 1 – 90% probability
 - Task 2 – 90%
 - Task 3 – 90%
- Task 1 & 2
 - $90 * 90 = 81\%$
- Task 1, 2 & 3
 - $90 * 90 * 90 = 73\%$

Project Time Management

- **Plan Schedule Management**
- **Define Activities**
- **Sequence Activities**
- **Estimate Activity Resources**
- **Estimate Activity Duration**
- **Develop Schedule**
- **Control Schedule**

Plan Schedule Management

Establishing the policies, procedures, and documentation for planning, developing, managing, executing, and controlling the project schedule.

Inputs

1. Project management plan
2. Project charter
3. Enterprise environmental factors
4. Organizational process assets

Tools & Techniques

1. Expert judgement
2. Analytical techniques
3. Meetings

Outputs

1. Schedule management plan

Provides guidance and direction on how the project schedule will be managed throughout the project.

Define Activities

Identifying and documenting the specific actions to be performed to produce the project deliverables.

Inputs

1. Schedule management plan
2. Scope baseline
3. EEF
4. OPA

Tools & Techniques

1. Decomposition
2. Rolling wave planning
3. Expert judgement

Outputs

1. Activity list
2. Activity attributes
3. Milestone list

To break down work packages into activities that provide a basis for estimating, scheduling, executing, monitoring, and controlling the project work.

Define Activity (Tools & Techniques)

Rolling Wave Planning

- A form of progressive elaboration planning where the work to be accomplished at the near term is planned in detail at a low level of the WBS, while the work far in the future is planned at relatively high levels of the WBS.

Decomposition

- Decomposition: The process of subdividing the project work packages into smaller, more manageable components called schedule activities.

Define Activity (Outputs)

- An **activity list** is a tabulation of activities to be included on a project schedule. The list should include:
 - The activity name
 - An activity identifier or number
 - A brief description of the activity
- **Activity attributes** provide more information about each activity, such as predecessors, successors, logical relationships, leads and lags, resource requirements, constraints, imposed dates, and **assumptions related to the activity**.
- **Milestone**
 - A **milestone** is a significant event that normally has no duration.
 - Milestones are typically major accomplishments of the project and mark the completion of major deliverables or some other key event in the project.

Which comes first?



Sequence Activities

Identifying and documenting relationships among the project activities.

Inputs

1. Schedule management plan
2. Activity list
3. Activity attributes
4. Milestone list
5. Project scope statement
6. EEF
7. OPA

Tools & Techniques

1. Precedence diagramming method (PDM)
2. Dependency determination
3. Leads and lags

Outputs

1. Project schedule network diagrams
2. Project documents updates

Defines the logical sequence of work to obtain the greatest efficiency given all project constraints.

Sequence Activities

- A **dependency** or **relationship** relates to the sequencing of project activities or tasks.
- You *must* determine dependencies in order to use critical path analysis.
- Can be performed by using manual or automated techniques or project management software

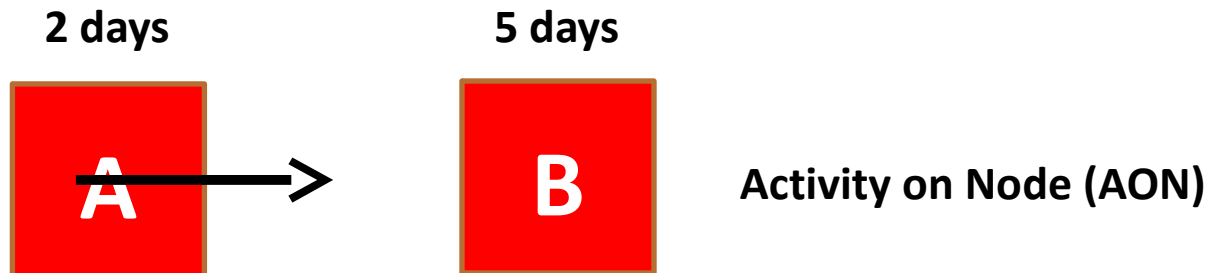
Precedence Diagramming Method(PDM)

Includes four types of dependencies or logical relationships:

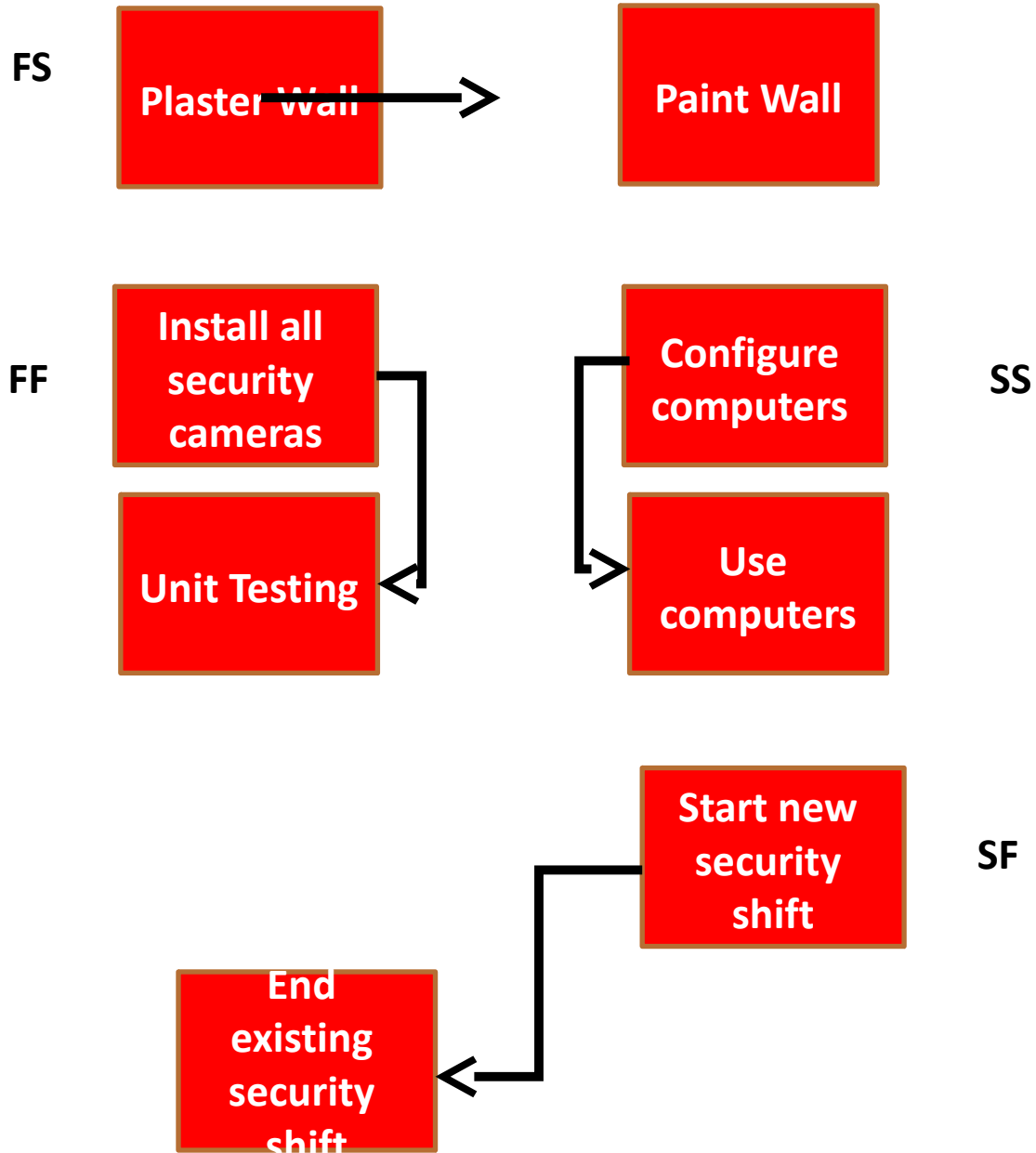
- Finish-to-start (FS)
- Finish-to-finish (FF)
- Start-to-start (SS)
- Start-to-finish (SF)

Precedence Diagramming Method (PDM)

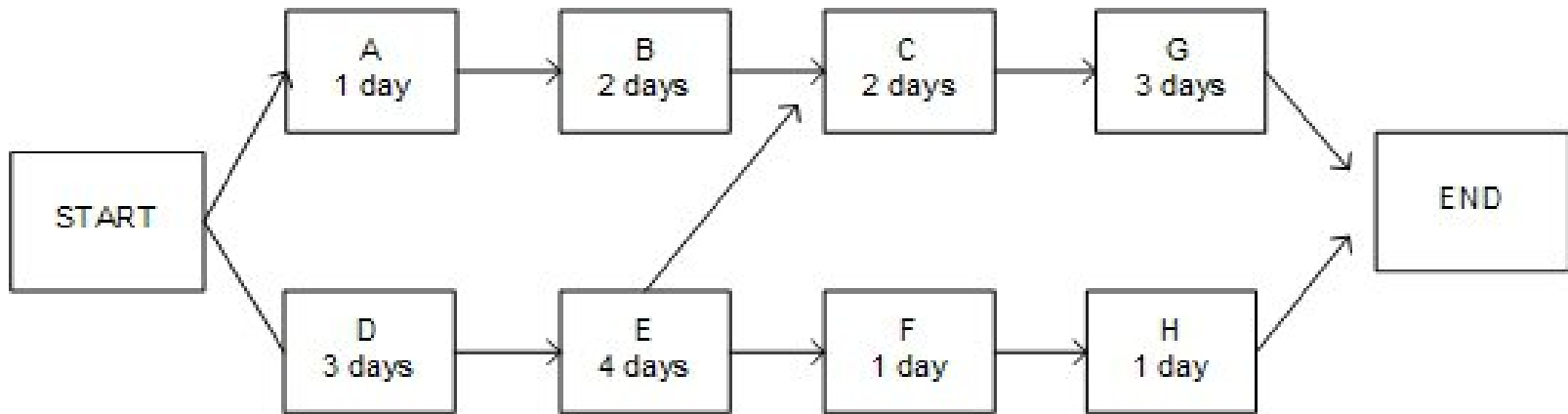
- Activities are represented by boxes/ rectangles.
- Arrows show relationships between activities
- Better at showing different types of dependencies
- In PDM, finish-to-start is the most common relationship



Precedence Diagramming Method (PDM)



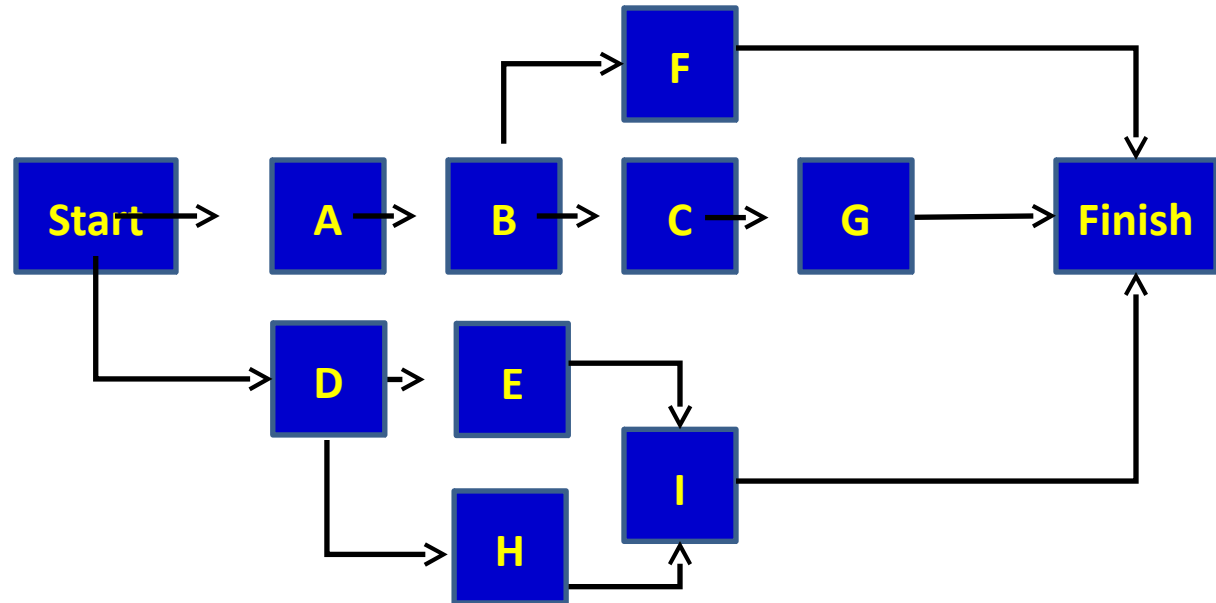
Precedence Diagramming Method (PDM)



Practice Exercise – Network Diagrams

Name Predecessor

Start	-
A	Start
B	A
C	B
D	Start
E	D
F	B
G	C
H	D
I	E,H
Finish	F,G,I



Practice Exercise – Network Diagrams

Name	Predecessor
Start	-
1	Start
2	1
3	2
4	Start
5	3
6	Start
7	6
Finish	7,4,5

Estimate Activity Resource



Estimate Activity Resource/Duration

- 1. Estimate should be done by the person doing the work whenever possible to improve accuracy.**
- 2. Historical information from past projects is a key to improving estimates.**
- 3. A schedule baseline should be kept and not changed except for approved project changes.**
- 4. Changes are approved in the Perform Integrated Change Control process.**
- 5. Estimates are more accurate if smaller-size work component are estimated.**
- 6. Padding is not an acceptable project management practice.**
- 7. Estimates must be reviewed when they are received to see if they are reasonable and to check for padding and risks.**

Estimate Activity Resource

Estimating the type and quantities of material, human resources, equipment, or supplies required to perform each activity.

Inputs

1. Schedule management plan
2. Activity list
3. Activity attributes
4. Resource calendars
5. Risk register
6. Activity cost estimates
7. EEF
8. OPA

Tools & Techniques

1. Expert judgment
2. Alternative analysis
3. Published estimating data
4. Bottom-up estimating
5. Project management software

Outputs

1. Activity resource requirements
2. Resource breakdown structure
3. Project documents updates

Identifies the type, quantity, and characteristics of resources required to complete the activity which allows more accurate cost and duration estimates.



Estimate Activity Duration

Estimating the number of work periods needed to complete individual activities with estimated resources.

Inputs

1. Schedule management plan
2. Activity list
3. Activity attributes
4. Activity resource requirements
5. Resource calendars
6. Project scope statement
7. Risk register
8. Activity cost estimates
9. EEF
10. OPA

Tools & Techniques

1. Expert judgment
2. Analogous estimating
3. Parametric estimating
4. Three-point estimating
5. Group decision-making techniques
6. Reserve analysis

Outputs

1. Activity duration estimates
2. Project documents updates

Provides the amount of time each activity will take to complete, which is a major input into the Develop Schedule process

Estimate Activity Duration

(Input)

Resource Calendars

Used to reflect specific working hours, vacations, leaves of absence, and planned personal time for individual resources.

Can be used for human resources as well as equipment.

Estimate Activity Duration

(Tool & Technique)

Alternative Analysis

Methods or ways of accomplishing the activities resources have been assigned.

Many times, you can accomplish an activity in more than one way, and alternatives analysis helps decide among the possibilities.

Tools & Techniques

- Analogous Estimating – expert judgment with historical information. Top-down.
- Parametric Estimating – uses a statistical relationship between historical data and other variables. A resource will take 20hrs per module and hence 1000 modules will take 50hrs (50X20 = 1000hrs)
- **Program Evaluation and Review Technique (PERT)** – uses three estimates per activity - optimistic, pessimistic and most likely. **$(P + 4M + O)/6$**

Develop Schedule

Analyzing activity sequences, durations, resource requirements, and schedule constraints to create the project schedule model.

Inputs

1. Schedule management plan
2. Activity list
3. Activity attributes
4. Project schedule network diagrams
5. Activity resource requirements
6. Resource calendars
7. Activity duration estimates
8. Project scope statement
9. Risk register
10. Project staff assignments
11. RBS
12. EEF
13. OPA

Tools & Techniques

1. Schedule network analysis
2. Critical path method
3. Critical chain method
4. Resource optimization techniques
5. Modelling techniques
6. Leads and lags
7. Schedule compression
8. Scheduling tool

Outputs

1. Schedule baseline
2. Project schedule
3. Schedule data
4. Project calendars
5. Project management plan updates
6. Project documents updates

Generates a schedule model with planned dates for completing project activities.

Develop Schedule (Tools & Techniques)

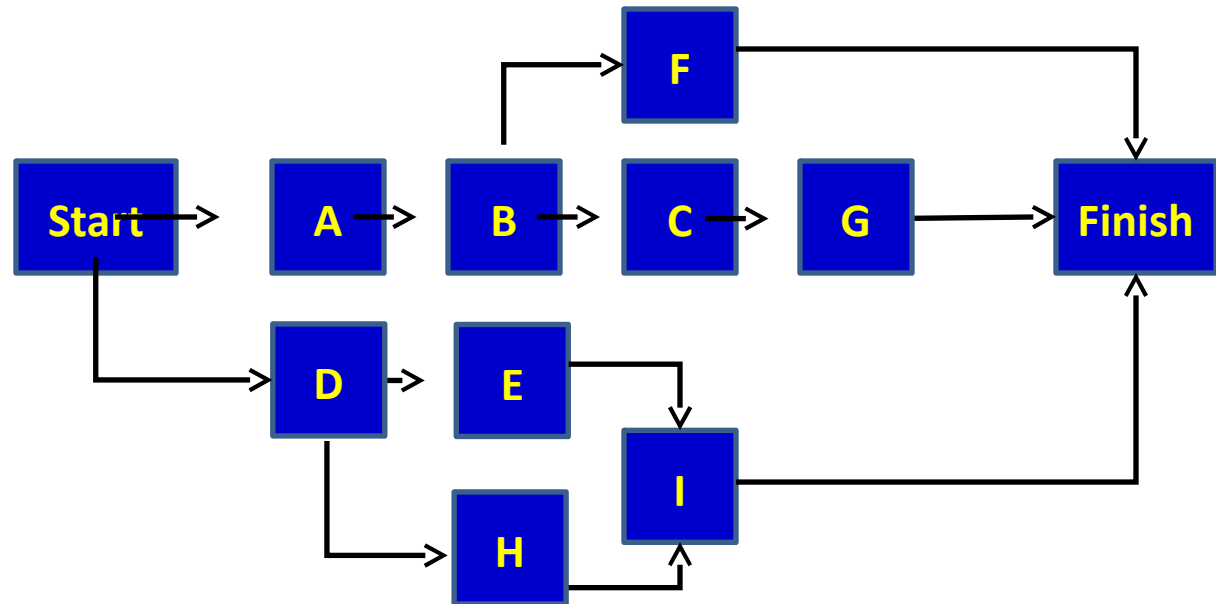
Critical path method (CPM)** is a schedule network analysis technique. It determines the amount of **float**, or schedule flexibility, for each of the network paths by calculating the ***earliest start date, earliest finish date, latest start date, and latest finish date for each activity.*

Slack or **float** is the amount of time an activity can be delayed without delaying a succeeding activity or the project finish date

Practice Exercise – Network Diagrams

Name Predecessor

Start	-
A	Start
B	A
C	B
D	Start
E	D
F	B
G	C
H	D
I	E,H
Finish	F,G,I



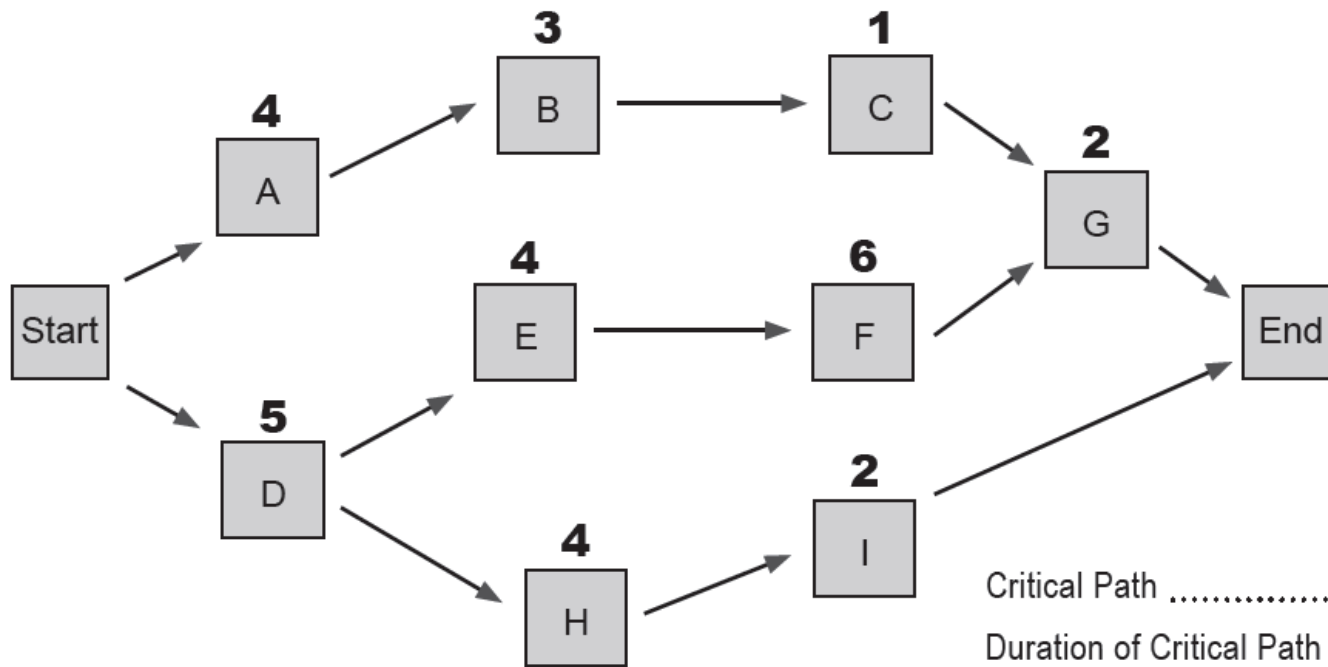
The **critical path** (CP) is generally the longest full path on the project. Any project activity with a float time that equals zero is considered a critical path task.

How to find the Critical Path

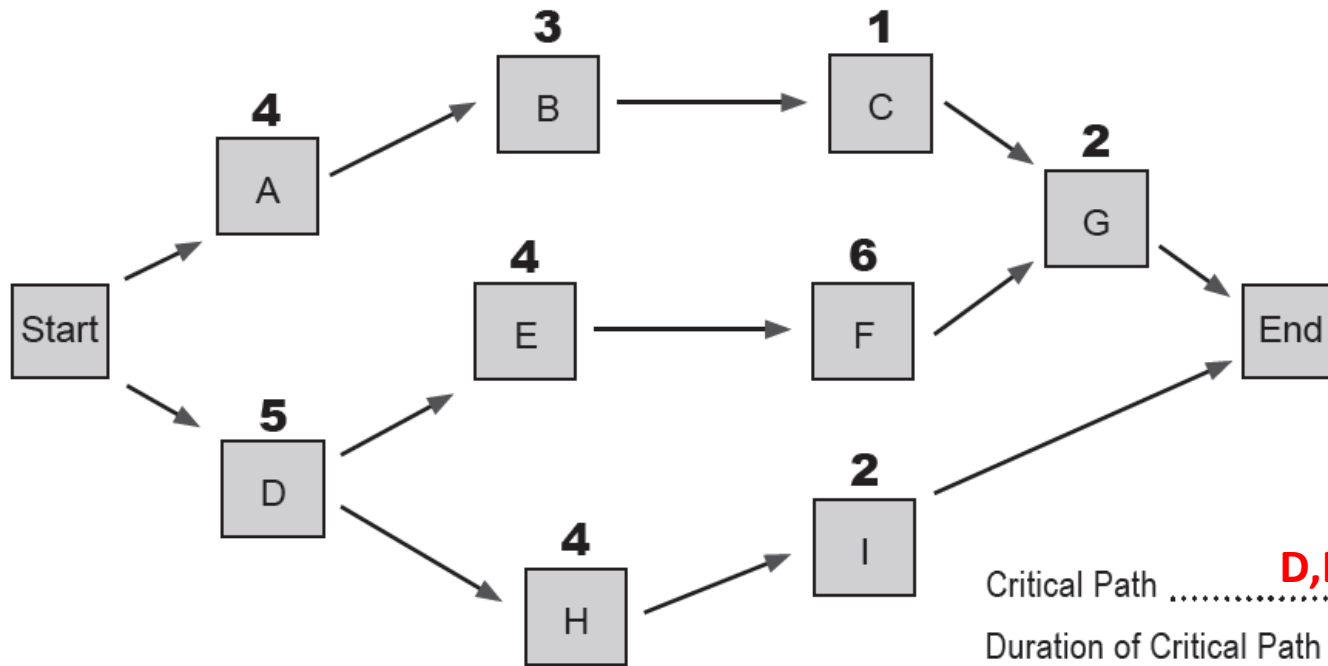
1. Start with an activity network diagram
2. Find all of the paths in the diagram. A path is any string of activities that goes from the start of the project to the end.
3. Find the duration of each path by adding up the durations of each of the activities on the path.

Critical Path

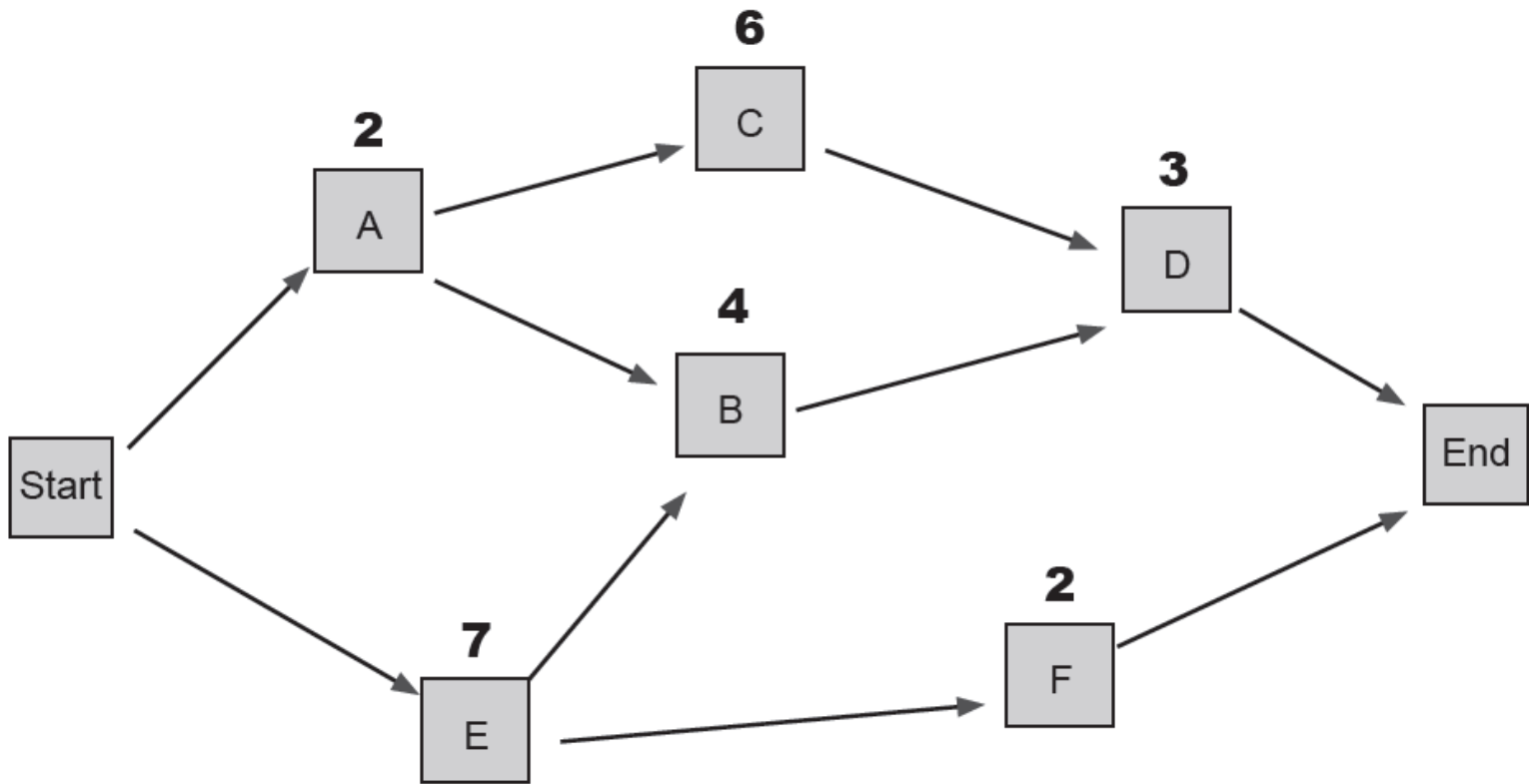
- Longest Path through Network
- Drives project completion date
- Least or Zero Float
- Delay on critical Path will delay completion of project



Critical Path
 Duration of Critical Path
 Total Number of Paths



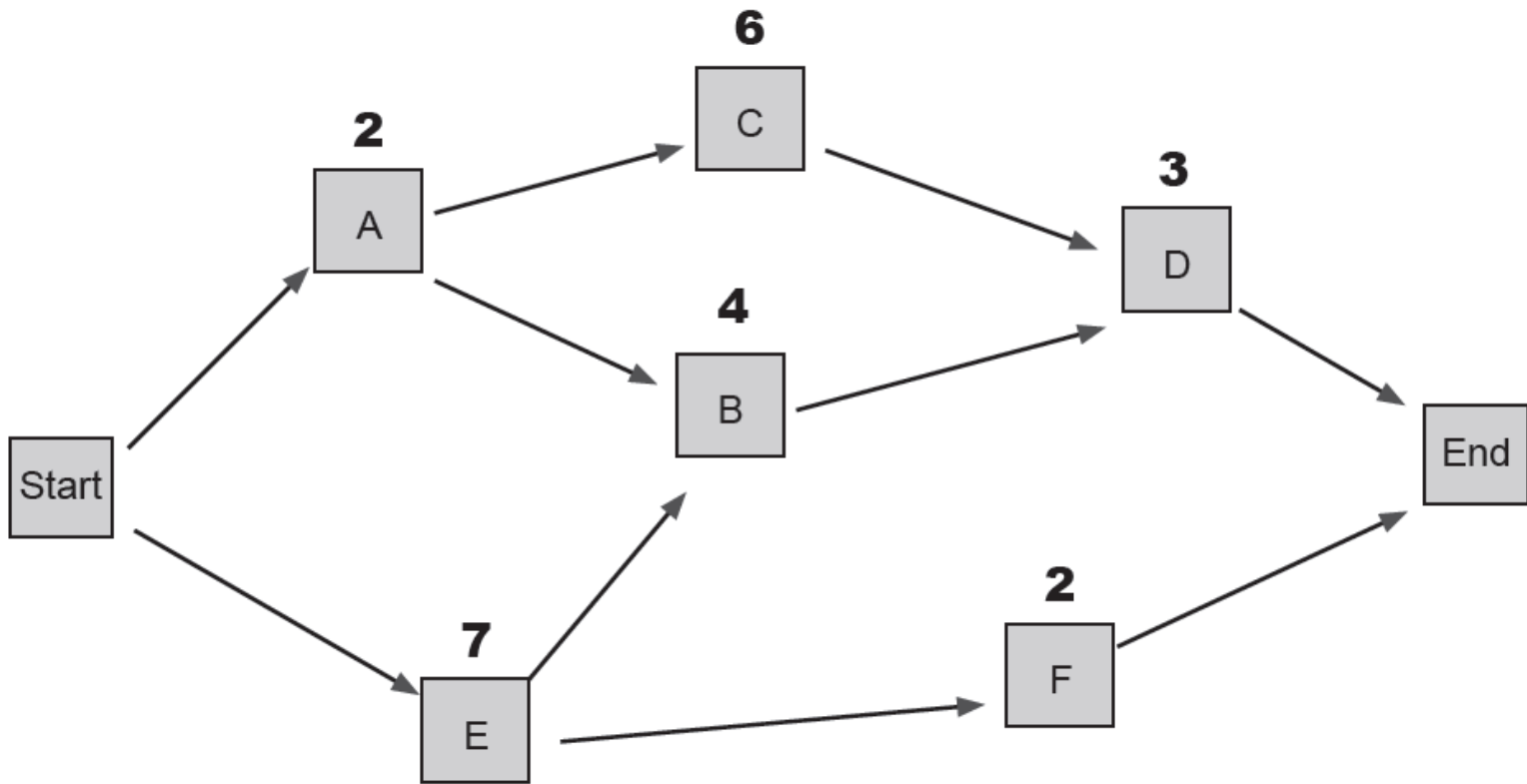
Critical Path **D,E,F,G**
 Duration of Critical Path **17**
 Total Number of Paths **3**



Critical Path

Duration of Critical Path

Total Number of Paths



Critical Path **E,B,D**

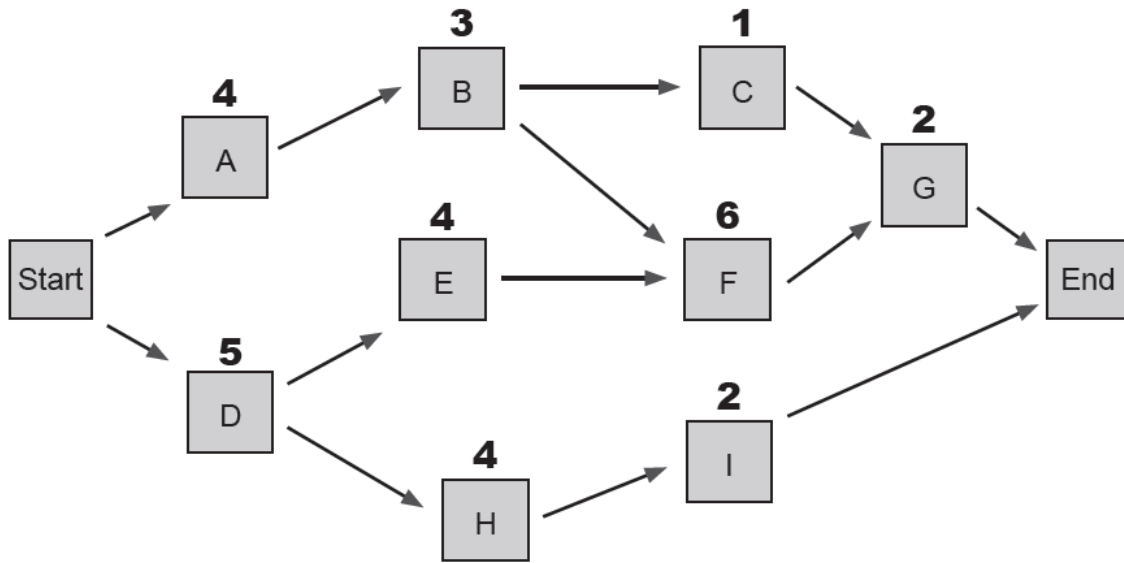
Duration of Critical Path **14**

Total Number of Paths **4**

Types of Floats (or Slack)

Float time is also called slack time and there are three types of float:

- **Total Float** – The amount of time an activity can be delayed without delaying the planned project end date or milestone.
- **Free Float** – The amount of time an activity can be delayed without delaying the early start date of successor activity or without delaying the early start of any immediately following activities.
- **Project Float** – The amount of time a project can be delayed without delaying an externally imposed project completion date (other than calculated by CPM) by customer.



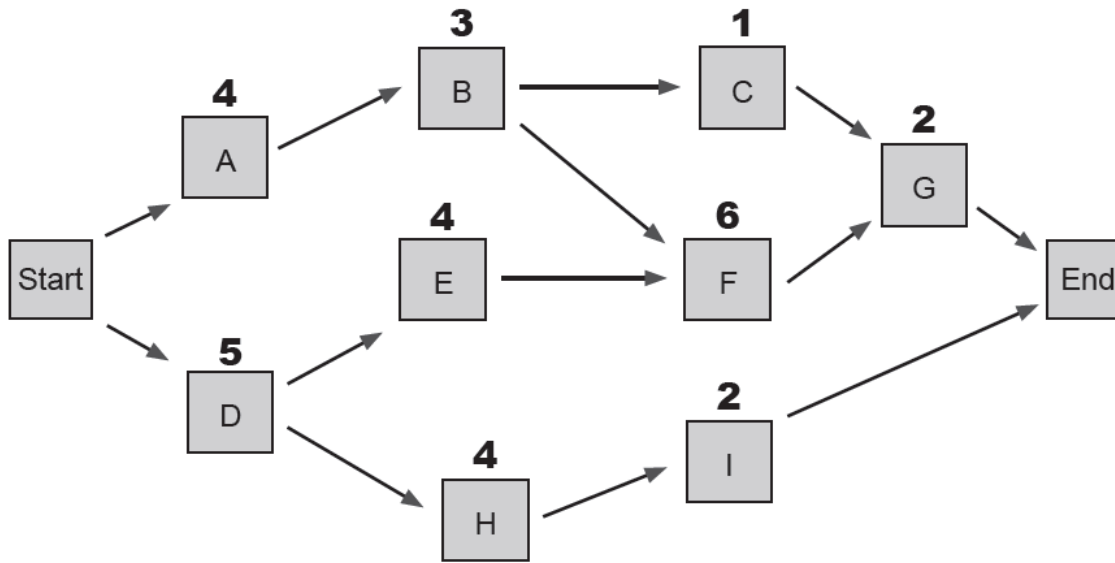
1. What is the float for each activity on the critical path?
2. What is the total duration for path A → B → C → G?
3. What is the total duration for path A → B → F → G?
4. What is the total duration for path D → E → F → G?
5. What is the total duration for path D → H → I?
6. Which path is the critical path? → → →

7. Write down the float for each activity:

A..... B..... C..... D..... E.....

F..... G..... H..... I.....

Hint: First fill in the float for the critical path activities. Then move on to the next-longest path, and then the next-longest one, filling in any float that hasn't been filled in yet.



1. What is the float for each activity on the critical path? **0**

2. What is the total duration for path A → B → C → G? **10**

3. What is the total duration for path A → B → F → G? **15**

4. What is the total duration for path D → E → F → G? **17**

5. What is the total duration for path D → H → I? **11**

6. Which path is the critical path? **D → E → F → G**

7. Write down the float for each activity:

A **2** B **2** C **7** D **0** E **0**

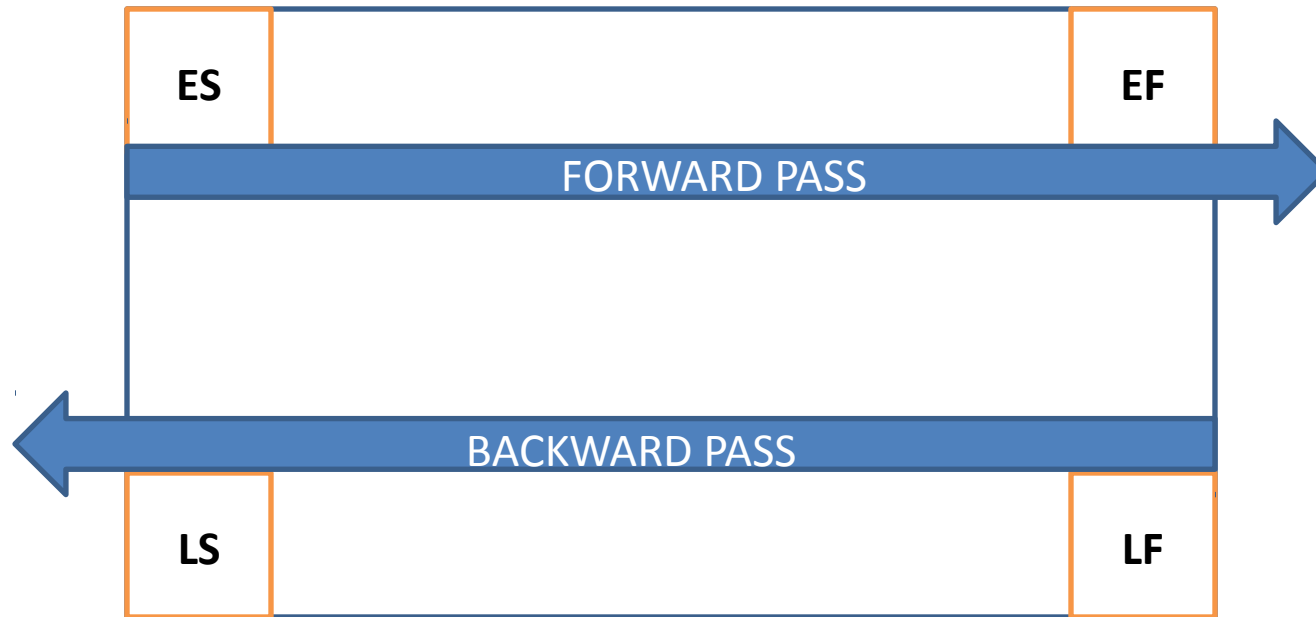
F **0** G **0** H **6** I **6**

Hint: First fill in the float for the critical path activities. Then move on to the next-longest path, and then the next-longest one, filling in any float that hasn't been filled in yet.

FORWARD & BACKWARD PASS



DURATION



Early & Late Schedule

- $EF = (ES + \text{Duration})$
- $LS = (LF - \text{Duration})$
- Window between ES & LF is the window for PM to schedule resource for work

Forward Pass

- **Calculates Earliest Times for each activity – Start & Finish**
- **Rules:**
- **ES for first Activity = 0**
- **EF for first Activity = Duration of act.**
- **ES of an activity = latest EF of its predecessors**
- **EF = ES + Duration**

Backward Pass

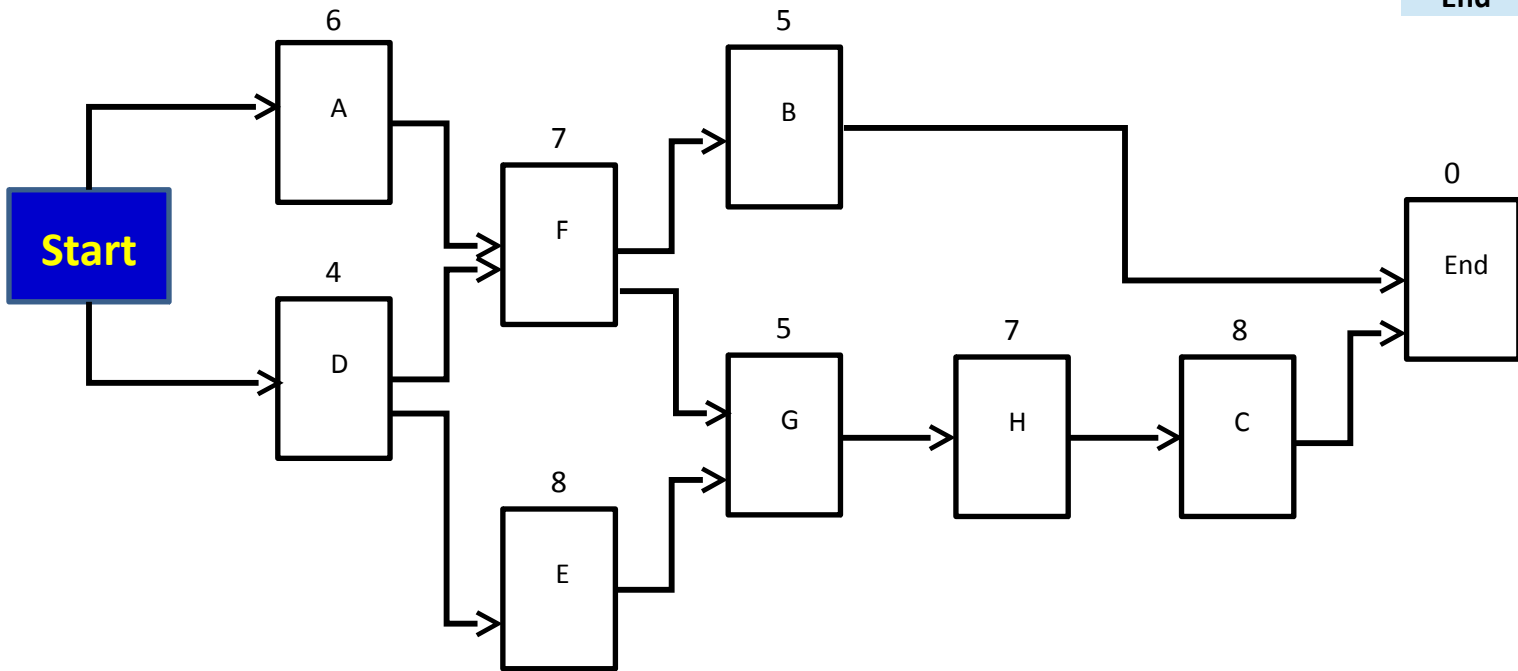
- **Calculates the LS and LF**
- **Determines the Critical Activities and Critical Path**
- **Set the latest allowable finish time for the last activity in network = to its EF or to the Constrained End Date**
- **Set the LF for all other activities = earliest LS time of its successors**
- **$LS = LF - \text{Duration}$**

Exercise

Activity	Preceding Activity	Estimate in days
Start		0
D	Start	4
A	Start	6
F	D,A	7
E	D	8
G	F,E	5
B	F	5
H	G	7
C	H	8
End	C,B	0

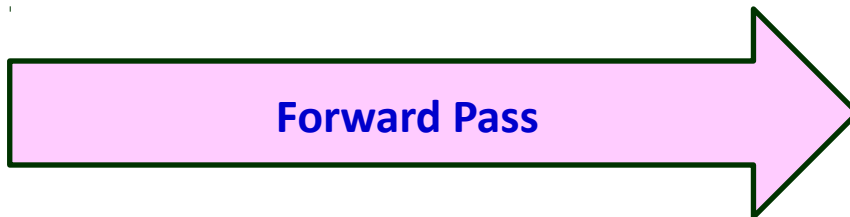
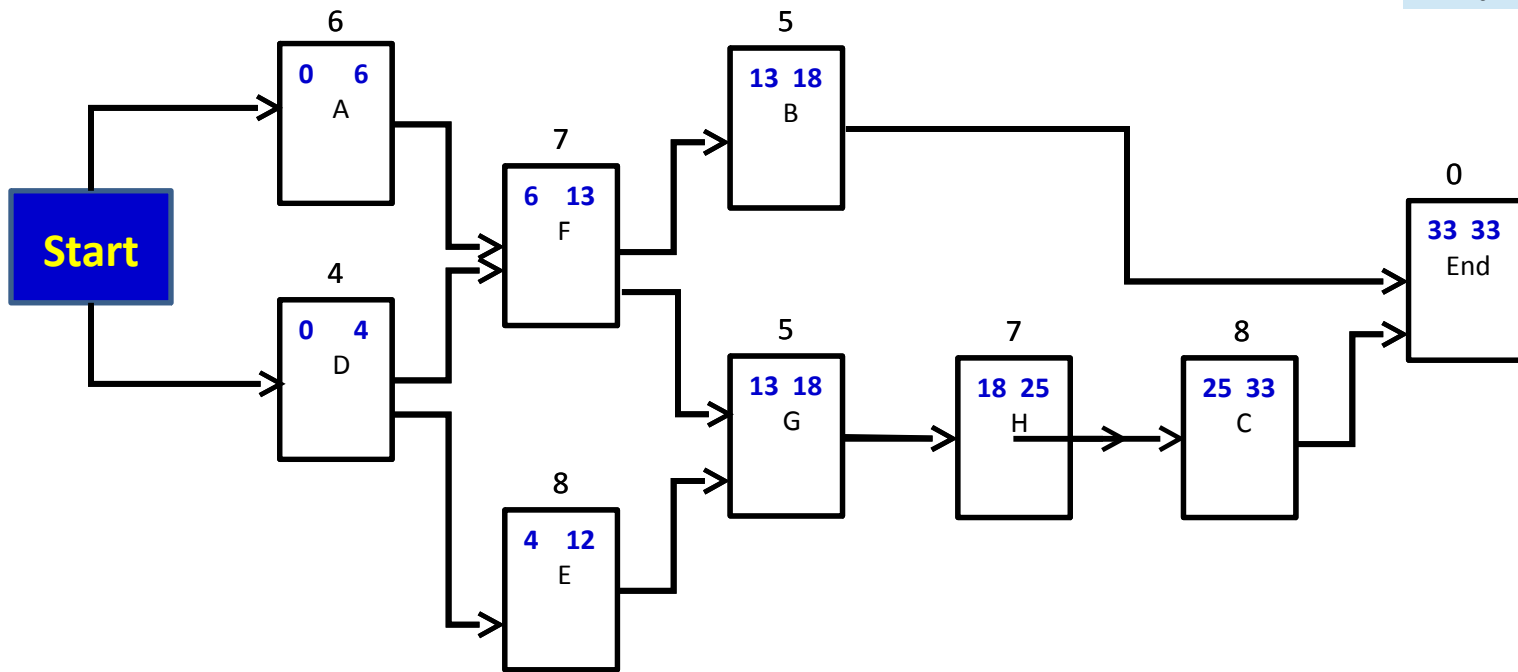
Network Diagram

Activity	Preceding Activity	Estimate in days
Start		0
D	Start	4
A	Start	6
F	D,A	7
E	D	8
G	F,E	5
B	F	5
H	G	7
C	H	8
End	C,B	0



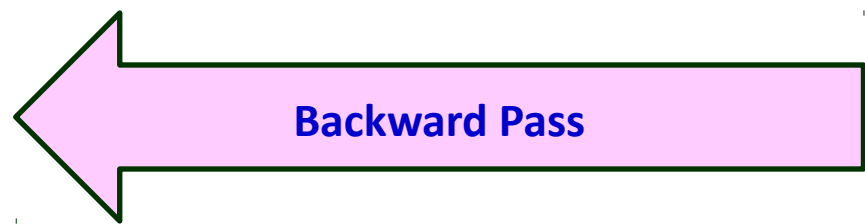
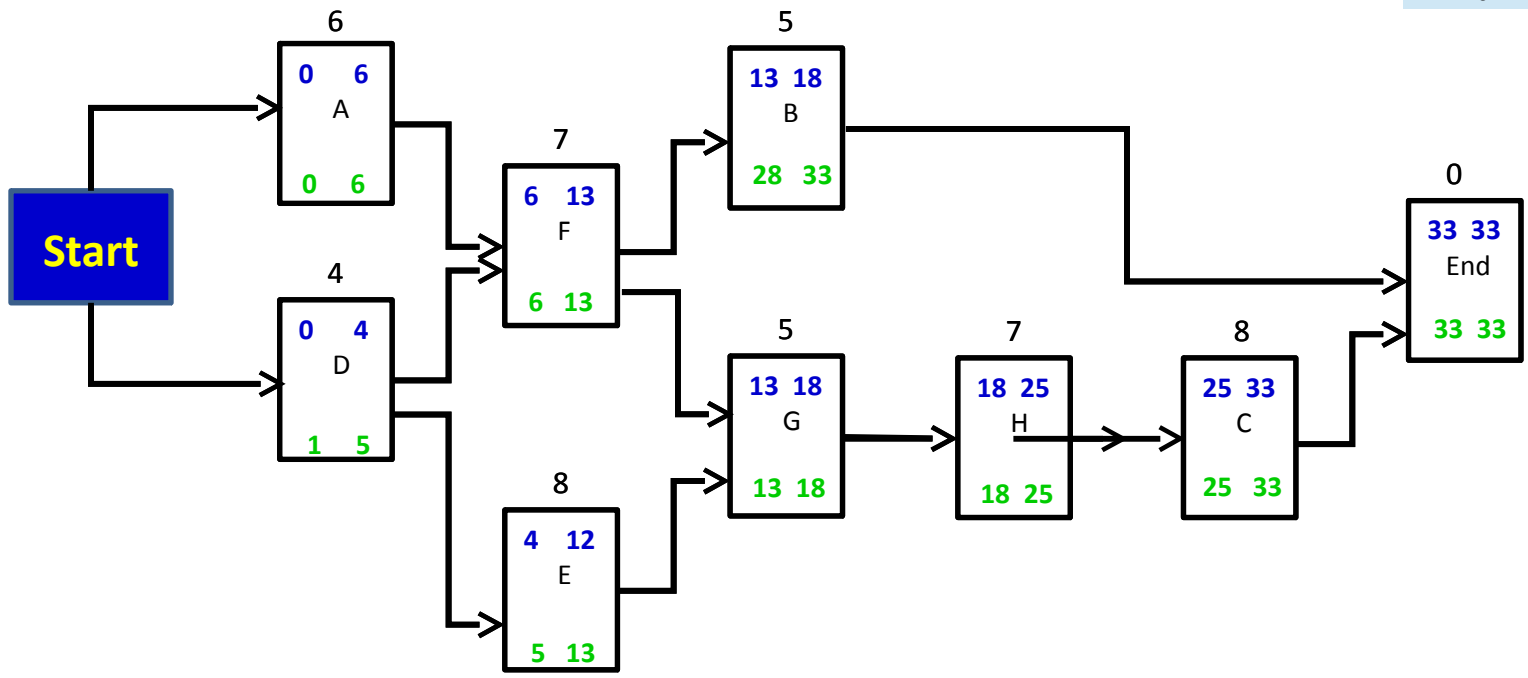
- Calculates Earliest Times for each activity - Start & Finish
- Rules:
 - ES for first Activity = 0
 - EF for first Activity = Duration of act.
 - ES of an activity = latest EF of its predecessors
 - EF = ES + Duration

Activity	Preceding Activity	Estimate in days
Start		0
D	Start	4
A	Start	6
F	D,A	7
E	D	8
G	F,E	5
B	F	5
H	G	7
C	H	8
End	C,B	0



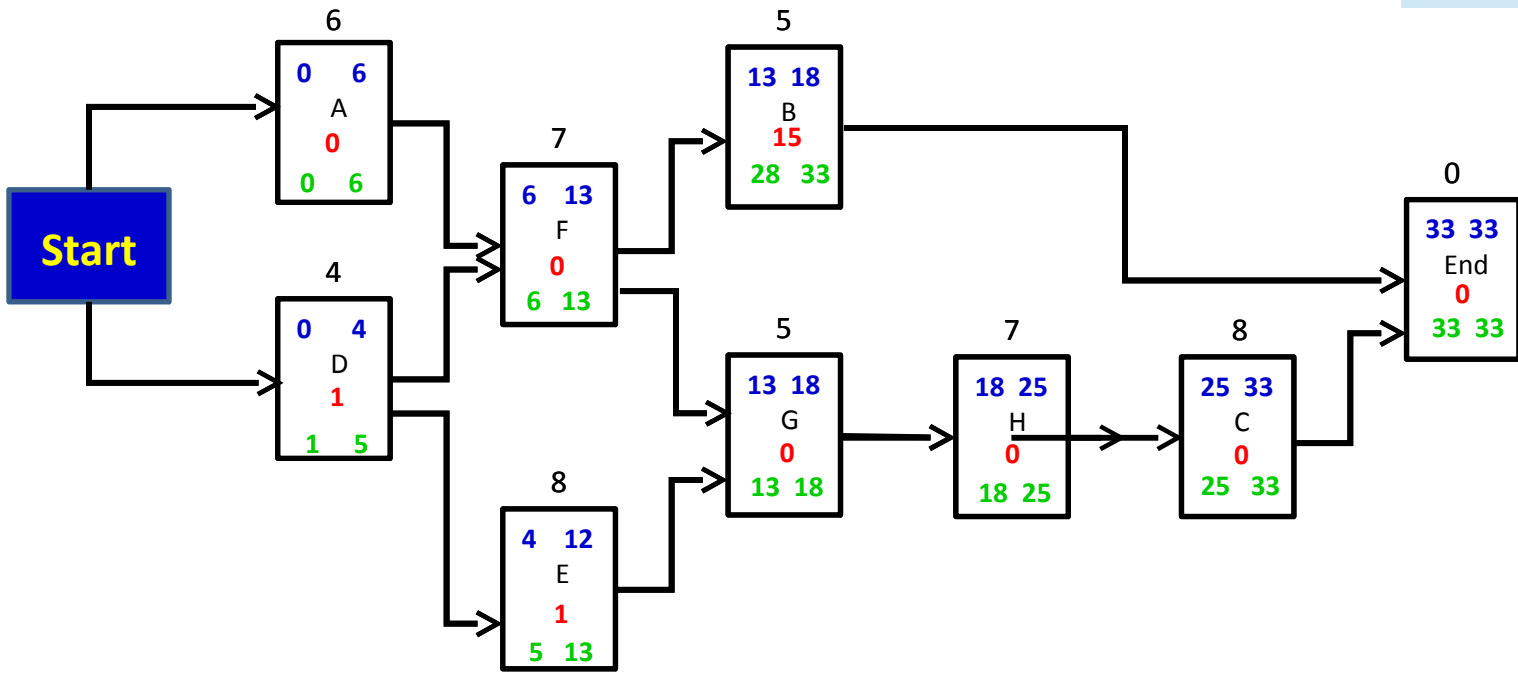
- Calculates the LS and LF
- Determines the Critical Activities and Critical Path
- Set the latest allowable finish time for the last activity in network = to its EF or to the Constrained End Date
- Set the LF for all other activities = earliest LS time of its successors
- $LS = LF - \text{Duration}$

Activity	Preceding Activity	Estimate in days
Start		0
D	Start	4
A	Start	6
F	D,A	7
E	D	8
G	F,E	5
B	F	5
H	G	7
C	H	8
End	C,B	0



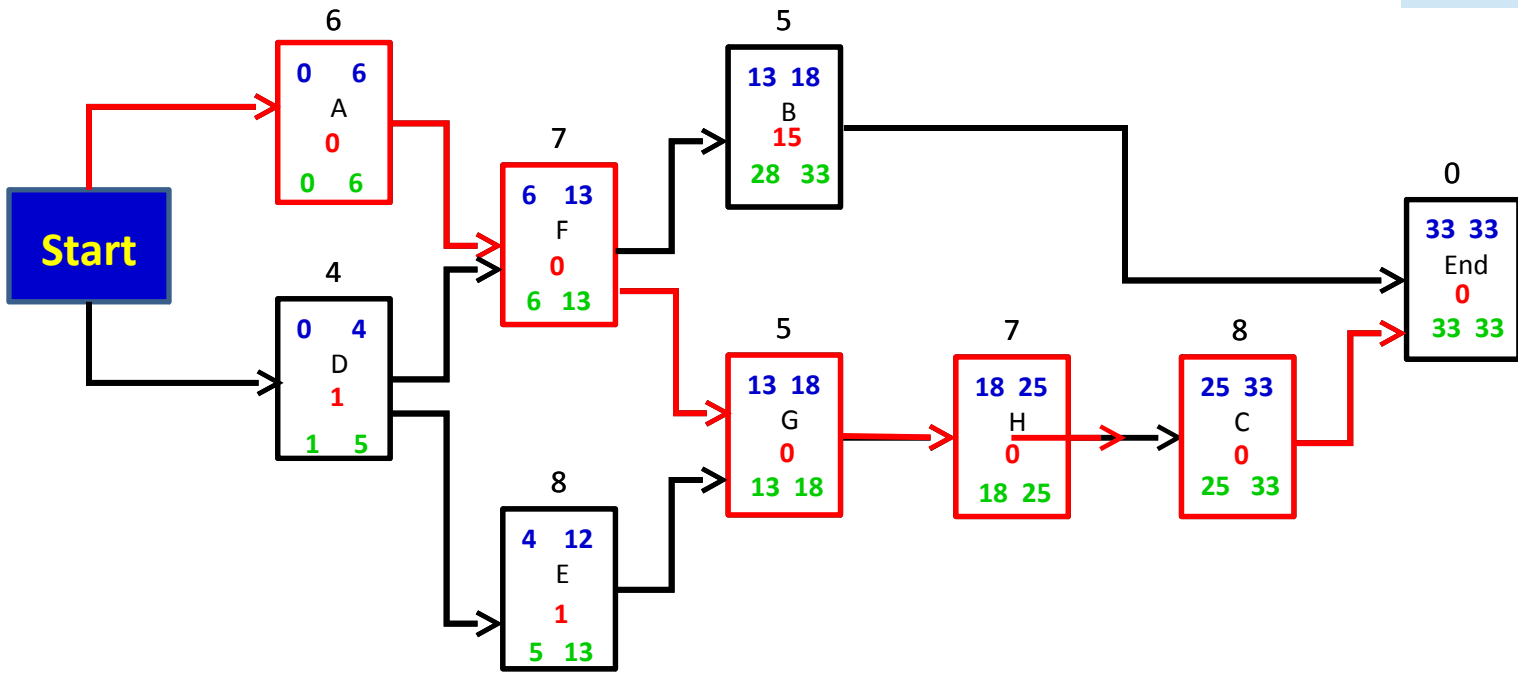
**Float = LF – EF or
LS - ES**

Activity	Preceding Activity	Estimate in days
Start		0
D	Start	4
A	Start	6
F	D,A	7
E	D	8
G	F,E	5
B	F	5
H	G	7
C	H	8
End	C,B	0



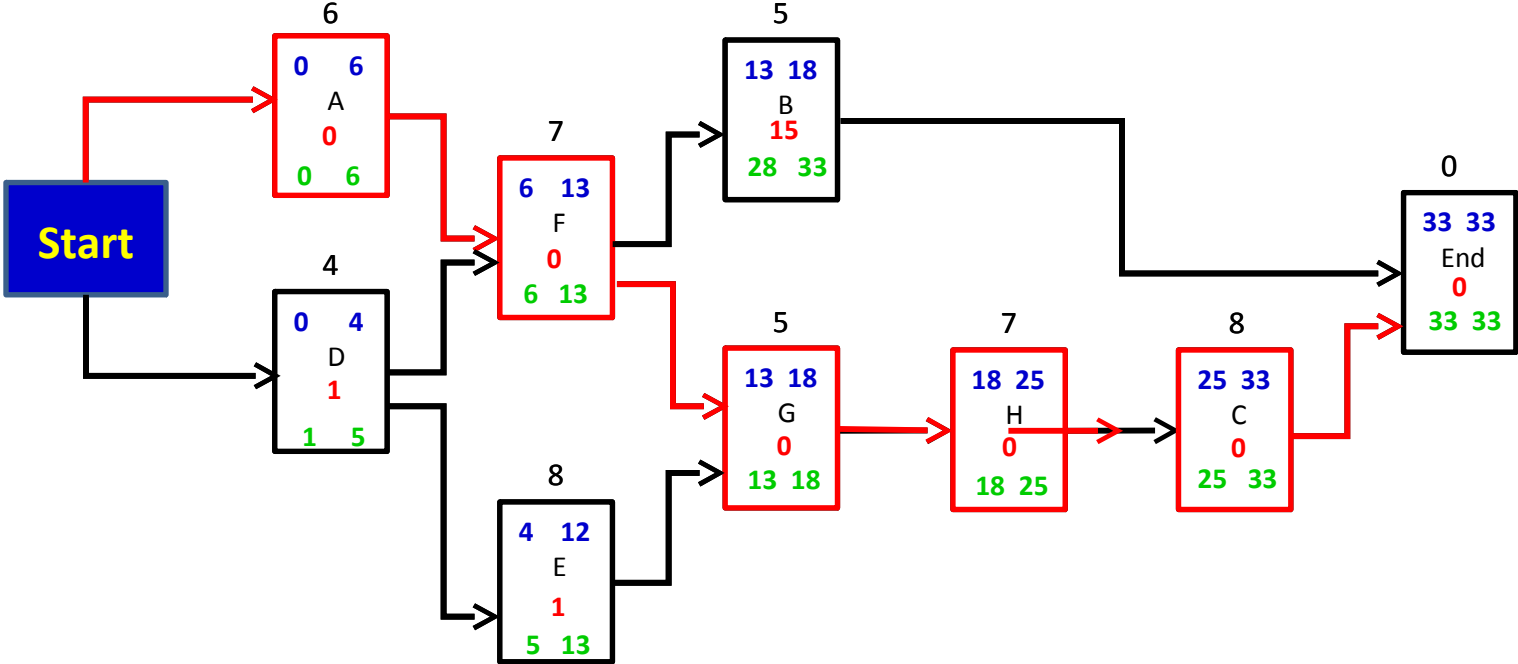
Critical Path

Activity	Preceding Activity	Estimate in days
Start		0
D	Start	4
A	Start	6
F	D,A	7
E	D	8
G	F,E	5
B	F	5
H	G	7
C	H	8
End	C,B	0



*Critical chain method is a schedule network analysis technique that will modify the project schedule by accounting for limited or restricted resources. After the project schedule network diagram is constructed using duration estimates, dependencies, and constraints, resource availability is entered into the scheduling tool. The modified schedule is calculated and you'll find that it often changes the critical path. The new critical path showing the resource restrictions is called the *critical chain*.*

Critical Chain



← 33 days →

Project Schedule (16.5 days)	Project Float (8 days)
------------------------------	------------------------

Schedule Control is concerned with:

1. Determining the current status of the project schedule
2. Influencing the factors that create schedule changes.
3. Determining that the project schedule has changed, and
4. Managing the actual changes as they occur.

Control Schedule

Monitoring the status of project activities to update project progress and manage changes to the schedule baseline to achieve the plan.

Inputs

1. Project management plan
2. Project schedule
3. Work performance data
4. Project calendars
5. Schedule data
6. OPA

Tools & Techniques

1. Performance reviews
2. Project management software
3. Resource optimization techniques
4. Modelling techniques
5. Leads and lags
6. Schedule compression
7. Scheduling tool

Outputs

1. Work performance information
2. Schedule forecasts
3. Change requests
4. Project management plan updates
5. Project documents updates
6. Organizational process assets updates

Provides the means to recognize deviation from the plan and take corrective and preventive actions and thus minimize risk.

PMBOK: Knowledge Areas

Chapter 7

PROJECT COST MANAGEMENT

Knowledge Area	Process Groups				
	Initiating	Planning	Executing	Monitor & Controlling	Closing
Integration	4.1 Develop Project Charter	4.2 Develop Project Management Plan	4.3 Direct and Manage Project Work	4.4 Monitor and Control Project Work 4.5 Perform Integrated Change Control	4.6 Close Project or Phase
Scope		5.1 Plan Scope Management 5.2 Collect Requirements 5.3 Define Scope 5.4 Create WBS		5.5 Validate Scope 5.6 Control Scope_	
Time		6.1 Plan Schedule Management 6.2 Define Activities 6.3 Sequence Activities 6.4 Estimate Activity Resources 6.5 Estimate Activity Durations 6.6 Develop Schedule		6.7 Control Schedule	
Cost		7.1 Plan Cost Management 7.2 Estimate Costs 7.3 Determine Budget		7.4 Control Costs	
Quality		8.1 Plan Quality Management	8.2 Perform Quality Assurance	8.3 Control Quality	
Human Resource		9.1 Plan Human Resource Management	9.2 Acquire Project Team 9.3 Develop Project Team 9.4 Manage Project Team		
Communications		10.1 Plan Communications Management	10.2 Manage Communications	10.3 Control Communications	
Risk		11.1 Plan Risk Management 11.2 Identify Risks 11.3 Perform Qualitative Risk Analysis 11.4 Perform Quantitative Risk Analysis 11.5 Plan Risk Responses		11.6 Control Risks	
Procurement		12.1 Plan Procurement Management	12.2 Conduct Procurements	12.3 Control Procurements	12.4 Close Procurements
Stakeholder	13.1 Identify Stakeholders	13.2 Plan Stakeholder Management	13.3 Manage Stakeholder Engagement	13.4 Control Stakeholder Engagement	

Project Cost Management

Involves

- **Estimating**
- **Budgeting**
- **Controlling**

...so that the project can be completed within the approved budget costs.

- Considers the stakeholder requirements for managing costs

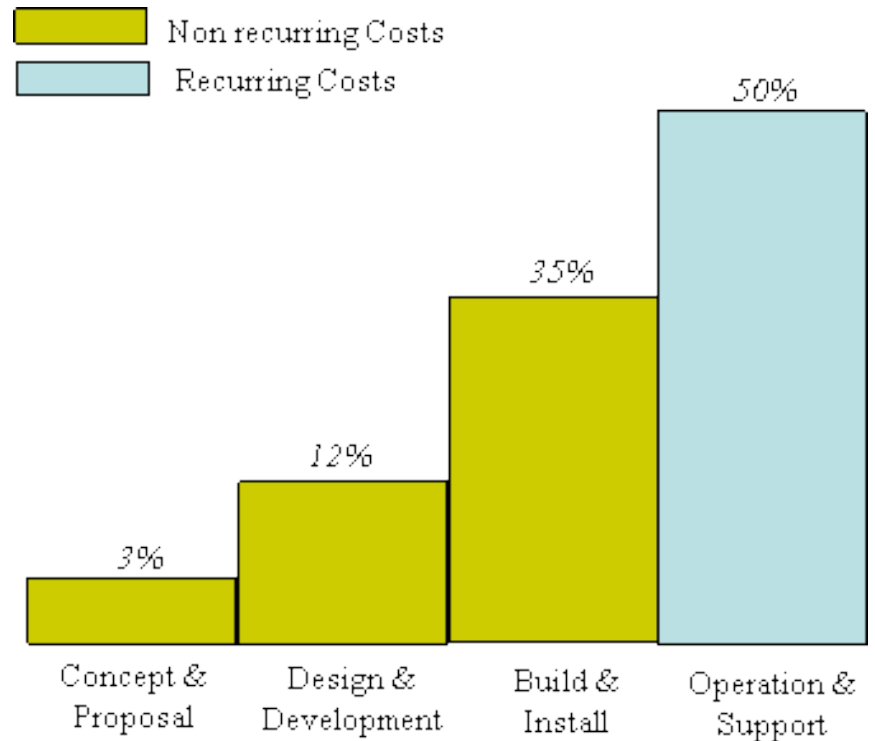
Project Cost Management

- **Plan Cost Management** – The Process that establishes the policies, procedures, and documentation for planning, managing, expending, and controlling project costs.
- **Estimate Costs** - The process of developing an approximation of the monetary resources needed to complete project activities.
- **Determine Budget** - The process of aggregating the estimated cost of individual activities or work packages to establish an authorized cost baseline.
- **Control Costs** - The process of monitoring the status of the project to update the project budget and manage changes to the cost baseline

Project Cost Management

Life cycle costing

Considering the effect of project decisions on the subsequent **recurring cost** of using, **maintaining**, and **supporting** the product, service or result of the project.



Project Cost Management Overview

Project Cost Management Overview

7.1 Plan Cost Management

- .1 Inputs
 - .1 Project management plan
 - .2 Project charter
 - .3 Enterprise environmental factors
 - .4 Organizational process assets
- .2 Tools & Techniques
 - .1 Expert judgment
 - .2 Analytical techniques
 - .3 Meetings
- .3 Outputs
 - .1 Cost management plan

7.4 Control Costs

- .1 Inputs
 - .1 Project management plan
 - .2 Project funding requirements
 - .3 Work performance data
 - .4 Organizational process assets
- .2 Tools & Techniques
 - .1 Earned value management
 - .2 Forecasting
 - .3 To-complete performance index (TCPI)
 - .4 Performance reviews
 - .5 Project management software
 - .6 Reserve analysis
- .3 Outputs
 - .1 Work performance information
 - .2 Cost forecasts
 - .3 Change requests
 - .4 Project management plan updates
 - .5 Project documents updates
 - .6 Organizational process assets updates

7.2 Estimate Costs

- .1 Inputs
 - .1 Cost management plan
 - .2 Human resource management plan
 - .3 Scope baseline
 - .4 Project schedule
 - .5 Risk register
 - .6 Enterprise environmental factors
 - .7 Organizational process assets
- .2 Tools & Techniques
 - .1 Expert judgment
 - .2 Analogous estimating
 - .3 Parametric estimating
 - .4 Bottom-up estimating
 - .5 Three-point estimating
 - .6 Reserve analysis
 - .7 Cost of quality
 - .8 Project management software
 - .9 Vendor bid analysis
 - .10 Group decision-making techniques
- .3 Outputs
 - .1 Activity cost estimates
 - .2 Basis of estimates
 - .3 Project documents updates

7.3 Determine Budget

- .1 Inputs
 - .1 Cost management plan
 - .2 Scope baseline
 - .3 Activity cost estimates
 - .4 Basis of estimates
 - .5 Project schedule
 - .6 Resource calendars
 - .7 Risk register
 - .8 Agreements
 - .9 Organizational process assets
- .2 Tools & Techniques
 - .1 Cost aggregation
 - .2 Reserve analysis
 - .3 Expert judgment
 - .4 Historical relationships
 - .5 Funding limit reconciliation
- .3 Outputs
 - .1 Cost baseline
 - .2 Project funding requirements
 - .3 Project documents updates

Plan Cost Management

Establishing the policies, procedures, and documentation for planning, developing, managing, executing, and controlling the project costs.

Inputs

1. Project management plan
2. Project charter
3. Enterprise environmental factors
4. Organizational process assets

Tools & Techniques

1. Expert judgement
2. Analytical techniques
3. Meetings

Outputs

1. Cost management plan

Provides guidance and direction on how the project costs will be managed throughout the project.

Plan Cost Management – Inputs

- **Project Management Plan**
 - Scope Baseline
 - Schedule Baseline
 - Other Information

Plan Cost Management – Outputs

- **Cost Management Plan**
 - Units of measure
 - Level of precision
 - Level of accuracy
 - Organizational procedures links
 - Control thresholds
 - Rules of performance measurement
 - Reporting formats
 - Process descriptions
 - Additional details

Estimate Cost

Developing an approximation of the monetary resources needed to complete project activities.

Inputs

1. Cost management plan
2. Human resource management plan
3. Scope baseline
4. Project schedule
5. Risk register
6. EEF
7. OPA

Tools & Techniques

1. Expert judgement
2. Analogous estimating
3. Parametric estimating
4. Bottom-up estimating
5. Three-point estimating
6. Reserve analysis
7. Cost of quality
8. Project management software
9. Vendor bid analysis
10. Group decision-making techniques

Outputs

1. Activity cost estimates
2. Basis of estimates
3. Project documents updates

Determines the amount of cost required to complete project work.

Estimate Cost

- Cost estimates are a predictions
- Cost estimates are generally expressed in units of some currency
- Cost estimates should be reviewed and refined

Estimate Costs – Inputs

- **Scope Baseline**
 - Project scope statement
 - Work breakdown structure
 - WBS dictionary
- **Risk Register**
 - Should be reviewed to consider risk response costs
- **Enterprise Environmental Factors**
 - Market conditions
 - Published commercial information

Estimate Costs – T&T

- **Bottom-up Estimating.** Cost estimation starts from bottom level.
- **Analogous Estimating.** It is also known as top-down estimating.
- **Parametric Estimating.** Uses statistical relationship between historical data and other variables.
- **Three Point (PERT) Estimating**
 - Most likely
 - Optimistic
 - Pessimistic
 - Triangular Distribution
 - Beta Distribution

Estimate Costs – T&T

- **Reserve Analysis.** Reserves are added to costing to manage risks, cost overruns and errors associated with costing.
- **Cost of Quality (COQ).** Assumptions about cost of quality may be used to prepare the activity cost estimates.
- **Project Management Estimating Software.** Tools can include project management software, spreadsheet programs, and simulations.
- **Vendor Bid Analysis.** Vendors' bids are analyzed to help determine project cost of deliverables, etc.

Estimate Costs – Outputs

- **Activity Cost Estimates**
- **Basis of Estimates**

Determine Budget

Aggregating the estimated costs of individual activities or work packages to establish an authorized cost baseline.

Inputs

1. Cost management plan
2. Scope baseline
3. Activity cost estimates
4. Basis of estimates
5. Project schedule
6. Resource calendars
7. Risk register
8. Agreements
9. OPA

Tools & Techniques

1. Cost aggregation
2. Reserve analysis
3. Expert judgment
4. Historical relationships
5. Funding limit reconciliation

Outputs

1. Cost baseline
2. Project funding requirements
3. Project documents updates

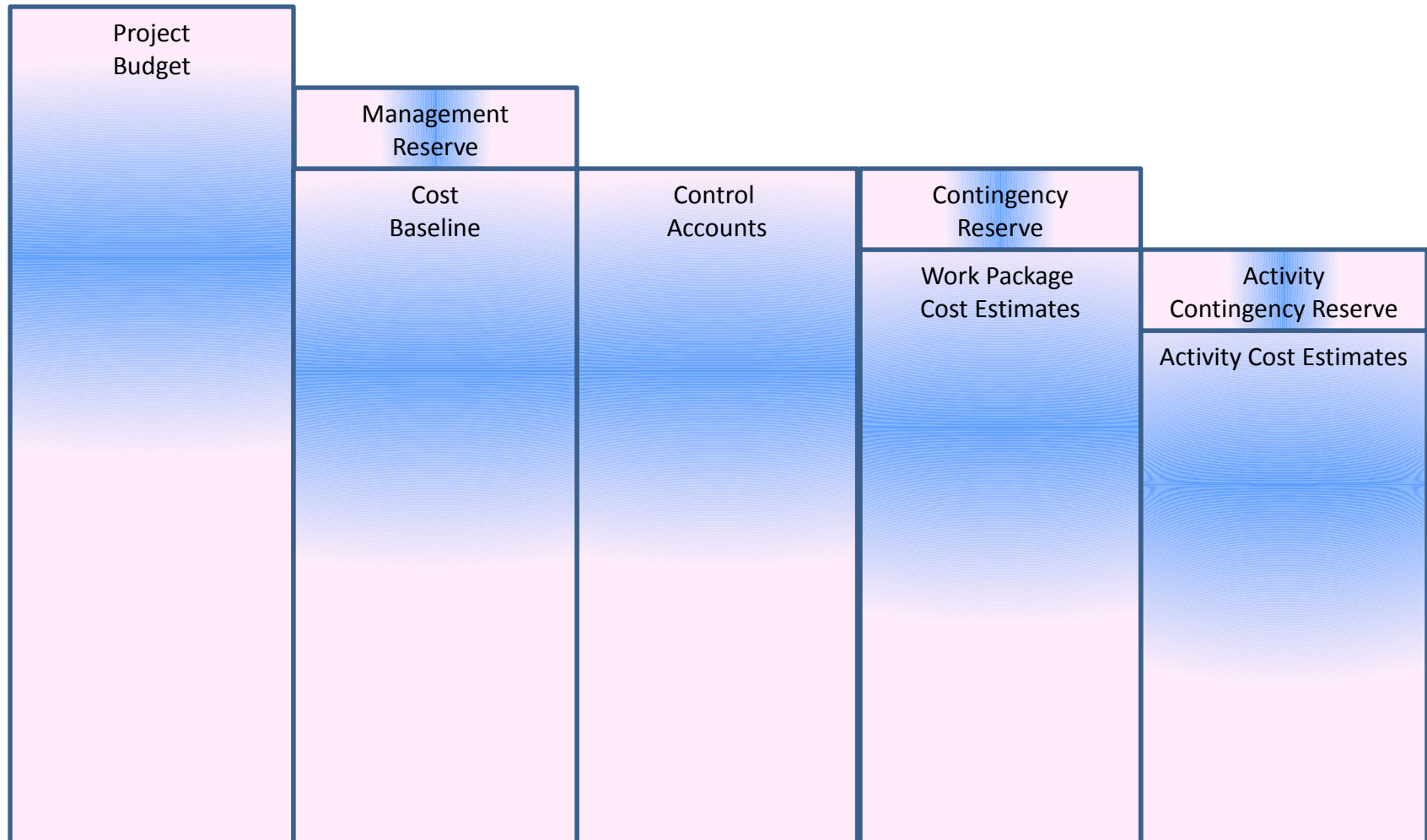
Determines the cost baseline against which project performance can be monitored and controlled.

Determine Budget – **Inputs**

- **Cost Management Plan**
- **Scope Baseline**
 - Project scope statement
 - Work breakdown structure
 - WBS dictionary

Determine Budget – T&T

- **Cost Aggregation**



- **Cost Aggregation**

Activity costs are rolled up to **work package costs**.
Work package costs are rolled up to **control account costs** and finally into **project costs**.



Determine Budget – T&T

- **Reserve Analysis:** **Reserves** are dollars included in a cost estimate to mitigate cost risk by allowing for future situations that are difficult to predict.
 - **Contingency reserves** allow for future situations that may be partially planned for. (sometimes called **known unknowns**) and are included in the project cost baseline. Project manager will normally have the authority to utilize contingency reserves.
 - **Management reserve** - Budget set aside to cover unforeseen risks or changes (**unknown unknowns**) to the project. Management reserves are not part of earned value calculations (since it is not part of cost baseline & measurements are based on baselines)

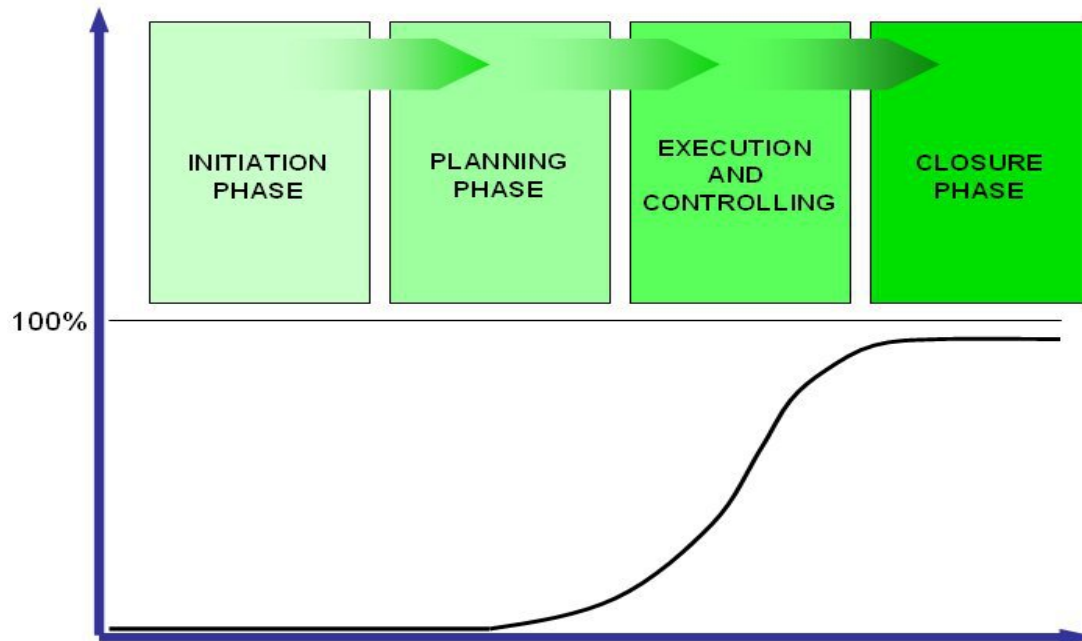
Determine Budget – T&T

- **Expert Judgment**
- **Historical Relationships**
- **Funding Limit Reconciliation**
 - Funding limit reconciliation involves reconciling the amount of funds to be spent with the amount of funds budgeted for the project.
 - The organization or the customer sets these limits.

Plan Cost Management – Outputs

- **Cost Baseline**

- The approved version of the time-phased project budget
- Excludes any management reserves
- Can only be changed through formal change control procedures



Plan Cost Management – Outputs

- **Project Funding Requirements**
 - Refers to the entire estimated cost of the budget, including any contingency or management reserves
- **Project Documents Updates**
 - Risk register
 - Activity cost estimates
 - Project schedule

Control Cost

Monitoring the status of the project to update the project costs and managing changes to the cost baseline.

Inputs

1. Project management plan
2. Project funding requirements
3. Work performance data
4. OPA

Tools & Techniques

1. Earned value management
2. Forecasting
3. To-complete performance index (TCPI)
4. Performance reviews
5. Project management software
6. Reserve analysis

Outputs

1. Work performance information
2. Cost forecasts
3. Change requests
4. Project management plan updates
5. Project documents updates
6. OPA updates

Provides the means to recognize variance from the plan in order to take corrective action and minimize risk.

Control Costs – Inputs

- **Cost Baseline**
- **Cost Management Plan**

Control Cost – T&T

- **Earned Value Management**

- Measuring the project progress compared to the plan using the earned value formulas
- A methodology
- Combines scope, schedule, and resource measurements
- Assess project performance and progress
- Planned value
- Earned value
- Actual cost
- Schedule variance
- Cost variance
- Schedule performance index
- Cost performance index

Control Cost – T&T

Earned Value Management

- Earned Value Management is carried out using the three main inputs:
 - Planned Value (**PV**)
 - Earned Value (**EV**)
 - Actual Cost (**AC**)

Earned Value (EV)

- Estimated (not actual) value of work actually completed in monetary terms.
- Work package **WP2** has 4 stages and each stage will take one week to complete with \$500 estimated cost per stage. End of 2nd week 3 stages were completed what is the **PV** and **EV**.
- **PV** on 2nd Week = Total value of planned work to be completed on second week in monetary terms ($500 \times 2 = 1000$).
- **EV** on 2nd week = Estimated value of work (actually) completed ($500 \times 3 = 1500$).

Planned Value (PV)

Authorized budget assigned to the work to be accomplished on a particular day.

It means, value of planned work to be done as of today.

Work package **WP1** has 4 stages and each stage will take one week to complete with \$500 estimated cost per stage.

What is the PV on 3rd week?

= Total value of planned work to be completed on third week in monetary terms ($500 \times 3 = 1500$).

Total Planned Value for project will be approved total budget (Remember –Management reserve is not part of EVM) and is known as Budget at Completion (**BAC**).

Actual Cost (AC)

- **Actual cost spent to complete the work completed.**
- Work package **WP3** has 4 stages and each stage will take one week to complete with \$500 estimated cost per stage. End of 2nd week 3 stages were completed and contractor has spend \$1700. What is the **PV, EV & AC**
- **PV** on 2nd Week = Total value of planned work to be completed on second week in monetary terms ($500 \times 2 = 1000$)
- **EV** on 2nd week = **Estimated value of work completed ($500 \times 3 = 1500$)**
- **AC** on 2nd Week = **Actual cost spend of work already completed (1700)**

Control Cost – T&T

- **Forecasting**

- **EAC** forecast for **ETC** work performed at the budgeted rate
- **EAC** forecast for **ETC** work performed at the present **CPI**
- **EAC** forecast for **ETC** work considering both **SPI** and **CPI** factors

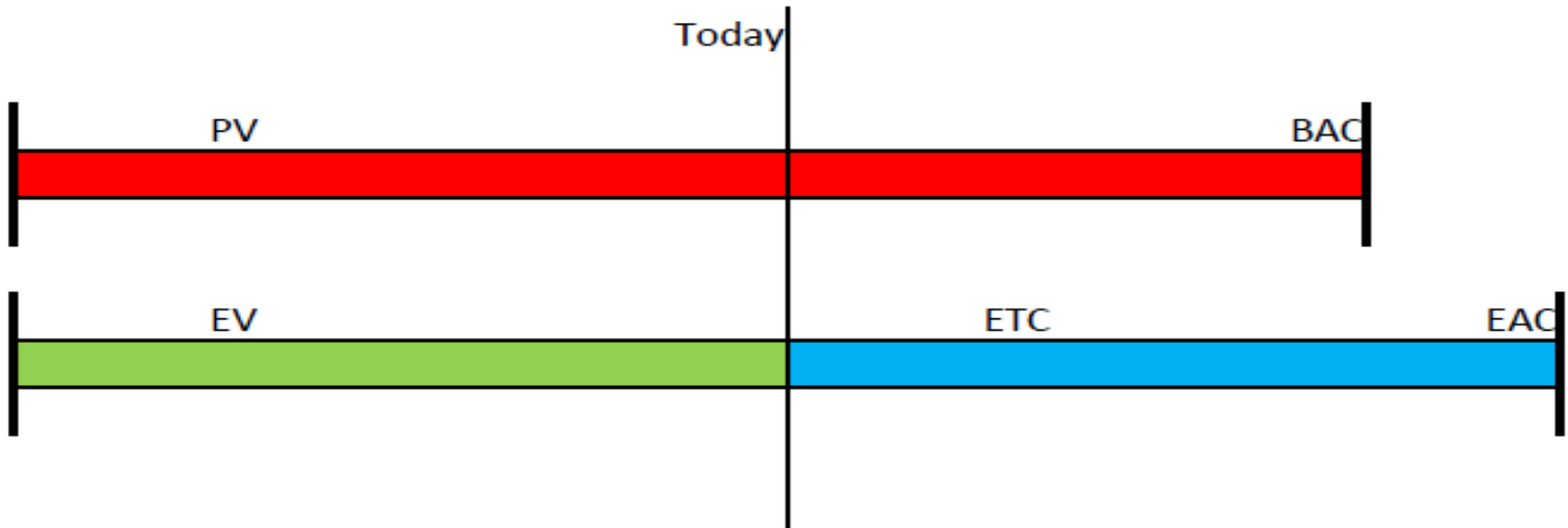
Control Cost – T&T

Forecasting – Calculating EAC

- There are many ways to calculate EAC, depending on the assumptions made.
- Simple EAC calculation (**$EAC = BAC / CPI$**) assume that the cumulative CPI adequately reflects past performance that will continue to the end of the project.
- **$AC + (BAC - EV)$**
 - used when current variances are thought to be atypical of the future.
- **$AC + \text{Bottom-up ETC}$**
 - used when the original estimate was fundamentally flawed. New baseline.
- **$AC + (BAC - EV) / (CPI * SPI)$**
 - it assumes poor cost performance and *need to hit a firm completion date.*

Control Cost – T&T

- **Forecasting**
- Using the earned value analysis, team can now forecast the project performance.
- Estimate at completion (**EAC**) may now differ from Budget at Completion (**BAC**)



Control Cost – T&T

- **To-Complete Performance Index (TCPI)**
- **Performance Reviews**
 - Variance analysis
 - Trend analysis
 - Earned value performance

Earned Value Terms

Acronym	Term	Definition
PV	Planned Value	As of today, what is the estimated value of the work planned to be done?
EV	Earned Value	As of today, what is the estimated value of the work actually accomplished?
AC	Actual Cost (total cost)	As of today, what is the actual cost incurred for the work accomplished?
BAC	Budget at Completion (the budget)	How much did we BUDGET for the TOTAL project effort?
EAC	Estimate at Completion	What do we currently expect the TOTAL project to cost (a forecast)?
ETC	Estimate to Completion	From this point on, how much MORE do we expect it to cost to finish the project (a forecast)?
VAC	Variance at Completion	As of today, how much over or under budget do we expect to be at the end of the project?

Name	Formula	What it says	Why you use it
BAC—Budget at Completion	No formula – it's the project budget	How much money you'll spend on the project	To tell the sponsor the total amount of value that he's getting for the project
PV—Planned Value	$PV = BAC \times \frac{\text{Planned \% Complete}}{\text{Complete}}$	What your schedule says you should have spent	To figure out what value your plan says you should have delivered so far
EV—Earned Value	$EV = BAC \times \frac{\text{Actual \% Complete}}{\text{Complete}}$	How much of the project's value you've really earned	EV lets you translate how much work the team's finished into a dollar value
AC—Actual Cost	What you've actually spent on the project	How much you've actually spent so far	The amount of money you spend doesn't always match the value you get!
SPI—Schedule Performance Index	$SPI = \frac{EV}{PV}$	Whether you're behind or ahead of schedule	To figure out whether you've delivered the value your schedule said you would
SV—Schedule Variance	$SV = EV - PV$	How much ahead or behind schedule you are	This puts a dollar value on exactly how far ahead or behind schedule you are
CPI—Cost Performance Index	$CPI = \frac{EV}{AC}$	Whether you're within your budget or not	Your sponsor is always most interested in the bottom line!
TCPI—To-Complete Performance Index	$TCPI = \frac{BAC - EV}{BAC - AC}$	How well your project must perform to stay on budget.	This will let you forecast whether or not you can stick to your budget.
CV—Cost Variance	$CV = EV - AC$	How much above or below your budget you are	Your sponsor needs to know how much it costs to get him the value you deliver

Earned Value Management (EVM)

- Earned Value – Planned Value = Schedule Variance (SV)
- $EV - PV = SV$ When SV is positive (Good) when negative (Bad)

- Earned Value – Actual Costs = Cost Variance (CV)
- $EV - AC = CV$ When CV is positive (Good) when negative (Bad)

Earned Value Management (EVM)

- Earned Value divided by Planned Value – Schedule Performance Index
- $EV / PV = SPI$ When $SPI > 1$ (Good) when $SPI < 1$ (Bad)
- Earned Value divided by Actual Costs = Cost Performance Index
- $EV / AC = CPI$ when $CPI > 1$ (Good) when $CPI < 1$ (Bad)
- Cumulative CPI – widely used to forecast project costs at completion.
- Equals the sum of the periodic Earned Values divided by the sum of the individual Actual Costs.

Exercise

- You have a project to build a new fence. The fence is four sided. Each side is to take one day to build and is budgeted for \$1,000 per side. The sides are planned to be completed one after the other. Today is the end of day three.
- Using the following project status chart, calculate PV, EV, etc.

Activity	Day 1	Day 2	Day 3	Day 4	Status End of Day 3
Side 1	S-----F				Complete, spent \$1,000
Side 2		S-----PF	----F		Complete, spent \$1,200
Side 3			PS---S---PF		50% done, spent \$600
Side 4				PS-----PF	Not yet started

Key: S = Actual Start, F = Actual Finish, PS = Planned Start, and PF = Planned Finish

Exercise

- PV
- EV
- AC
- BAC
- CV
- CPI
- SV
- SPI
- EAC
- ETC
- VAC

Control Cost – T&T

- **To-Complete Performance Index(TCPI)**

Helps to determine the efficiency that must be achieved on the remaining work for a project to meet a specified endpoint, such as BAC or the team's revised EAC.

- **TCPI** =
$$\frac{\text{Work Remaining (BAC - EV)}}{\text{Funds Remaining (BAC - AC) or EAC - AC}}$$

Control Costs – Outputs

- **Project Management Plan Updates**
 - Cost Baseline
 - Cost Management Plan

PMBOK: Knowledge Areas

END OF

Chapter 7
PROJECT COST
MANAGEMENT

PMBOK: Knowledge Areas



Chapter 8

PROJECT QUALITY

MANAGEMENT

Knowledge Area	Process Groups				
	Initiating	Planning	Executing	Monitor & Controlling	Closing
Integration	4.1 Develop Project Charter	4.2 Develop Project Management Plan	4.3 Direct and Manage Project Work	4.4 Monitor and Control Project Work 4.5 Perform Integrated Change Control	4.6 Close Project or Phase
Scope		5.1 Plan Scope Management 5.2 Collect Requirements 5.3 Define Scope 5.4 Create WBS		5.5 Validate Scope 5.6 Control Scope_	
Time		6.1 Plan Schedule Management 6.2 Define Activities 6.3 Sequence Activities 6.4 Estimate Activity Resources 6.5 Estimate Activity Durations 6.6 Develop Schedule		6.7 Control Schedule	
Cost		7.1 Plan Cost Management 7.2 Estimate Costs 7.3 Determine Budget		7.4 Control Costs	
Quality		8.1 Plan Quality Management	8.2 Perform Quality Assurance	8.3 Control Quality	
Human Resource		9.1 Plan Human Resource Management	9.2 Acquire Project Team 9.3 Develop Project Team 9.4 Manage Project Team		
Communications		10.1 Plan Communications Management	10.2 Manage Communications	10.3 Control Communications	
Risk		11.1 Plan Risk Management 11.2 Identify Risks 11.3 Perform Qualitative Risk Analysis 11.4 Perform Quantitative Risk Analysis 11.5 Plan Risk Responses		11.6 Control Risks	
Procurement		12.1 Plan Procurement Management	12.2 Conduct Procurements	12.3 Control Procurements	12.4 Close Procurements
Stakeholder	13.1 Identify Stakeholders	13.2 Plan Stakeholder Management	13.3 Manage Stakeholder Engagement	13.4 Control Stakeholder Engagement	

The Cube Box 809ASD



**How do you know if this is a
high quality product?**



Scenario 1

You press the button, but nothing happens.



Scenario 2

You press the button and a voice comes out of the box that says, "You pressed the button incorrectly."



Scenario 3

You press the button and the box heats up to **400°C**. You drop the box and it shatters into hundreds of pieces.

Hmm I have
no idea what
these tests
prove



**CUBE BOX 809ASD
Specification Manual**

The 809ASD is a heating element for an industrial oven

809ASD must heat up to exactly 400°C in 0.7 seconds

800ASD must have a large, easy-to-press button

Quality is the measurement of how closely your product meets its requirements.

What Is Quality?

Quality can be defined as “the degree to which project fulfils requirements.”

What is Quality ?

- **Conformance to requirements: meeting written specifications**
- **Fitness for use: ensuring a product can be used as it was intended**
- **The degree to which a set of inherent characteristics fulfill requirements**

Quality Theorists

- **Joseph Juran-** developed the ***80/20 principle***, advocated top management involvement, defined quality as ***“fitness for use.”***
- **W. Edwards Deming-** developed ***14 Steps to Total Quality Management***, advocated the ***Plan-Do-Check- Act cycle*** as the basis for quality improvement.
- **Phillip Crosby-** popularized the concept of ***cost of poor quality***, advocated ***prevention over inspection*** and ***“zero defects.”*** He believed that quality is ***“conformance to requirements.”***
- **Kaizen approach-** Quality technique from Japan. (Continuous improvement) Improve the quality of people first. Then quality of products or service.

Quality vs. Grade

- **Quality** is the degree to which a service or product with certain characteristics fulfills requirements.
 - Quality level that fails to meet requirements is always a PROBLEM.
- **Grade** is a category assigned to a service or product having the same function but with different technical characteristics.
 - Low grade may not be a problem.
- While a quality level that does not meet requirements is always a problem, a low grade service or product may not be a problem.



**Which is
quality food?**

Purpose of Project Quality Management

- To ensure that the Project satisfies the needs for which it was undertaken.
 - Scope
 - Cost
 - Performance
 - Meet or exceed Customer Satisfaction
- The customer ultimately decides if Quality is acceptable.

Benefit of Good Quality

that is, meeting quality requirements...

- Less rework
- Higher productivity
- Lower costs
- Increased stakeholder satisfaction
- Increased profitability

24th April 2013

Impact of Poor Quality

Ramin Plaza, Savar,
Dhaka, Bangladesh.



Project Quality Management Standards

- The basic approach to **project quality management** as described in the PMBok is intended to be compatible with **International Organization for Standardization (ISO)** quality standards..



Common Quality Management Traits

1. Customer satisfaction
2. Prevention over inspection
3. Continuous improvement
4. Management responsibility
5. Cost of quality

Total cost of the conformance work and the non-conformance work that should be done as a compensatory effort

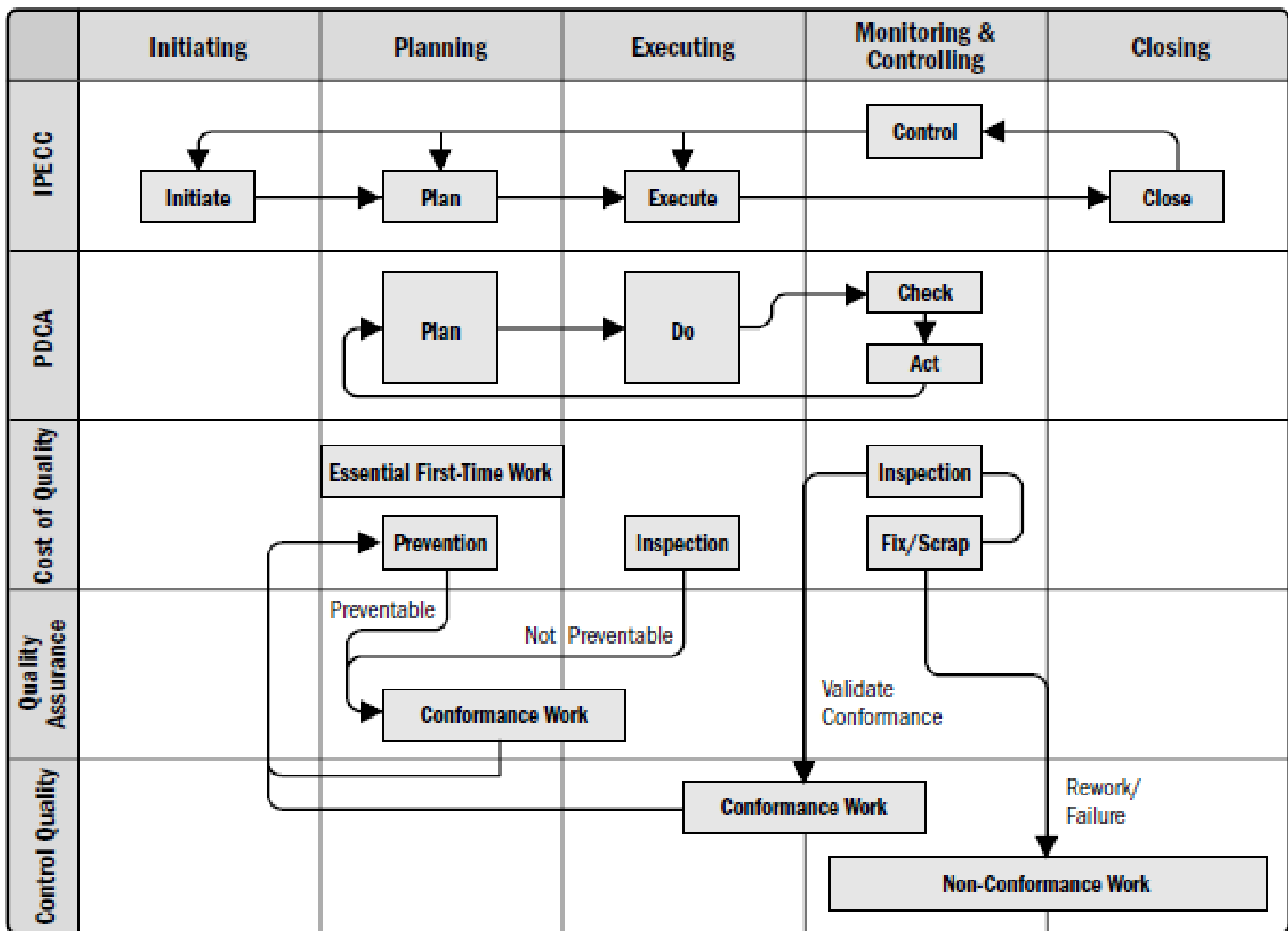


Figure 8-2. Fundamental Relationships of Quality Assurance and Control Quality to the IPECC, PDCA, Cost of Quality Models and Project Management Process Groups

Quality Management includes:

- **Plan Quality Management** - Identifying which quality standards are relevant to the project and how to satisfy them.
 - What is quality? How will we ensure it? How will you measure it? How will you prevent defects?
- **Perform Quality Assurance**- Periodically evaluating overall project performance to ensure the project will satisfy the relevant quality standards.
 - Are we following the processes?
- **Quality Control** - Monitoring specific project results to ensure that they comply with the relevant quality standards.
 - Are we meeting the standards?

Plan Quality Management

Identifying quality requirements and/or standards for the project and its deliverables, and documenting how the project will demonstrate compliance with relevant quality requirements.

Inputs

1. Project management plan
2. Stakeholder register
3. Risk register
4. Requirements documentation
5. EEF
6. OPA

Tools & Techniques

1. Cost-benefit analysis
2. Cost of quality
3. Seven basic quality tools
4. Benchmarking
5. Design of experiments
6. Statistical sampling
7. Additional quality planning tools
8. meetings

Outputs

1. Quality management plan
2. Process improvement plan
3. Quality metrics
4. Quality checklists
5. Project documents updates

Provides guidance and direction on how quality will be managed and validated throughout the project.

Plan Quality Management – **Inputs**

- **Scope Baseline**
- **Schedule Baseline**
- **Cost Baseline**
- **Other Management Plans**

Plan Quality Management – T&T

- **Benefit/Cost Analysis**
 - compares the cost of the quality step to the expected benefit
- **Cost of Quality (COQ)**
- **Seven Basic Quality Tools**
 - Cause-and-effect diagrams
 - Flowcharts,
 - Checksheets,
 - Pareto diagrams
 - Histograms,
 - Control charts
 - Scatter diagrams

Seven Basic Quality Tools

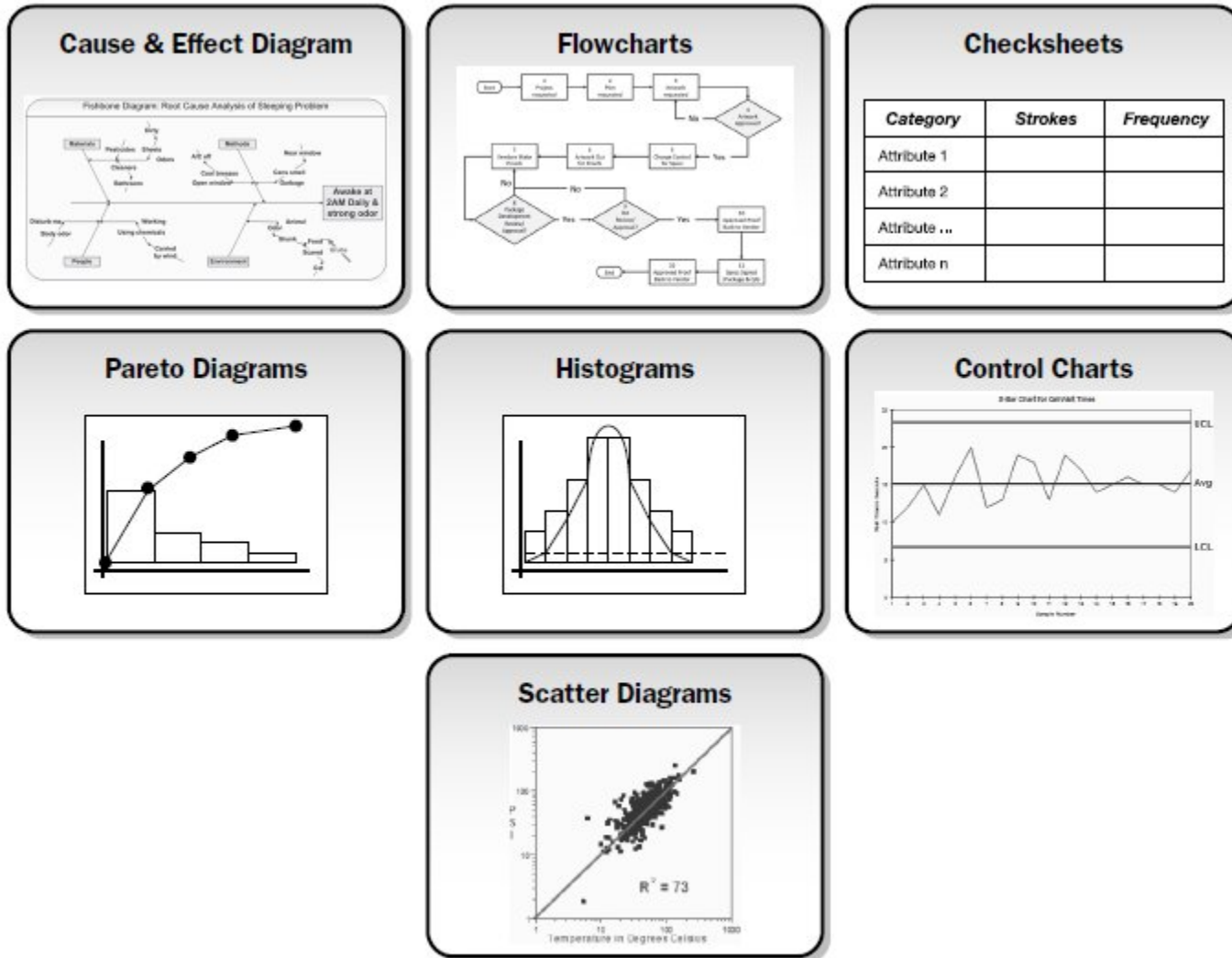


Figure 8-7. Storyboard Illustrating a Conceptual Example of Each of the Seven Basic Quality Tools

Plan Quality Management – T&T

- **Benchmarking**
- **Design of Experiments**
- **Statistical Sampling**
- **Additional Quality Planning Tools**
 - Brainstorming.
 - Force field analysis
 - Nominal group technique
 - Quality management and control tools

Flowcharting

- It helps to analyze how problems occur.
- A flowchart is a graphical representation of a process.
- It shows how various elements of a system interrelated and the order of processing.
- It helps the project team anticipate what and where quality problems might occur.

Cause and Effect Diagram

- Ishikawa or fishbone diagram
- Used to show how various factors are linked to identify problems/ adverse effects
- Diagnostic
- Analyses data
- Determines defects
- Employs brainstorming technique

Cause and Effect Diagram

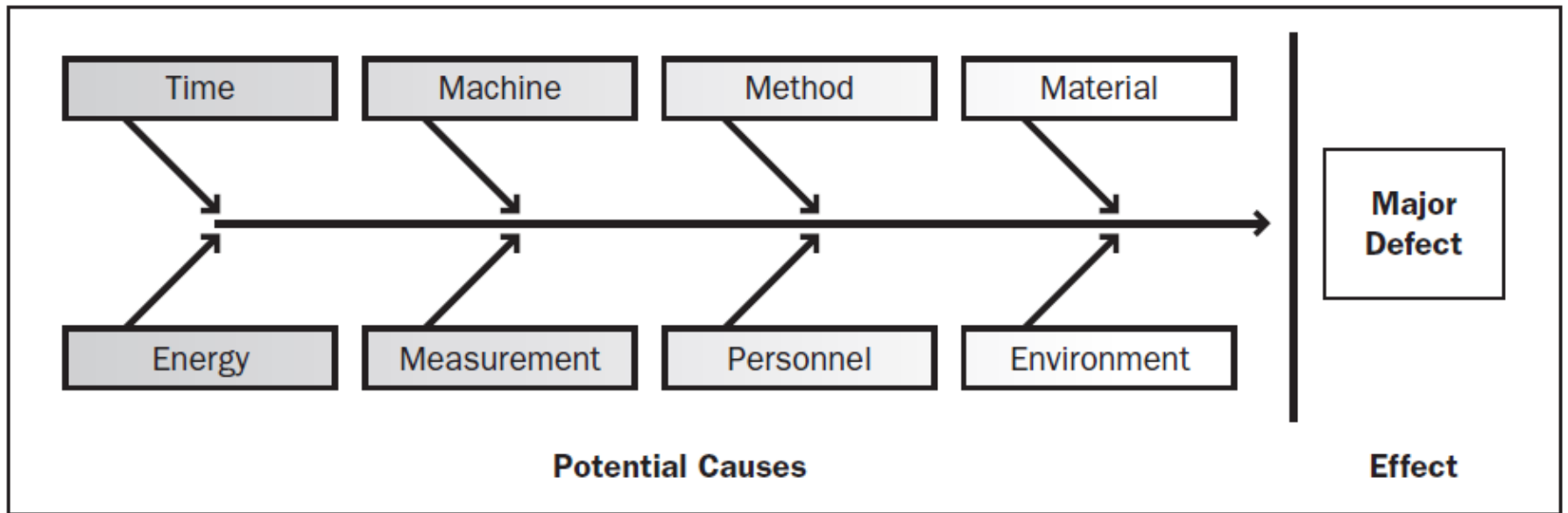


Figure 8-12. Classic Sources of Problems to Consider

Pareto Diagram – 80/20 Rule

Vilfredo Pareto: Credited for discovering the rule.

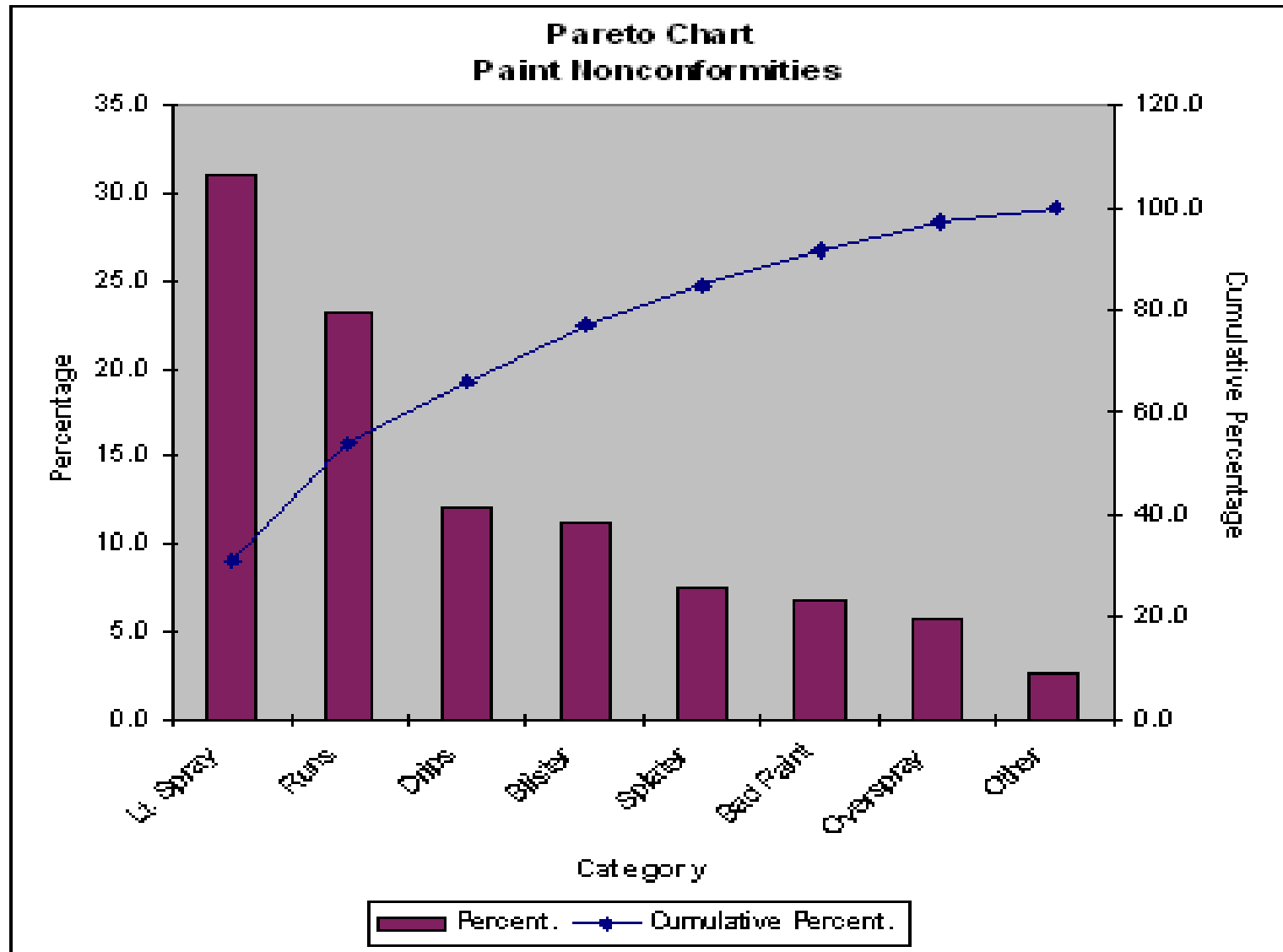
PARETO'S PRINCIPLE: 20% of activities cause 80% of problems => a small no. of causes (20%) create the majority of problems (80%)

Pareto chart is a bar chart where the data is arranged in order of importance... most significant problem is listed first and other problems fall in descending order

The Benefit is to spend the majority of your time fixing, **THE MOST IMPORTANT** problem.



Pareto Chart



Histogram

- **Histogram:** it is a bar chart showing the distribution of variables.
- Each column represents an attribute or characteristics of a problem or situation
- The height of each column represents the relative frequency of the characteristics.
- Histogram helps identify the cause of the problem in a process by the shape and width of the distribution

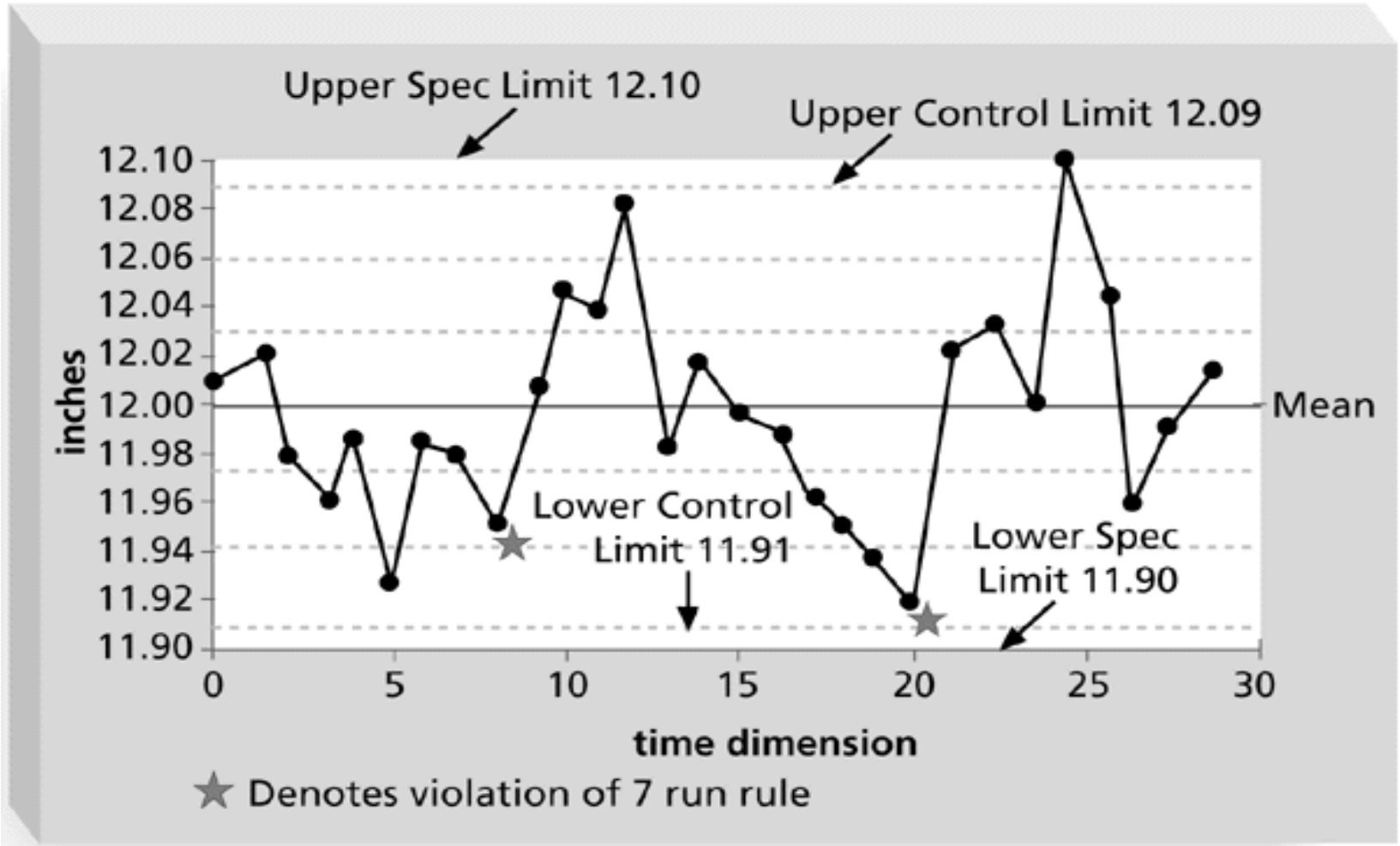
Control Chart

It determines whether or not a process is stable or has Predictable performance.

- ✓ When a process is outside acceptable limits the process should be adjusted.
- ✓ The upper control limits and lower control limits are usually set at ± 3 sigma (i.e. standard deviation).
- **Specification limit** – are normally drawn from contract or customer requirement. It may be more stringent than control limits
- **Mean** represent the average of control limits or specification limits

Sample Quality Control

Any block of length less than 11.91 and more than 12.09 is said to have a "defect".
Two "opportunities" for defects – one in length and one in breadth



Control Chart Cont.

- **Out of control** – A process is considered out of control if:
 - A data point falls out of control limits
 - Breaks the rule of seven
- **Rule of seven** – Is a rule of thumb or heuristic. A consecutive seven data points one single side of mean is considered out of control, even though the data points are within control limits.
- **Assignable cause / Special Cause Variation** – is a data point that requires investigation (either out of control limits or breaks rule of seven)

Six Sigma Defined

- **Measure** to define the capability of a process
- **Goal** for improvement that reaches near-perfection
- **System of Management** approach to achieve highest quality and performance

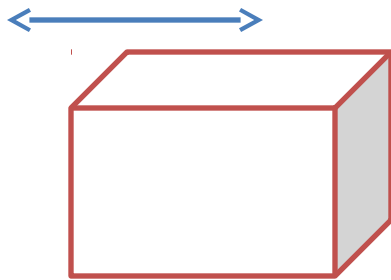
Process Variations vs Quality

Example of a metal block of required length = 10cm

Tolerance = $\pm 1\%$

UCL = 10.1cm

LCL = 9.9cm



Process Variations vs Quality

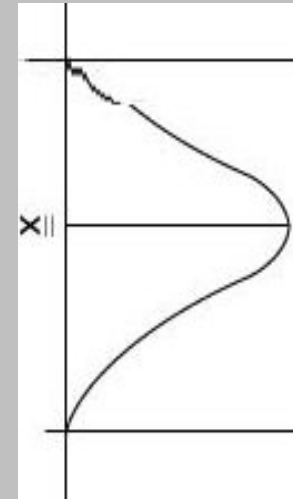
- **Variation is deviation from expectation.**
- **Variation is inherent to a process.**
- **Every output varies.**
- **The mean is the central tendency of your process.**

Process Variations vs Quality

Length in cm

10.1

9.9



Any block of length less than 9.9cm and more than 10.1cm is said to have a “defect”.
Two “opportunities” for defects – one in length and one in breadth

σ -level in terms of defects

- Concept of DPM coined by Bill Smith of Motorola
- Process capability is calculated using statistical tools
- Process capability in terms of σ is a symbol of quality for customer.

σ	DPMO	%
6	3.4	99.99966
5	233	99.977
4	6,210	99.38
3	66,807	93.32
2	308,537	69.20

Process Capability Defects Per Million Opportunities Yield

99% Good (3.8 Sigma)	99.99966% Good (6 Sigma)
20,000 lost articles of mail per hour	Seven articles lost per hour
Unsafe drinking water for almost 15 minutes each day	One unsafe minute every seven months
5,000 incorrect surgical operations per week	1.7 incorrect operations per week
Two short or long landings at most major airports each day	One short or long landing every five years
200,000 wrong drug prescriptions each year	68 wrong prescriptions per year
No electricity for almost seven hours each month	One hour without electricity every 34 years

Normal Distribution curve showing 3 sigmas

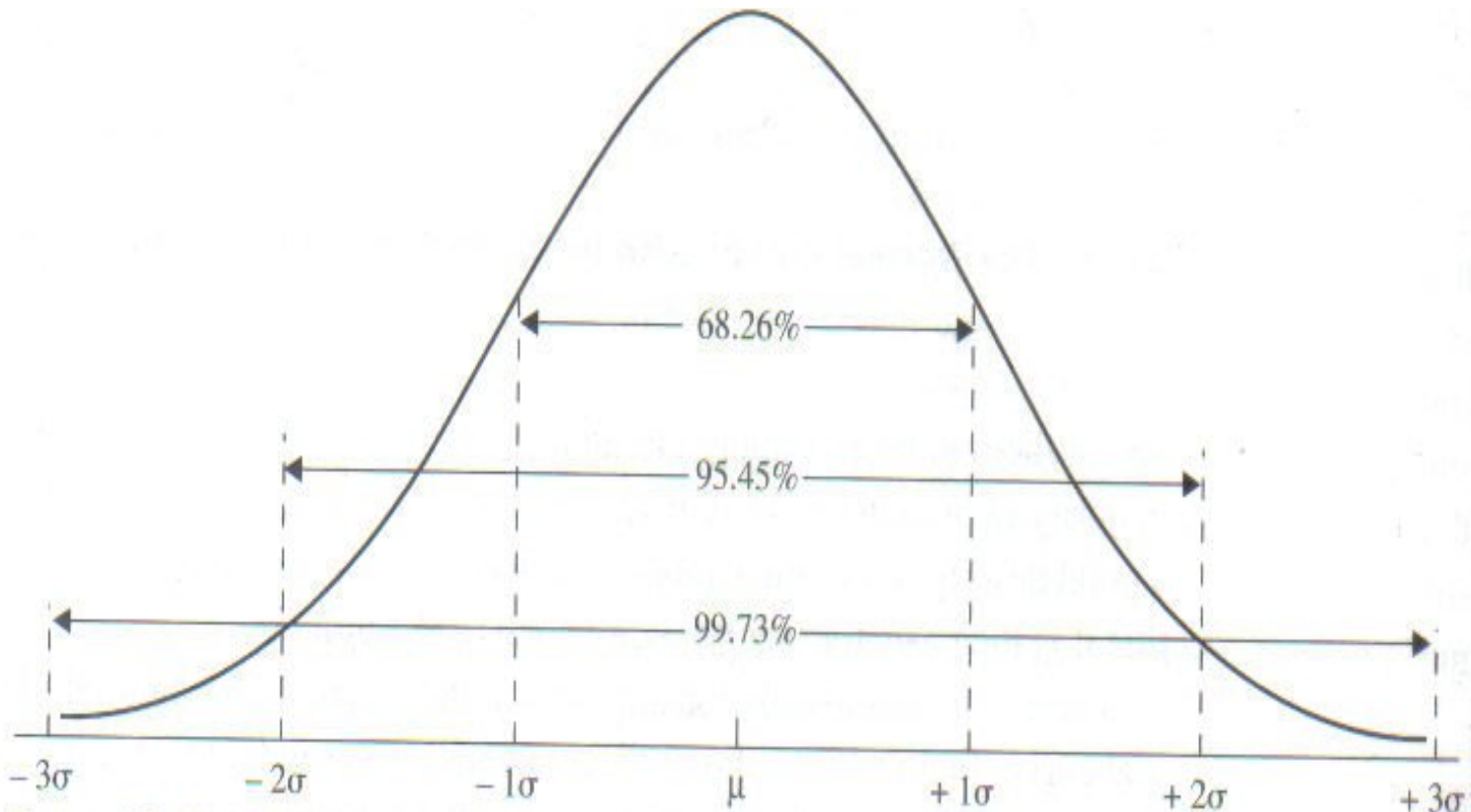
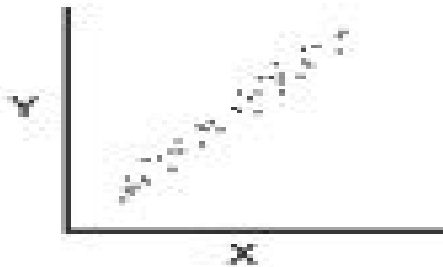


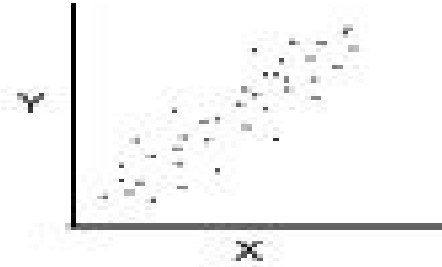
Figure 18-13 Percent of Values Included Between Certain Values of the Standard Deviation

Scatter Diagram

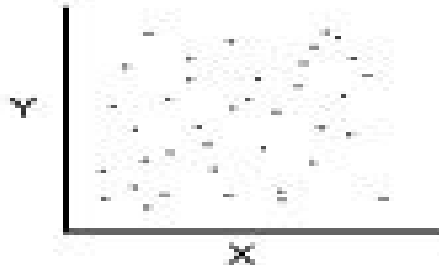
Scatter Diagram Interpretation



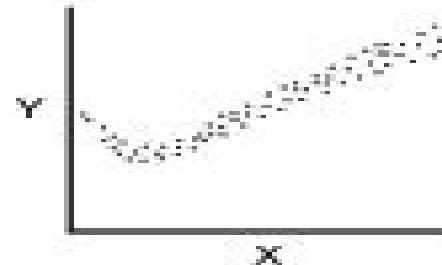
Strong correlation:
suggests a strong relationship



Weak correlation:
look for alternate factors with
stronger relationships



No correlation:
look for alternative relationship



J-shaped association:
suggests complex relationship

Scatter Diagram

- Shows the pattern of the relationships between two variables.

Quality Planning (Tools & Techniques)

The Cost of Quality

- The cost of quality is the cost of conformance plus the cost of nonconformance.
 - **Conformance** means delivering products that meet requirements and fitness for use.
 - **Cost of nonconformance** means taking responsibility for failures or not meeting quality expectations.

Quality Planning (Tools & Techniques)

The Cost of Quality (CoQ)

Cost of Conformance

Cost of Non-Conformance



Should be
less than

Prevention Costs

(Build a quality product)

- Training
- Document Processes
- Equipment
- Time to do it right

Appraisal Costs

(Assess the Quality)

- Testing
- Destructive testing loss
- Inspection

Internal Failure Costs

(Failures found by the project)

- Rework
- Scrap

External Failure Costs

(Failures found by the customer)

- Testing
- Destructive testing loss
- Inspection

Plan Quality Management – Outputs

- **Quality Management Plan**
- **Process Improvement Plan**
 - Process boundaries
 - Process configuration
 - Process metrics
 - Targets for improved performance
- **Quality Metrics**
- **Quality Checklists**
- **Project Documents Updates**

Perform Quality Assurance

The process of auditing the quality requirements and the results from quality control measurements to ensure that appropriate quality standards and operational definitions are used.

Inputs

1. Quality management plan
2. Process improvement plan
3. Quality metrics
4. Quality control measurements
5. Project documents

Tools & Techniques

1. Quality management and control tools
2. Quality audits
3. Process analysis

Outputs

1. Quality management plan
2. Process improvement plan
3. Quality metrics
4. Quality checklists
5. Project documents updates

Facilitates the improvement of quality processes

Perform Quality Assurance – T&T

- *Are we using the standard?*
- *Can we improve the standard?*

Perform Quality Assurance – T&T

- **Quality Management and Control Tools**
 - Affinity diagrams
 - Process decision program charts (PDPC)
 - Interrelationship digraphs
 - Tree diagrams
 - Prioritization matrices
 - Activity network diagrams
 - Matrix diagrams
- **Quality Audits**
- **Process Analysis**

Perform Quality Assurance – Outputs

- **Change Requests**

Control Quality

Monitoring and recording results of executing the quality activities to assess performance and recommend necessary changes.

Inputs

1. Project management plan
2. Quality metrics
3. Quality checklists
4. Work performance data
5. Approved change requests
6. Deliverables
7. Project documents
8. OPA

Tools & Techniques

1. Seven basic quality tools
2. Statistical sampling
3. Inspection
4. Approved change requests review

Outputs

1. Quality control measurements
2. Validated changes
3. Verified deliverables
4. Work performance information
5. Change requests
6. Project management plan updates
7. Project documents updates
8. OPA updates

Identify causes of poor quality and recommend action; validate that project deliverables and work meet requirements specified necessary for acceptance.

Control Quality – T&T

Inspection

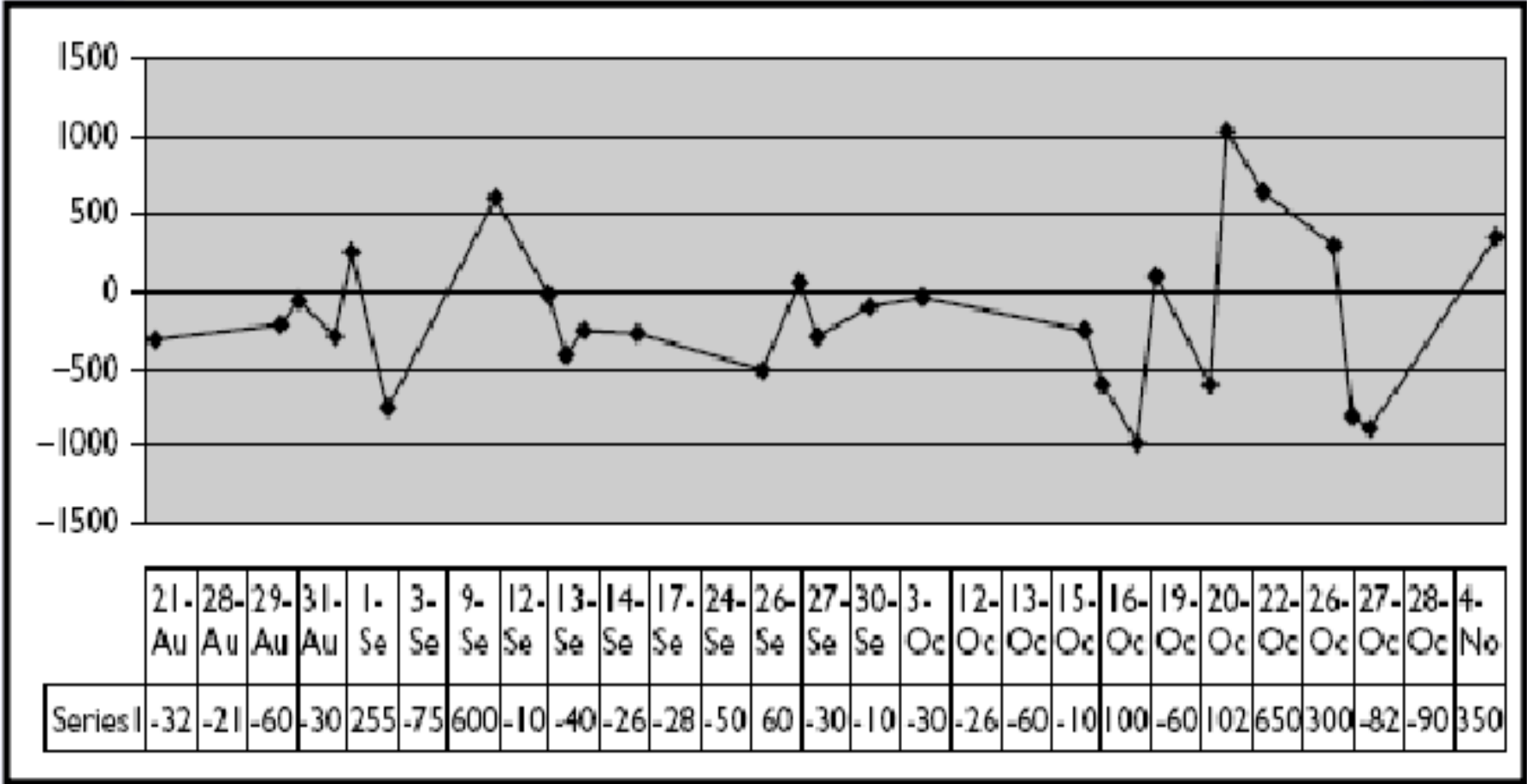
- Inspection includes activities such as measuring, examining and testing undertaken to determine whether results conform to requirements
- Inspection can be carried out on the level of a single activity or a final product
- Inspections can be called reviews, product reviews, audits, and walk-throughs

QC (Tools & Techniques)

Run Chart

- It shows the history and pattern of variation.
- It is a line graph that shows data points plotted in the order in which they occur.
- Can be used to perform trend analysis to forecast future outcomes based on historical patterns

Run Chart



Sampling Methods

- A method of determining the value of a product or service when it is not practical to examine the entire population
 - Random sampling

Perform Quality Control: Outputs

Quality Control Measurements

- These measurements are the result of the QC activities
- These measurements are fed back to the QA to reevaluate and analyze the quality standards & processes.

Validate Changes :

- Any changed or repaired items are inspected and will be either accepted or rejected before notification of the decision is provided .
- Rejected items may require rework

Control Quality: Outputs

Validated Deliverables

- QC aims to determine the correctness of deliverables
- The result of the execution quality control process are validated deliverables.

Change Requests :

- If the recommended corrective or preventive actions or a defect repair requires a change to the project management plan , a change request should be initiated in accordance with the defined Perform

Integrated Change Control process

Control Quality: Outputs

- **Organizational Process Assets Updates**
 - Completed checklists
 - lessons learned documentation

PMBOK: Knowledge Areas

Chapter 9

PROJECT HUMAN RESOURCE MANAGEMENT

Knowledge Area	Process Groups				
	Initiating	Planning	Executing	Monitor & Controlling	Closing
Integration	4.1 Develop Project Charter	4.2 Develop Project Management Plan	4.3 Direct and Manage Project Work	4.4 Monitor and Control Project Work 4.5 Perform Integrated Change Control	4.6 Close Project or Phase
Scope		5.1 Plan Scope Management 5.2 Collect Requirements 5.3 Define Scope 5.4 Create WBS		5.5 Validate Scope 5.6 Control Scope_	
Time		6.1 Plan Schedule Management 6.2 Define Activities 6.3 Sequence Activities 6.4 Estimate Activity Resources 6.5 Estimate Activity Durations 6.6 Develop Schedule		6.7 Control Schedule	
Cost		7.1 Plan Cost Management 7.2 Estimate Costs 7.3 Determine Budget		7.4 Control Costs	
Quality		8.1 Plan Quality Management	8.2 Perform Quality Assurance	8.3 Control Quality	
Human Resource		9.1 Plan Human Resource Management	9.2 Acquire Project Team 9.3 Develop Project Team 9.4 Manage Project Team		
Communications		10.1 Plan Communications Management	10.2 Manage Communications	10.3 Control Communications	
Risk		11.1 Plan Risk Management 11.2 Identify Risks 11.3 Perform Qualitative Risk Analysis 11.4 Perform Quantitative Risk Analysis 11.5 Plan Risk Responses		11.6 Control Risks	
Procurement		12.1 Plan Procurement Management	12.2 Conduct Procurements	12.3 Control Procurements	12.4 Close Procurements
Stakeholder	13.1 Identify Stakeholders	13.2 Plan Stakeholder Management	13.3 Manage Stakeholder Engagement	13.4 Control Stakeholder Engagement	

Project Human Resource Management

- Managing and leading the project team includes
 - **Influencing the project team**
 - **Professional and ethical behaviour**

Project Human Resource Management Overview

Project Human Resource Management Overview

9.1 Plan Human Resource Management

- .1 Inputs
 - .1 Project management plan
 - .2 Activity resource requirements
 - .3 Enterprise environmental factors
 - .4 Organizational process assets
- .2 Tools & Techniques
 - .1 Organization charts and position descriptions
 - .2 Networking
 - .3 Organizational theory
 - .4 Expert judgment
 - .5 Meetings
- .3 Outputs
 - .1 Human resource management plan

9.2 Acquire Project Team

- .1 Inputs
 - .1 Human resource management plan
 - .2 Enterprise environmental factors
 - .3 Organizational process assets
- .2 Tools & Techniques
 - .1 Pre-assignment
 - .2 Negotiation
 - .3 Acquisition
 - .4 Virtual teams
 - .5 Multi-criteria decision analysis
- .3 Outputs
 - .1 Project staff assignments
 - .2 Resource calendars
 - .3 Project management plan updates

9.3 Develop Project Team

- .1 Inputs
 - .1 Human resource management plan
 - .2 Project staff assignments
 - .3 Resource calendars
- .2 Tools & Techniques
 - .1 Interpersonal skills
 - .2 Training
 - .3 Team-building activities
 - .4 Ground rules
 - .5 Colocation
 - .6 Recognition and rewards
 - .7 Personnel assessment tools
- .3 Outputs
 - .1 Team performance assessments
 - .2 Enterprise environmental factors updates

9.4 Manage Project Team

- .1 Inputs
 - .1 Human resource management plan
 - .2 Project staff assignments
 - .3 Team performance assessments
 - .4 Issue log
 - .5 Work performance reports
 - .6 Organizational process assets
- .2 Tools & Techniques
 - .1 Observation and conversation
 - .2 Project performance appraisals
 - .3 Conflict management
 - .4 Interpersonal skills
- .3 Outputs
 - .1 Change requests
 - .2 Project management plan updates
 - .3 Project documents updates
 - .4 Enterprise environmental factors updates
 - .5 Organizational process assets updates

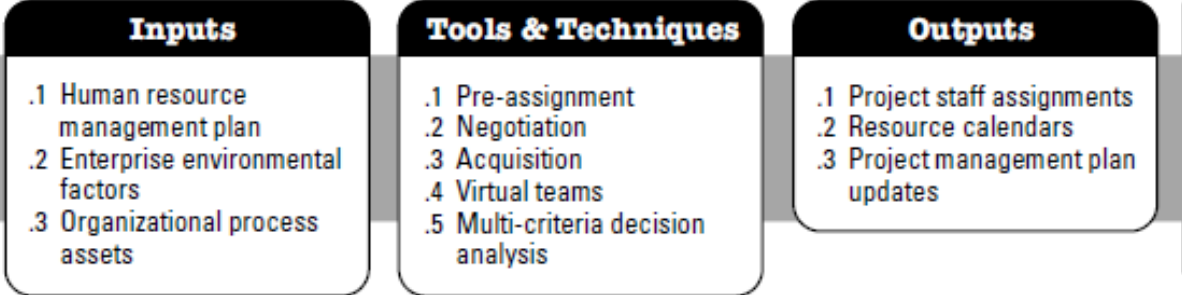
Project Human Resource Management

- **Plan Human Resource Management** – Identifying and documenting project roles, responsibilities and required skills, reporting relationships and creating a staffing management plan
- **Acquire Project Team** – confirming human resource availability and obtaining the team necessary to complete the project assignments
- **Develop Project Team** – Improving the competencies, team interaction and the overall team performance to enhance project success
- **Manage Project Team** – tracking team member performance, providing feedback, resolving issues and managing changes to optimize project performance

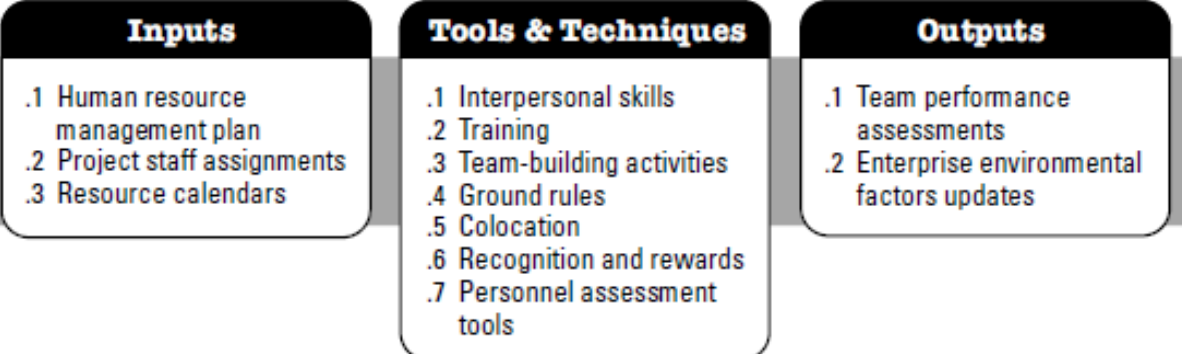
- Plan Human Resource Management



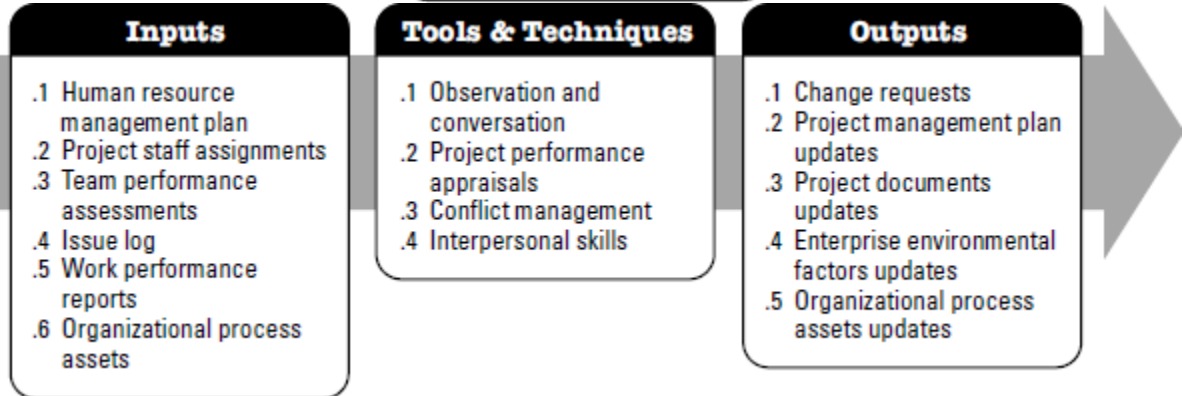
- Acquire Project Team



- Develop Project Team



- Manage Project Team



Plan Human Resource Management

Identifying and documenting project roles, responsibilities, required skills, reporting relationships, and creating a staffing management plan.

Inputs

1. Project management plan
2. Activity resource requirements
3. EEF
4. OPA

Tools & Techniques

1. Organization charts and position descriptions
2. Networking
3. Organization theory
4. Expert judgment
5. Meetings

Outputs

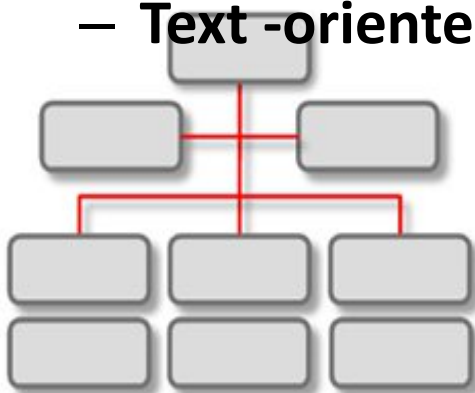
1. Human resource management plan

Establishes project roles and responsibilities, project organization charts, and the staffing management plan including the timetable for staff acquisition and release.

Plan Human Resource Management – T&T

Organizational Chart & Position Desc.

- Ensure that each work package has an unambiguous owner.
- All team member have a clear understanding of their roles and responsibility.
- Types of Roles and Responsibility:
 - **Hierarchal** e.g. Organizational Breakdown Structure (OBS)
 - **Matrix** e.g. Responsibility Assignment Matrix (RAM) e.g. RACI (Responsible, Accountable, Consult and Inform)
 - **Text -oriented**



Activity	Role-1	Role-2	Role-3	Role-4
Aaaaaa	R	R	C	I
Bbbbbb		R	A	I
Ccccc	R	A	C	I

A form for role and responsibility assignment. It includes fields for Role, Responsibility, and Authority, each followed by a series of horizontal lines for text entry.

Plan Human Resource Management – T&T

RACI Chart	Person				
Activity	Ann	Ben	Carlos	Dina	Ed
Create charter	A	R	I	I	I
Collect requirements	I	A	R	C	C
Submit change request	I	A	R	R	C
Develop test plan	A	C	I	I	R

R = Responsible A = Accountable C = Consult I = Inform

RACI Chart

R=Responsible: The role is primarily responsible for performing the work required of that activity.

A=Accountable: The role is held accountable for the activity's output, deliverable, or artifact.

C=Consult: The role is in an advisory position for the activity.

I=Inform: The role will be kept in the loop as the activity is underway.

Plan Human Resource Management – T&T

- **Networking**
- **Organizational Theory**
 - Provides information regarding the way in which people, teams, and organizational units behave
- **Expert Judgment**

Roles and Responsibility

- **Role**
- **Authority**
- **Responsibility**
- **Competency**

Plan Human Resource Management – Output

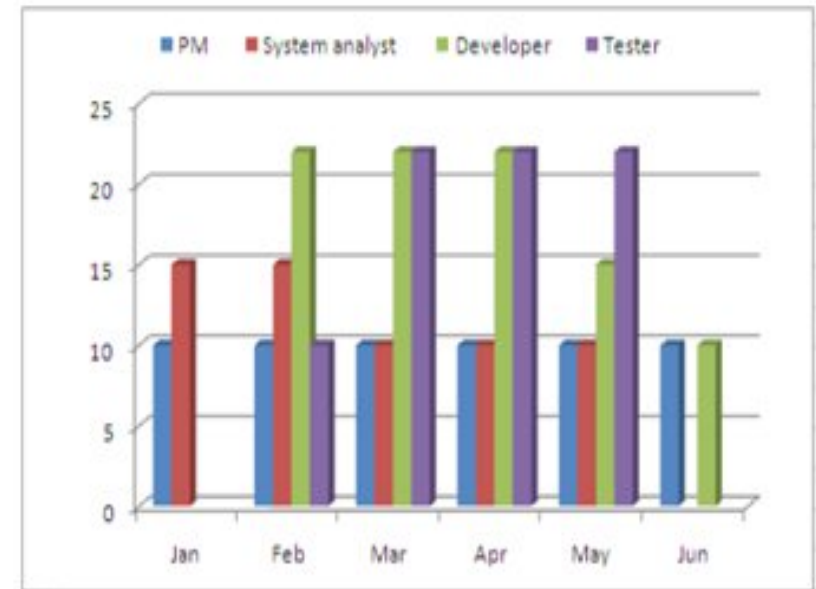
- **Project Organizational Chart**
- **Staffing Management Plan**
 - Staff Acquisition
 - Resource calendars
 - Staff Release Plan
 - Training needs
 - Recognition and Rewards
 - Compliance, Safety

Plan Human Resource Management – Output

2. Project Organizational Chart

3. Staffing Management Plan

- Staff Acquisition
- *Resource calendars*
- Staff Release Plan
- Training needs
- Recognition and Rewards
- Compliance, Safety



Acquire Project Team

Confirming human resource availability and obtaining the team necessary to complete project activities.

Inputs

1. Human resource management plan
2. EEF
3. OPA

Tools & Techniques

1. Pre-assignment
2. Negotiation
3. Acquisition
4. Virtual teams
5. Multi-criteria decision analysis

Outputs

1. Project staff assignments
2. Resource calendars
3. Project management plan updates

Outlining and guiding the team selection and responsibility assignment to obtain a successful team.

Acquire Project Team – **Inputs**

- **Human Resource Management Plan**

Acquire Project Team – T&T

- **Pre-assignment**
 - Resources who are assigned in advance. Staff assignments are defined within the project charter.
- **Negotiation**
 - With Functional Manager to ensure availability of component staff.
 - With other PMg't teams to assign scarce / specialized resources.
- **Acquisition**
 - From Internal /External resources. Acquiring from outside may take place due to shortage / lack of staff in-house
- **Virtual Teams**
 - This is the possibility of having groups of people in different geographic locations, with little or no time spent to meet face to face.

Acquire Project Team – T&T

- **Multi-Criteria Decision Analysis**
 - Availability
 - Cost
 - Experience
 - Ability
 - Knowledge
 - Skills
 - Attitude
 - International factors

Develop Project Team

Improving competencies, team member interaction, and overall team environment to enhance project performance.

Inputs

1. Human resource management plan
2. Project staff assignments
3. Resource calendars

Tools & Techniques

1. Interpersonal skills
2. Training
3. Team-building activities
4. Ground rules
5. Colocation
6. Recognition and rewards
7. Personnel assessment tools

Outputs

1. Team performance assessments
2. EEF updates

Improved teamwork, enhanced people skills and competencies, motivated employees, reduced staff turnover rates, and improved overall project performance.

Develop Project Team

Project managers should acquire skills to identify, build, maintain, motivate, lead, and inspire project teams to achieve high team performance

Develop Project Team – T&T

- **Interpersonal Skills**
 - sometimes known as "soft skills," are behavioral competencies
- **Training**
 - all activities designed to enhance the competencies of the project team members
- **Team-building Activities**

Develop Project Team – T&T

Team–Building Activities

The are five (5) stages of team development:

- **Forming** – Team meets and learns about the project and what their respective formal roles and responsibilities are.
- **Storming** – Team begins to address project work. If members are not open and collaborative environment can be destructive
- **Norming** – Team members begin to work together and adjusts work habits to support team. Trust is present.
- **Performing** – Team is a well organized unit
- **Adjourning** – Team completes work and moves on

Develop Project Team – T&T

- **Ground Rules**
- **Colocation – tight matrix**
- **Recognition and Rewards**

Develop Project Team – Output

- **Team Performance Assessment**

Evaluation may include:

- Improvements in skills
- Improvements-in competencies
- Reduced staff turnover rate
- Increased team cohesiveness

Manage Project Team

Tracking team member performance, providing feedback, resolving issues, and managing team changes to optimize project performance.

Inputs

1. Human resource management plan
2. Project staff assignments
3. Team performance assessment
4. Issue log
5. Work performance reports
6. OPA

Tools & Techniques

1. Observation and conversation
2. Project performance appraisals
3. Conflict management
4. Interpersonal skills

Outputs

1. Change requests
2. Project management plan updates
3. Project documents updates
4. EEF updates
5. OPA updates

Influences team behaviour, manages conflict, resolves issues, and appraises team member performance.

Manage Project Team – **Input**

- **Issue Log**
 - Issues arise in the course of managing the project team

Manage Project Team – T&T

- **Observation and Conversation**
- **Project Performance Appraisals**
- **Conflict Management**

Manage Project Team – T&T

Five (5) General Techniques for resolving conflicts:

- **Withdrawing/Avoiding** – Retreat from the conflict
- **Smoothing/Accommodating** – Focus on agreement rather than differences
- **Compromising/Reconciling** – Win-Win
- **Forcing/Direct** – Pushing a view point at the expense of another
- **Collaborating/Problem Solving** – Treating conflict as a problem and solve by examining alternatives and incorporating multiple viewpoints

Manage Project Team – T&T

- **Interpersonal Skills**
 - Technical, Personal & Conceptual Skills
 - Leadership
 - Influencing
 - Effective decision making

Manage Project Team – T&T

Powers:

- **Formal (Legitimate)**- power due to project manager position.
- **Reward**- Power stems from giving rewards
- **Penalty (coercive)**- Power due to people being afraid of the power the project manager holds. (punish, penalize).
- **Expert Power (earned or technical)**- comes from being a technical or project management expert.
- **Referent- Power** due to charisma or fame, make another person like or respect the project manager.

The best forms of power are **Expert** and **Reward**.

Earned on your own: **Expert**

The worst type of power: **Penalty**

These forms of power are derived from positions within the company: **Formal, Reward and Penalty.**

Exercise: Conflict Management

Description	Type of Resolving
"It seems that the real problem here is not a lack of communication, but a lack of knowledge of what needs to be done and when. Here is a copy of the project schedule. It should help you understand what you need to know."	
"Do it my way!"	
"Let's calm down and get the job done!"	
"Let us do a little of what both of you suggest"	
"Let's deal with this issue next week"	
"Sandy and Amanda, both of you want this project to cause as little distraction to your departments as possible. With that in mind, I am sure we can come to an agreement on the purchase of equipment and what is best for the project."	
"We have talked about new computers enough. I do not want to get the computers, and that is it!"	
"Sandy, you say that the project should include the purchase of new computers, and Amanda, you say that the project can use existing equipment. I suggest we perform the following test on the existing equipment to determine if it needs to be replaced."	
"Let's what everyone thinks, and try to reach a consensus"	

Manage Project Team – T&T

- Avoid conflict
 - Informing the team
 - Clearly assigning tasks without ambiguity
 - Challenging & interesting work assignments
- Conflict Sources (in order of frequency)
 - Schedules
 - Project Priorities
 - Resources
 - Technical opinions
 - Administrative Procedures
 - Cost
 - Personality

Manage Project Team – T&T

Motivational Theories

Maslow's Hierarchy of Needs – people work to get a chance to contribute & use their skills

- 'self-actualization'

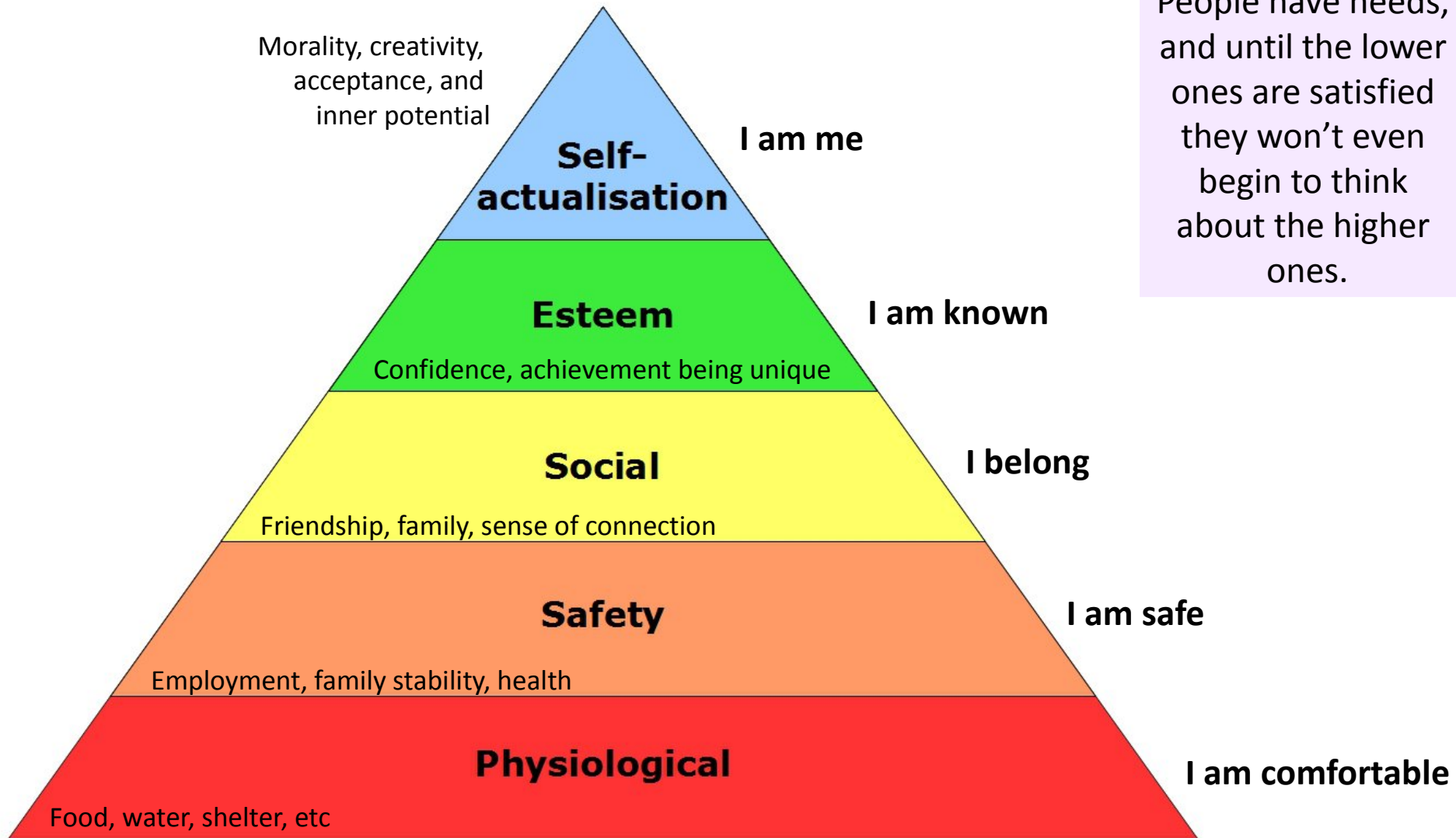
McGregor's Theory of X & Y

- X – people need to be watched every minute
- Y – people willing to work without supervision

Herzberg's Theory – poor hygiene factors destroy motivation but improving them will not improve motivation

- Motivating Agents
 - Responsibility
 - Self-actualization
 - Professional growth
 - Recognition

Maslow's Hierarchy of Needs



People have needs, and until the lower ones are satisfied they won't even begin to think about the higher ones.

Motivational Theory: Mc Gregors X & Y Theory



- **Theory X**

- People tend to be negative, impassive, e.g. incapable, avoid responsibility, need to be watched

- Extrinsic Motivation



- **Theory Y**

- People tend to be positive e.g. want to achieve, willing to work without supervision, can direct their own effort

- Intrinsic Motivation



Motivational Theory: Two Factors Theory

People need the stuff they normally expect out of a job before you can get them motivated about achievement and personal growth

- **Herzberg's Theory**

- Job dissatisfaction due to hygiene factors.
- Job satisfaction due to motivational factors

Click to edit Master text styles

Second level

Hygiene Factors

- Third level

- Fourth level

- Working condition
- Salary
- Fifth level
- Relationship at work
- Security
- Status

Motivation Factors

- Responsibility
- Self actualization
- Professional growth
- Recognition



PMBOK: Knowledge Areas

Chapter 10 PROJECT COMMUNICATIONS MANAGEMENT

Knowledge Area	Process Groups				
	Initiating	Planning	Executing	Monitor / Controlling	Closing
Integration	4.1 Develop Project Charter	4.2 Develop Project Management Plan	4.3 Direct and Manage Project Execution	4.4 Monitor and Control Project Work 4.5 Perform Integrated Change Control	4.6 Close Project or Phase
Scope		5.1 Plan Scope Management 5.2 Collect Requirements 5.3 Define Scope 5.4 Create WBS		5.5 Validate Scope 5.6 Control Scope_	
Time		6.1 Plan Schedule Management 6.2 Define Activities 6.3 Sequence Activities 6.4 Estimate Activity Resources 6.5 Estimate Activity Durations 6.6 Develop Schedule		6.7 Control Schedule	
Cost		7.1 Plan Cost Management 7.2 Estimate Costs 7.3 Determine Budget		7.4 Control Costs	
Quality		8.1 Plan Quality Management	8.2 Perform Quality Assurance	8.3 Perform Quality Control	
Human Resource		9.1 Plan Human Resource Management	9.2 Acquire Project Team 9.3 Develop Project Team 9.4 Manage Project Team		
Communications		10.1 Plan Communications Management	10.2 Manage Communications	10.3 Control Communications	
Risk		11.1 Plan Risk Management 11.2 Identify Risks 11.3 Perform Qualitative Risk Analysis 11.4 Perform Quantitative Risk Analysis 11.5 Plan Risk Responses		11.6 Monitor and Control Risks	
Procurement		12.1 Plan Procurement Management	12.2 Conduct Procurements	12.3 Administer Procurements	12.4 Close Procurements
Stakeholder	13.1 Identify Stakeholders	13.2 Plan Stakeholder Management	13.3 Manage Stakeholder Engagement	13.4 Control Stakeholder Engagement	

Project Communications Management

- Processes to ensure timely & proper generation, collection, dissemination & disposition of project information.
- General communications management
 - Communications Planning – determining informational needs, who needs what & when; **90%** of PM's time is spent communicating
 - Information Distribution – making information available
 - Performance Reporting – collecting & disseminating project information

Communication can take various methods:

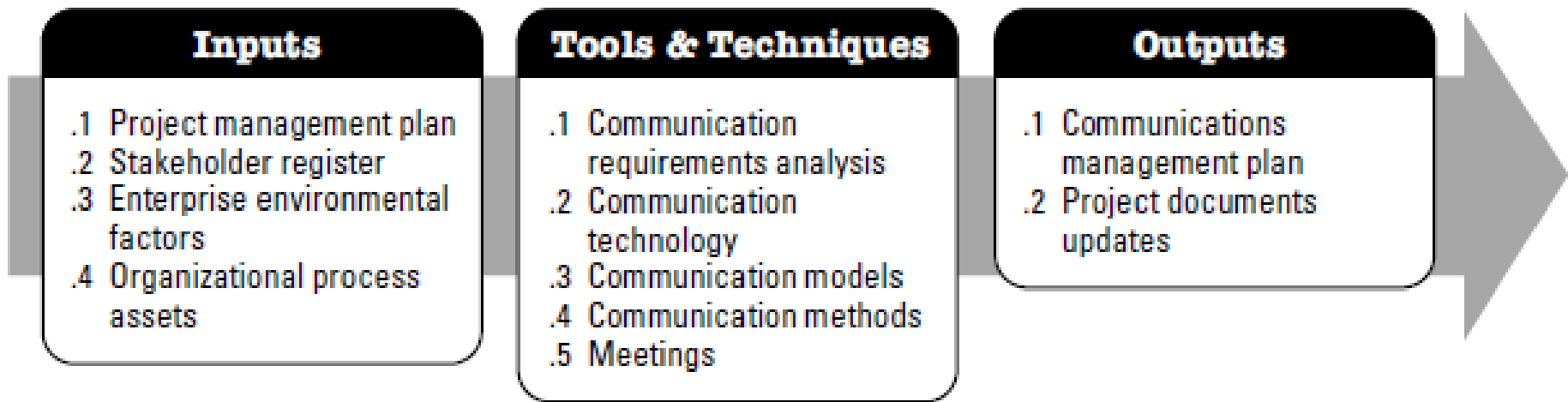
- **Internal** i.e. within the project and **external** to the project such as with the customer, other projects, the media, the public etc.
- **Formal**, such as reports, memos and briefings and **informal** such as emails, ad-hoc discussions.
- **Vertical** (up and down the organization and **horizontal** (with peers),
- **Verbal and Non-verbal** (voice inflections and body language).
- **Written and Oral**

Project Communications Management

- **Plan Communication Management** - Developing an appropriate approach and plan for project communications based on stakeholder's information needs and requirements, and available organizational assets.
- **Manage Communication** - Creating, collecting, distributing, storing, retrieving and the ultimate disposition of project information in accordance with the communications management plan.
- **Control Communications** – Collecting and distributing performance information – status, progress, forecasts.

Plan Communications Management

The process of developing an appropriate approach and plan for project communications based on stakeholder's information needs and requirements, and available organizational assets.



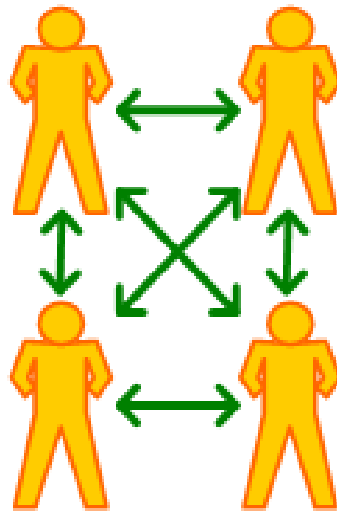
It identifies and documents the approach to communicate most effectively and efficiently with stakeholders.

Plan Communications Management – T&T

Communication Requirements Analysis

- The analysis of the communication requirements determines the information needs of the project stakeholders
- Consider the number of potential **communication channels** or paths

A key component in communication planning is to determine **who** will communicate with **whom** and **who** will receive **what** information.



$$\frac{N(N-1)}{2}$$

Plan Communications Management – T&T

Sources of information to identify and define project communication requirements

- Organizational Charts
- Project organization and stakeholder responsibility relationships
- Disciplines, departments, and specialties
- Logistics
- Internal information needs
- External information needs
- Stakeholder information and communications requirements

Plan Communications Management – T&T

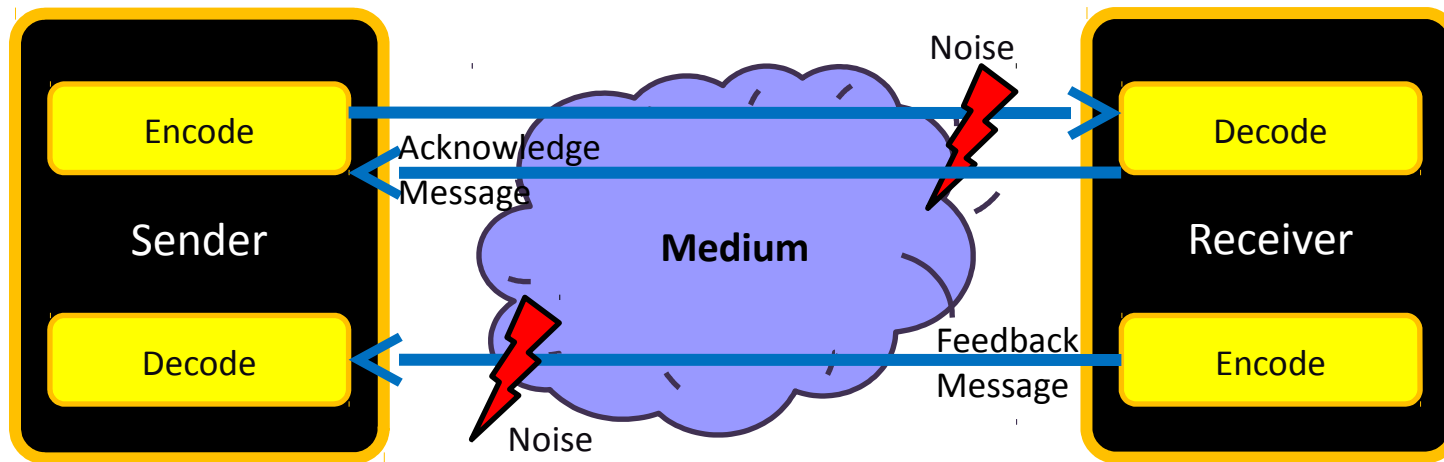
Communication Technology

- Urgency of the need for information
- Availability of technology
- Ease of Use
- Project environment
- Sensitivity and confidentiality of the information
-

Plan Communications Management – T&T

Communication Model

- The components in the model need to be taken into account when discussing project communications.
- The sender is responsible for making information clear and complete so that the receiver can receive it correctly, and for confirming that it is properly understood.



Basic Communication Model

- To make effective communication, sender/receiver need to be aware of these factors:
 - Nonverbal: 55% of all communication is nonverbal
 - Paralingual: pitch and tone of voice
 - Effective listening

Plan Communications Management – T&T

Communication Methods

- Interactive communication
- Push communication
- Pull communication
 -

Communications Management Plan – Output

- **The communications management plan documents:**
 - How the communication needs of the stakeholders will be met
 - The types of information that will be communicated
 - Who will communicate it
 - Who receives the communication
 - The methods used to communicate

Communications Management Plan – Output

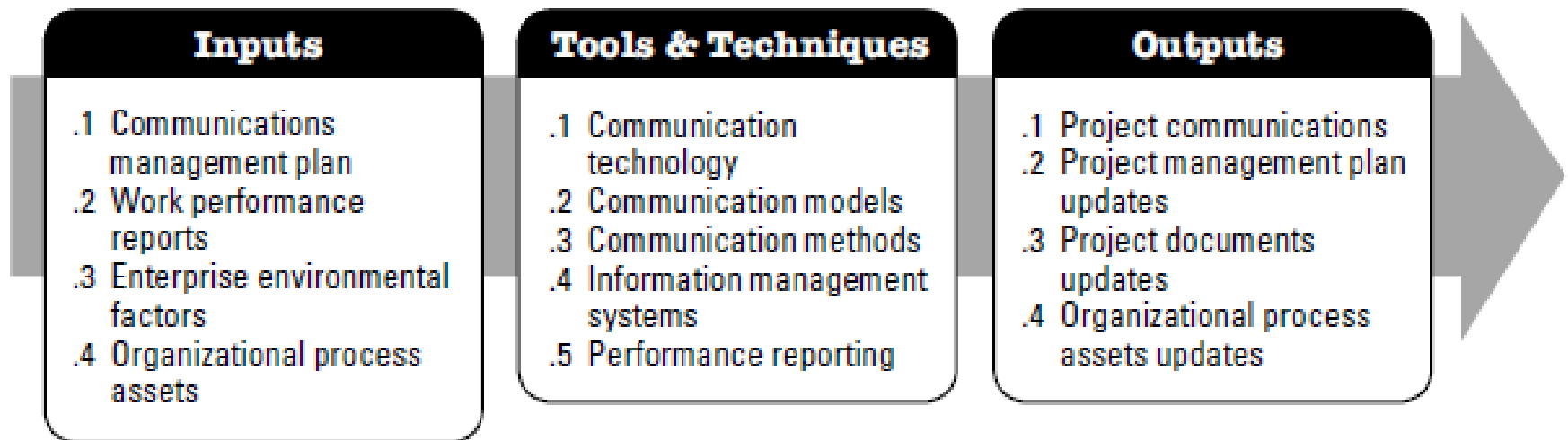
- **It describes how project communications will be:**
 - Planned
 - Structured
 - Monitored and controlled

Communications Management Plan – Output

- Complex messages need written & non verbal methods
- Least effective form of communication for complex issues: verbal & formal

Manage Communication

The process of creating, collecting, distributing, storing, retrieving, and the ultimate disposition of project information in accordance to the communications management plan.



It enables an efficient and effective communications flow between project stakeholders

Manage Communications

Techniques and considerations for effective communications management include, but are not limited to, the following:

- Sender-receiver models
- Choice of media
- Writing style
- Meeting management techniques
- Presentation techniques
- Facilitation techniques
- Listening techniques

Manage Communication – T&T

- **Communication Methods :**

Individual and group meetings , video and audio conferences computer chats, and other remote communication methods are used to distribute information .

Information Management System:

Information can be distributed through some of the following methods, given project demands and available technology:

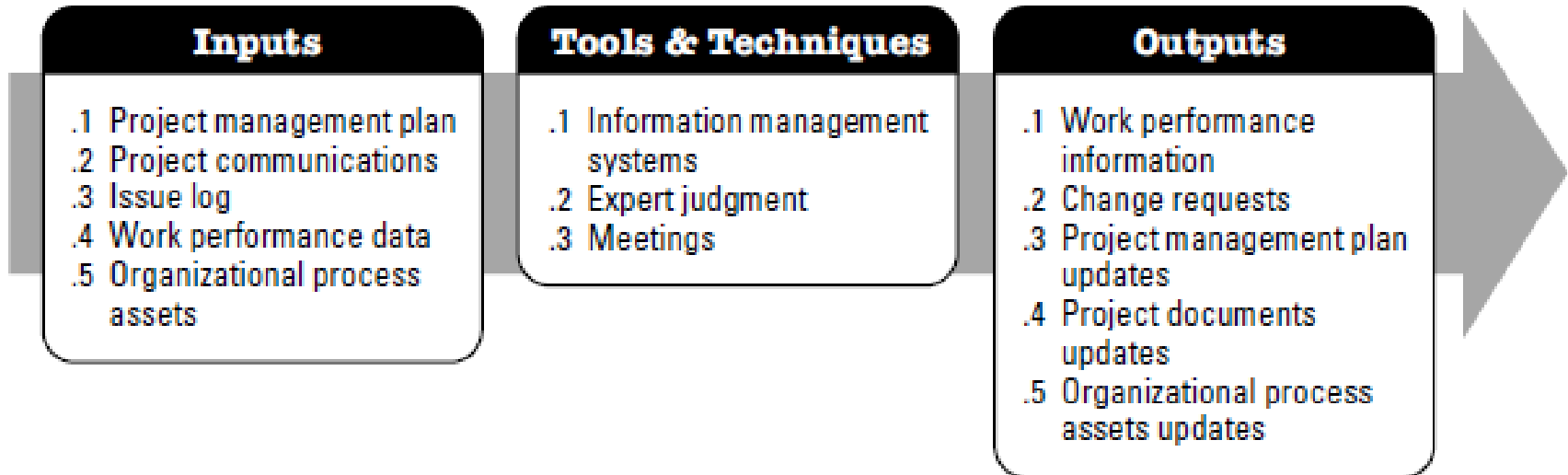
- Hard-copy
- Electronic communications
- Electronic project management tools

Performance Reporting

- Status Reports (where project is:)
- Progress Reports (what has been accomplished)
- Trend Report (project results over time)
- Forecasting Report (projecting future status)
- Variance Report (actual results vs. planned)
- Earned Value

Control Communications

The process of monitoring and controlling communications throughout the entire project life cycle to ensure the information needs of the project stakeholders are met.



It ensures an optimal information flow among all communication participants, at any moment in time.

Control Communications – **Input**

Project Management Plan

- Stakeholder communication requirements
- Reason for the distribution of the information
- Timeframe and frequency
- Individual or group responsible for communication
- Individual or group receiving the information

- One of the major purpose of communication is stakeholder management
- PM spends most of the time communicating (Integration is achieved through communications)
- Communication becomes difficult in Matrix / Functional organization and when virtual teams are used
- Noise is the biggest issue when multi-cultural/multi language teams are involved.

PMBOK: Knowledge Areas

Chapter 11 PROJECT RISK MANAGEMENT

What's a risk?

- Any time there's anything that **might** occur on your project that can change the outcome of a project activity, we call that a **risk**.
- Risk
 - Event e.g., a fire
 - Condition e.g., unavailability of an important part
 - Positive (opportunity) e.g., reduced cost
 - Negative (threat) e.g., increased time
- **A risk is any uncertain event or condition that might affect your project.**
- **A risk is an uncertain event or condition that, if it occurs, has an effect on at least one project objective (such as scope, cost and quality).**

Project Risk Management

Risk Attitude

- Much risk evaluation is subjective, depends on the nature of the risk taker. He/She can be:
 - Neutral
 - Risk Adverse (errs on the side of caution)
 - Risk Seeking (leans towards encouraging risks)

Factors Affecting Risk Attitude

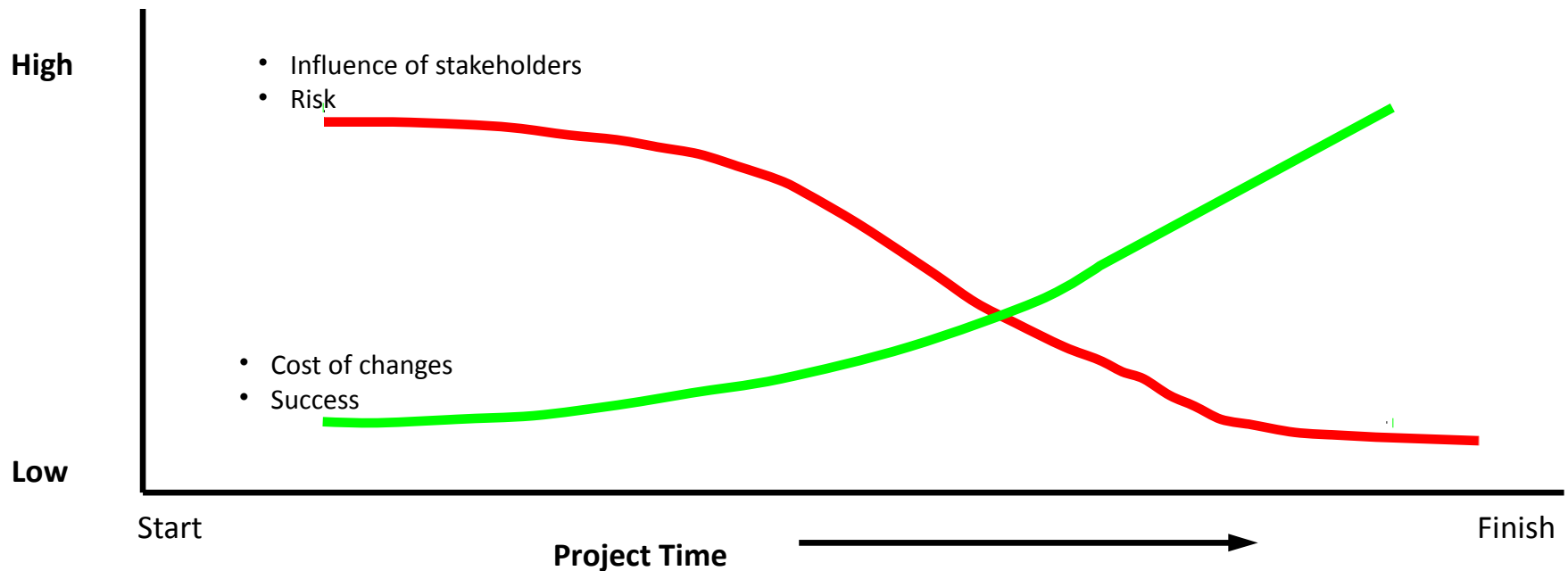
Organizations and stakeholders accept varying degrees of risk depending on their risk attitude. The risk attitudes may be influenced by several factors, classified as follows:

- **Risk appetite**
- **Risk tolerance**
- **Risk threshold**

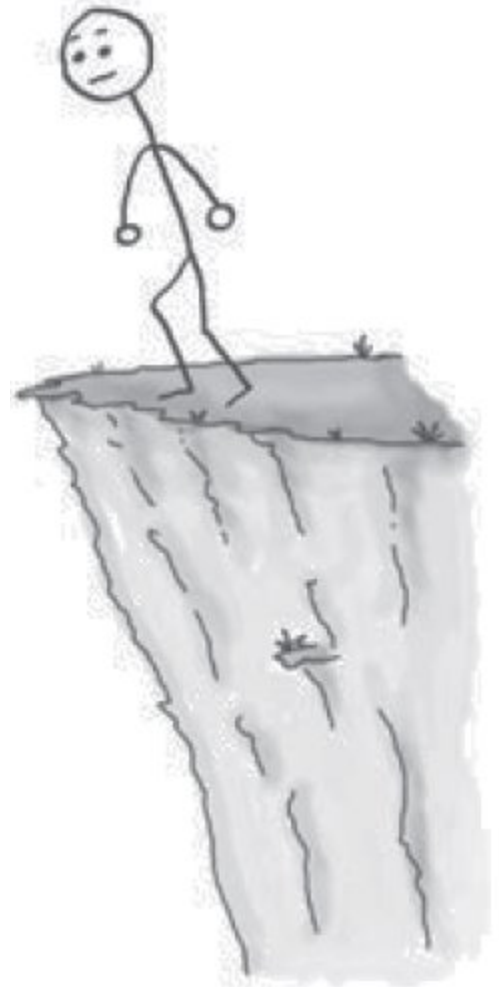
Risk and Project Life Cycle

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

	Start	End
Stakeholder	Highest	Lowest
Cost	Lowest	Highest
Risk	Highest	Lowest
Success	Lowest	Highest

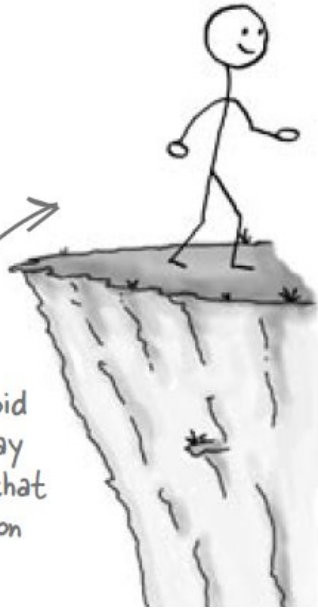


Dealing with (negative) risks



1**Avoid**

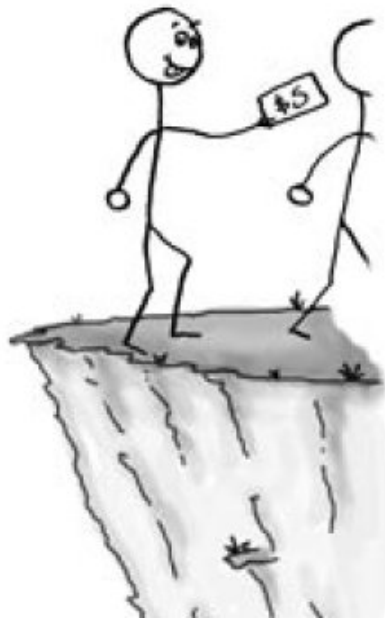
The best thing that you can do with a risk is avoid it—if you can prevent it from happening, it definitely won't hurt your project.



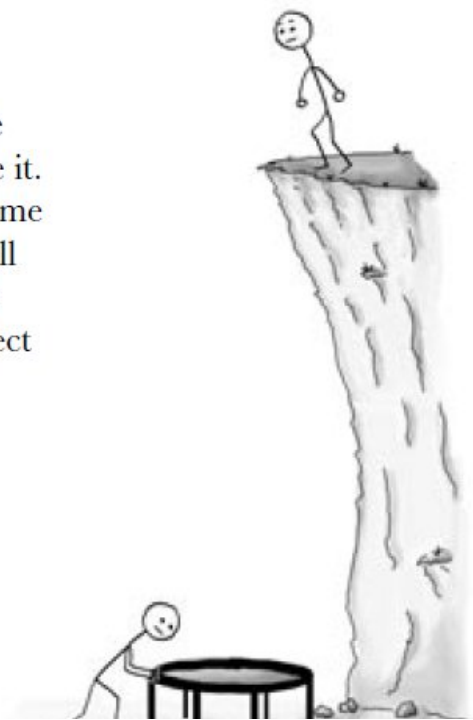
The easiest way to avoid this risk is to walk away from the cliff... but that may not be an option on this project.

3**Transfer**

One effective way to deal with a risk is to pay someone else to accept it for you. The most common way to do this is to buy insurance.

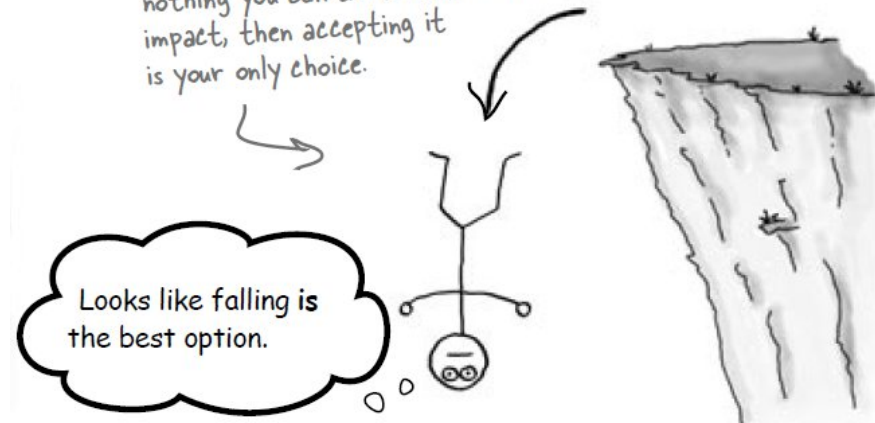
**2****Mitigate**

If you can't avoid the risk, you can mitigate it. This means taking some sort of action that will cause it to do as little damage to your project as possible.

**4****Accept**

When you can't avoid, mitigate, or transfer a risk, then you have to accept it. But even when you accept a risk, at least you've looked at the alternatives and you know what will happen if it occurs.

If you can't avoid the risk, and there's nothing you can do to reduce its impact, then accepting it is your only choice.



Project Risk Management Objectives

- Increase the probability and impact of positive events (**opportunities**).
- Decrease the probability and impact of negative events in the project (**threats**).

Project Risk Management

- **Plan Risk Management** – how to conduct risk management for a project
- **Identify Risks** – determine which risks may affect the project
- **Perform Qualitative Risk Analysis** – Prioritizing risks by way of probability and impact
- **Perform Quantitative Risk Analysis** – Numerically analyzing the effect of the risks on project
- **Plan Risk Response** – developing options/actions to enhance opportunities and reduce threats.
- **Control Risks** – implementing risks response plans, tracking identified risks, monitoring residual risks, identifying new risks and evaluating risk process effectiveness

Plan Risk Management

Defining how to conduct risk management activities for a project.

Inputs

1. Project management plan
2. Project charter
3. Stakeholder register
4. EEF
5. OPA

Tools & Techniques

1. Analytical techniques
2. Expert judgment
3. Meetings

Outputs

1. Risk management plan

Ensures that the degree, type, and visibility of risk management are commensurate with both the risks and the importance of the project to the organization.

Plan Risk Management

Importance of Risk Management Planning

Ensure that the degree, type, and visibility of risk management are commensurate.

Provide sufficient resource and time for risk management activities.

Establish an agreed-upon basis for evaluating risk.

Plan Risk Management – Output

Risk Management Plan may include:

Methodology

Risk categories

Definition of probability and impact

Stakeholder tolerances

Probability and impact matrix

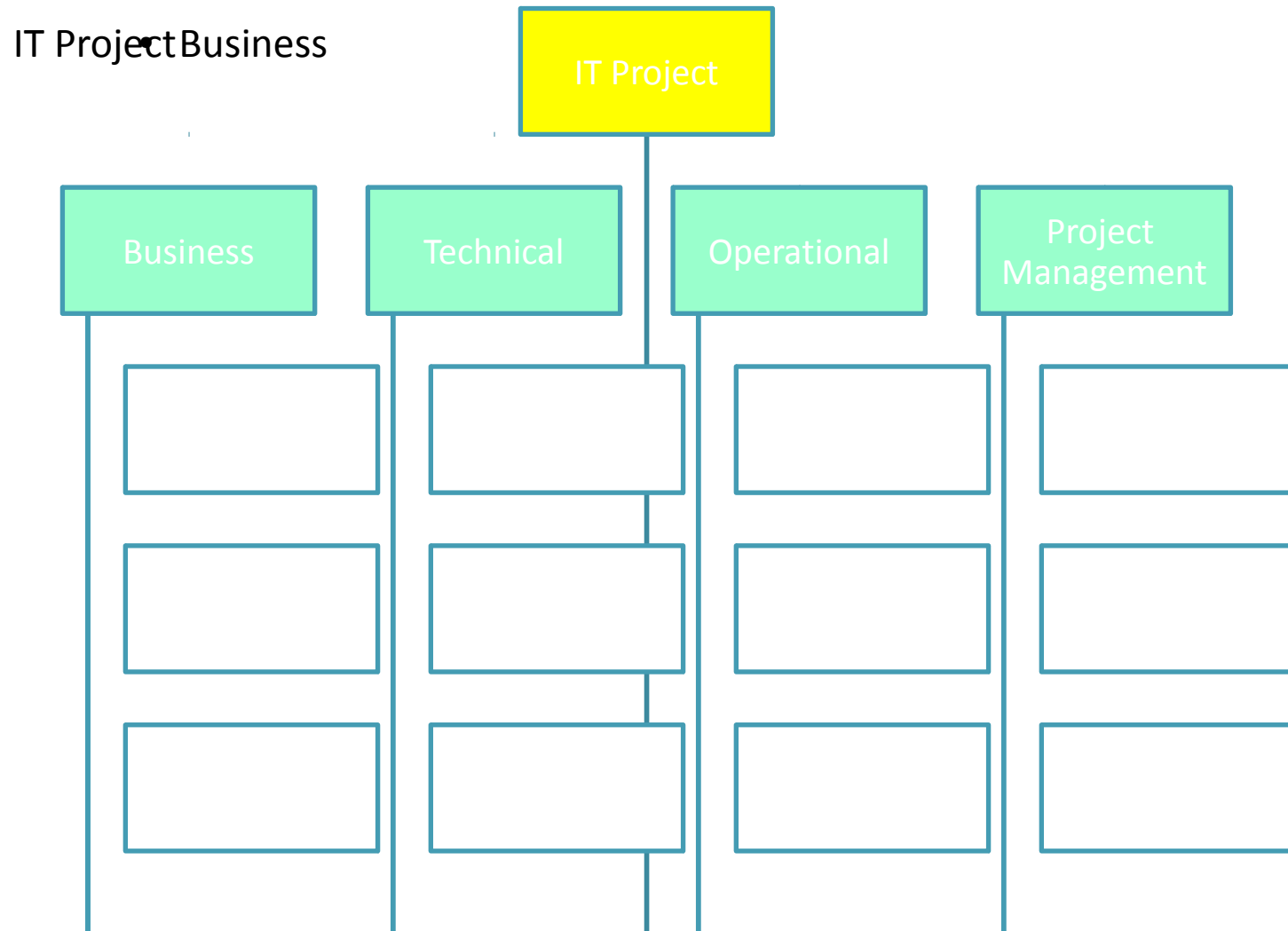
Revised stakeholders' tolerances

Reporting formats

Tracking

Plan Risk Management – Output

Risk Breakdown Structure (RBS) - A hierarchically-organized depiction of the identified project risks arranged by category.



Identify Risk

Determining which risks may affect the project and documenting their characteristics.

Inputs

1. Risk management plan
2. Cost management plan
3. Schedule management plan
4. Quality management plan
5. Human resource management plan
6. Scope baseline
7. Activity cost estimates
8. Activity duration estimates
9. Stakeholder register
10. Project documents
11. Procurement documents
12. EEF
13. OPA

Tools & Techniques

1. Documentation reviews
2. Information gathering techniques
3. Checklist analysis
4. Assumptions analysis
5. Diagramming techniques
6. SWOT analysis
7. Expert judgment

Outputs

1. Risk register

The documentation of existing risks and the knowledge and ability it provides to the project team to anticipate events.

Project Risk Management – T&T

How do you identify risks?

- Documentation Reviews (Lessons Learnt)
- Information Gathering Techniques
- Brainstorming
- Delphi Technique
- Interviewing
- Root Cause identifications
- Strength, weaknesses, opportunities, and threats (SWOT)
- Expert Judgment

Risk Register – Output

After Identify Risk process the output is initial entries into the risk register. It includes:

- List of risk
- List of POTENTIAL responses
- Root causes of risks
- Updated risk categories

Identified Risks	Potential Responses	Root Causes
High winds can lead to cliff disaster	Reinforce tent stakes; obtain weatherproof equipment	National weather service predicts 35% chance of high winds
Truck rental is unavailable	Pay to reserve equipment at a second company	Higher than expected demand for equipment in the area this season

Perform Qualitative Risk Analysis

Prioritizing risks for further analysis or action by assessing and combining their probability of occurrence and impact.

Inputs

1. Risk management plan
2. Scope baseline
3. Risk charter
4. EEF
5. OPA

Tools & Techniques

1. Risk probability and impact assessment
2. Probability and impact matrix
3. Risk data quality assessment
4. Risk categorization
5. Risk urgency assessment
6. Expert judgment

Outputs

1. Project documents update.

Enables project managers to reduce the level of uncertainty and to focus on high-priority risks.

Perform Qualitative Risk Analysis

- Help to focus on high priority risks
- A subjective analysis (**High, Medium, Low**)
- Analysis using...
 - Relative probability or likelihood of occurrence
 - Impact on project objective
 - Time frame response
 - Organization's risk tolerance
 - Etc.

Perform Qualitative Risk Analysis

- Can be also used to:
 - Compare risk to the overall risk of other projects
 - Determine whether the project should be selected, continued or terminated
 - Determine whether to proceed to Perform

Perform Qualitative Risk Analysis – T&T

- **Risk Probability and Impact Assessment**
 - investigates the likelihood that each specific risk will occur
- **Probability and Impact Matrix**
 - Each risk is rated on its probability of occurrence and impact on an objective if it does occur

Perform Qualitative Risk Analysis – T&T

A “**Risk Map / Matrix**” is a risk tool

- This shows the relationship between impact of risks and the probability of occurrence as a function of time

Perform Qualitative Risk Analysis – T&T

Probability and Impact Matrix

Probability	Threats					Opportunities				
0.90	0.05	0.09	0.18	0.36	0.72	0.72	0.36	0.18	0.09	0.05
0.70	0.04	0.07	0.14	0.28	0.56	0.56	0.28	0.14	0.07	0.04
0.50	0.03	0.05	0.10	0.20	0.40	0.40	0.20	0.10	0.05	0.03
0.30	0.02	0.03	0.06	0.12	0.24	0.24	0.12	0.06	0.03	0.02
0.10	0.01	0.01	0.02	0.04	0.08	0.08	0.04	0.02	0.01	0.01
	0.05	0.10	0.20	0.40	0.80	0.80	0.40	0.20	0.10	0.05

Impact (numerical scale) on an objective (e.g., cost, time, scope or quality)

Each risk is rated on its probability of occurring and impact on an objective if it does occur. The organization's thresholds for low, moderate or high risks are shown in the matrix and determine whether the risk is scored as high, moderate or low for that objective.

Figure 11-10. Probability and Impact Matrix

Perform Qualitative Risk Analysis – T&T

- **Risk Data Quality Assessment**
 - Used to evaluate the degree to which the data about risks is useful for risk management
- **Risk Categorization, by**
 - Sources of risk (using RBS)
 - Area of the project affected (using WBS)
 - Other categories to help determine areas of the project exposed to the effects of uncertainty
- **Risk Urgency Assessment**
 - Risks requiring near-term responses

Perform Quantitative Risk Analysis

Numerically analyzing the effect of identified risks on overall project objectives.

Inputs

1. Risk management plan
2. Cost management plan
3. Schedule management plan
4. Risk register
5. EEF
6. OPA

Tools & Techniques

1. Data gathering and representation techniques
2. Quantitative risk analysis and modelling techniques
3. Expert judgment

Outputs

1. Project documents update.

Produces quantitative risk information to support decision making in order to reduce project uncertainty.

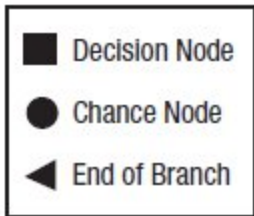
Perform Quantitative Risk Analysis – T&T

- **Data Gathering and Representation Techniques**
 - Interviewing
 - Probability distributions
- **Quantitative Risk Analysis and Modelling Techniques**
 - Sensitivity analysis
 - Expected monetary value analysis
 - Modelling and simulation

Perform Quantitative Risk Analysis

Decision Definition	Decision Node	Chance Node	Net Path Value
Decision to be Made	Input: Cost of Each Decision Output: Decision Made	Input: Scenario Probability, Reward if it Occurs Output: Expected Monetary Value (EMV)	Computed: Payoffs minus Costs along Path

Build or Upgrade?



Decision Tree (using Expected Monetary Value Analysis)

Perform Quantitative Risk Analysis – Output

- **Project Documents Updates**
 - Probabilistic analysis of the project
 - Probability of achieving cost and time objectives
 - Prioritized list of quantified risks
 - Trends in quantitative risk analysis results

Plan Risk Responses

- Risk Response Planning
 - Do something to eliminate the threats before they occur
 - Do something to make sure the opportunities happen
 - Develop options and actions to enhance opportunities and to reduce threats to project objectives
- For the remaining (residual) threats that cannot be eliminated:
 - Do something if the risk happens (contingency plans)
 - Do something if contingency plans are not effective (fallback plans)

Plan Risk Responses

Developing options and actions to enhance opportunities and to reduce threats to project objectives.

Inputs

1. Risk management plan
2. Risk register

Tools & Techniques

1. Strategies for negative risks or threats
2. Strategies for positive risks or opportunities
3. Contingent response strategies
4. Expert judgment

Outputs

1. Project management plan updates
2. Project documents updates

Addresses the risks by their priority, inserting resources and activities into the budget, schedule and project management plan as needed.

Plan Risk Responses – T&T

How do you respond to risk?

- **Negative Risks**
 - Accept (Risk Retention/Accept)
 - Mitigate (Risk Reduction)
 - Transfer (Risk transfer)
 - Avoid (Risk Avoidance)
- **Positive Risks**
 - Exploit
 - Share
 - Enhance
 - Accept

Strategies for Threats

- **Avoid**
Eliminate the threat entirely
Isolate project objectives from the risk's impact
- **Transfer (Deflect, Allocate)**
Shift some or all the negative impact of a threat to a third party.
- **Mitigate**
Implies a reduction in the probability and/or impact of an adverse risk event to be within acceptable threshold limits.
- **Accept**
Deal with the risks
Project management plan is not changed
Transferring a risk will leave some risk behind.

Strategies for Opportunities

- **Exploit**
Seek to ensure the opportunities definitely happen.
- **Share**
Allocate some or all of the ownership of the opportunity to a third party who is best able to capture the opportunity for the project benefit.
- **Enhance**
Increase the probability and/or the positive impacts of an opportunity.
- **Accept**
Not actively pursuing an opportunity

Contingent Response Strategies

- **Some responses are designed for use only if certain events occur**

Control Risk

Implementing risk response plans, tracking identified risks, monitoring residual risks, identifying new risks, and evaluating risk process effectiveness throughout the project

Inputs

1. Project management plan
2. Risk register
3. Work performance data
4. Work performance reports

Tools & Techniques

1. Risk reassessment
2. Risk audits
3. Variance and trend analysis
4. Technical performance measurement
5. Reserve analysis
6. Meetings

Outputs

1. Work performance information
2. Change requests
3. Project management plan updates
4. Project documents updates
5. OPA updates

Improves efficiency of the risk approach throughout the project life cycle to continuously optimize risk responses.

Control Risk

Involves executing the risk management process to respond to risk events.

Workarounds are unplanned responses to risk events that must be done when there are no contingency plans.

Main outputs of risk monitoring and control are:

- **Requested changes**
- **Outcomes of risk reassessments, risk audits, and periodic risk reviews**
- **Recommended corrective and preventive actions**
- **Updates to the risk register, project management plan, organizational process assets and project documents.**

Terminologies

- **Residual Risks** – Risks that are expected to remain after planned responses have been taken, as well as those have been deliberately accepted.
- **Secondary Risks** – Risks that arise as a direct outcome of implementing a risk response.
- **Recommended Corrective Actions** – For Risk monitor and Control include *Contingency plans and workaround plans*.
- **Workaround** Unplanned response to negative risk events. Work around plans are not initially planned but are required to deal with emerging risks that were previously unidentified or accepted.

Terminologies

- **Contingency Plan** Planned action steps to be taken if an identified residual risk occurs. (e.g. developing alternative activity sequences). It is for the risks which are accepted.
- **Contingency Reserve:** calculated based on the quantitative analysis of the project and organization' risk thresholds.
- **Fall Back Plan:** It is plan executed when contingency plan is not effective.

PMBOK: Knowledge Areas

Chapter 12

PROJECT PROCUREMENT MANAGEMENT

Knowledge Area	Process Groups				
	Initiating	Planning	Executing	Monitor / Controlling	Closing
Integration	4.1 Develop Project Charter	4.2 Develop Project Management Plan	4.3 Direct and Manage Project Execution	4.4 Monitor and Control Project Work 4.5 Perform Integrated Change Control	4.6 Close Project or Phase
Scope		5.1 Plan Scope Management 5.2 Collect Requirements 5.3 Define Scope 5.4 Create WBS		5.5 Validate Scope 5.6 Control Scope_	
Time		6.1 Plan Schedule Management 6.2 Define Activities 6.3 Sequence Activities 6.4 Estimate Activity Resources 6.5 Estimate Activity Durations 6.6 Develop Schedule		6.7 Control Schedule	
Cost		7.1 Plan Cost Management 7.2 Estimate Costs 7.3 Determine Budget		7.4 Control Costs	
Quality		8.1 Plan Quality Management	8.2 Perform Quality Assurance	8.3 Quality Control	
Human Resource		9.1 Plan Human Resource Management	9.2 Acquire Project Team 9.3 Develop Project Team 9.4 Manage Project Team		
Communications		10.1 Plan Communications Management	10.2 Manage Communications	10.3 Control Communications	
Risk		11.1 Plan Risk Management 11.2 Identify Risks 11.3 Perform Qualitative Risk Analysis 11.4 Perform Quantitative Risk Analysis 11.5 Plan Risk Responses		11.6 Control Risks	
Procurement		12.1 Plan Procurement Management	12.2 Conduct Procurements	12.3 Control Procurements	12.4 Close Procurements
Stakeholder	13.1 Identify Stakeholders	13.2 Plan Stakeholder Management	13.3 Manage Stakeholder Engagement	13.4 Control Stakeholder Engagement	

Project Procurement Management

- Processes required to **acquire products, services or results** from **outside the project team**
- Discussed from the perspective of the **buyer**
 - Terms & conditions of the contract is a key input to many processes
 - Buyer is the customer, thus a key stakeholder
 - Seller's project management team must be concerned with all processes of project management, not just their knowledge area

Project Procurement Management

What forms a **contract**

An **offer**

An **acceptance**

Consideration - something of value

Legal Capacity – separate legal parties, competent parties

Legal Purpose – cannot perform illegal goods or services

Project Procurement Management

- **Project Manager's role for procurement**
 - Risk identification & evaluation
 - Work within the procurement process
- **Procurement Process**
 - Procurement Planning = Make or buy
 - Solicitation Planning = Request for Proposal
 - Solicitation = Questions & Answers
 - Source Selection = Pick vendor
 - Contract Administration = Admin
 - Contract Closeout = Finish

Project Procurement Management

- **Plan Procurement Management** - Documenting project purchasing decisions, specifying the approach, and potential sellers
- **Conduct Procurement** - obtaining seller responses, selecting sellers and awarding contract
- **Control Procurements** - Managing procurement relationships, monitoring contract performance and making changes and corrections as needed
- **Close Procurements** - Completing each project procurement

Plan Procurement Management

Documenting project procurement decisions, specifying the approach, and identifying potential sellers.

Inputs

1. Project management plan
2. Requirements documentation
3. Risk register
4. Activity resource requirements
5. Project schedule
6. Activity cost estimates
7. Stakeholder register
8. EEF
9. OPA

Tools & Techniques

1. Make-or-buy analysis
2. Expert judgment
3. Market research
4. Meetings

Outputs

1. Procurement management plan
2. Procurement statement of work
3. Procurement documents
4. Source selection criteria
5. Make-or-buy decisions
6. Change requests
7. Project documents updates

Determines whether to acquire outside support, and if so, what to acquire, how to acquire it, how much is needed, and when to acquire it.

Plan Procurement Management

- Plan Procurement Management identifies those project needs that can **best be met** or **should be met** by acquiring products, services, or results outside of the project organization.
- It also entails evaluating potential sellers

Plan Procurement Management – Input

- Contract Type Selection – reasonable risk between the buyer & seller & greatest initiative for seller's efficient & economic performance
 - Scope – well defined?
 - Amount or frequency of changes expected after start date
 - Amount of effort & expertise the buyer can devote to manage the seller
 - Industry standards

Plan Procurement Management – **Input**

Contract types:

- **Fixed Price**
- **Cost Reimbursable Contracts**
- **Time & Materials**

Plan Procurement Management – Input

Contract Types:

- Cost Reimbursable (CR); seller's cost are reimbursed; buyer bears highest risk (cost increases)
 - **CPFF** – cost plus fixed fee, buyer pays all costs – fee (profit) established
 - **CPIF** – cost plus Incentive Fee; seller costs + fee + bonus for meeting/exceeding target (incentive clause). % of savings or shares in cost overruns.
 - **CPAF** – Cost Plus Award Fee
- This form of contract is often used when the buyer can only describe what is needed, rather than what to do.

Plan Procurement Management – **Input**

- **Time & Materials**; priced on per hour or per-item basis, elements of fixed price contract & cost reimbursable contracts.
 - Used for service efforts in which the level of effort cannot be defined at the time the contract is awarded
 - Work valued at small dollar amounts
 - Lasting a short amount of time
 - Buyer has medium risk

Plan Procurement Management – Input

- **Fixed Price** (lump sum, or firm fixed price) - most common (1 price for all work), risk of costs is upon seller
 - **FFP** – Firm Fixed Price
 - **FPIF** – Fixed Price Incentive Fee
 - **FPEPA** – Fixed Price Economic Price Adjustment – long duration projects
- Incentives – help bring seller's objectives in line with buyer's

Plan Procurement Management – Input

Contract Type vs. Risk Allocation

Scope of Work Information	Very Little	Partial			Complete
Uncertainty	HIGH	MODERATE			LOW
Degree of Risk	HIGH	MODERATE			LOW
Suggested Risk Allocation	100%	Buyer			0%
	0%	Seller			100%
Contract Types	CPFF	CPAF/ CPIF	T&M	FP-EPA / FPIF	FFP

CPFF: Cost + % Fee

CPIF: Cost + Incentive Fee

CPFF: Cost + Fixed Fee

FPIF: Firm Price + Incentive Fee

FFP: Firm Fixed Price

Plan Procurement Management – T&T

- **Make or Buy:** consider out of pocket costs & indirect cost of managing procurement
- **Buy** – to decrease risk (cost, schedule, performance, scope of work)
- **Make**
 - Idle plant or workforce
 - Retain control
 - Proprietary information/procedures
 - Buy vs. lease questions (use X = number of days when purchase & lease costs are equal)

Plan Procurement Management - T&T

- Make or Buy example *
- *You are trying to decide whether to lease or buy an item for your project. The daily lease cost is \$120. To purchase the item, the investment cost is \$1,000 and the daily cost is \$20. How long will it take for the lease cost to be the same as the purchase cost?*
- *Let D equal the number of days when the purchase and lease costs are equal.*
- $\$120D = \$1,000 + \$20D$
- $\$120D - \$20D = \$1,000$
- $\$100D = \$1,000$
- $D = 10$

Plan Procurement Management - T&T

Incentive Fee & Final Price Calculations

– Must Have:

- **Target Cost**
- **Target Fee**
- **Target Price**
- **Sharing Ratio** (buyer/seller)
- **Actual Cost**

– **Fee** = (Target Cost – Actual Cost) x Seller Ratio (%)

– **Total Fee** = Fee + Target Fee

– **Final Price** = Actual Cost + Total Fee

Plan Procurement Management – Output

Procurement Documents, Contract Type & Scope of Work

Request for Proposal – Cost Reimbursable – Performance or Functional Scope (can be somewhat loosely defined)

Invitation for Bid – Time & Materials – Design Scope (moderately defined)

Request for Quotation – Fixed Price – Any Scope (must be detailed)

Plan Procurement Management – Output

Source Selection Criteria

Understanding of need

Overall or life-cycle cost

Technical ability

Risk

Management Approach

Technical Approach

Warranty

Financial Capacity

Production capacity and interest

Project Management Ability

Plan Procurement Management – Output

Procurement Statement of Work (SOW)

The SOW for each procurement is developed from the project scope baseline and defines only that portion of the project scope that is to be included within the related contract

Plan Procurement Management

Terminology (Terms & Conditions)

Force majeure – act of God

Indemnification – who is liable

Liquidated damages – estimated damages as a result of contract breach

Material breach – a breach so large the project may not continue

Special Provisions – provided by the Project Manager to contracts so that particular needs are addressed

Privity – contractual relationship

Single Source – contract directly with preferred seller

Sole Source – only one supplier available in market

Conduct Procurement

Obtaining seller responses, selecting a seller, and awarding a contract

Inputs

1. Procurement management plan
2. Procurement documents
3. Source selection criteria
4. Seller proposals
5. Project documents
6. Make-or-buy decisions
7. Procurement statement of work
8. OPA

Tools & Techniques

1. Bidder conference
2. Proposal evaluation techniques
3. Independent estimates
4. Expert judgment
5. Advertising
6. Analytical techniques
7. Procurement negotiations

Outputs

1. Selected sellers
2. Agreements
3. Resource calendars
4. Change requests
5. Project management plan updates
6. Project documents updates

Provides alignment of internal and external stakeholder expectations through established agreements.

Conduct Procurements – **Input**

- **Make-or-Buy Decisions:** Factors that influence make-or-buy decisions may include:
 - **Core capabilities of the organization**
 - **Value delivered by vendors meeting the need**
 - **Risks associated with meeting the need in a cost-effective manner,**
 - **Capability internally compared with the vendor community**

Conduct Procurements – T&T

- **Bidder Conferences** : Bidder conferences are meetings with prospective vendors or sellers that occur prior to the completion of their response proposal.
- **Proposal evaluation techniques**
- **Independent estimates**
- **Expert judgment**
- **Advertising**: Advertising is letting potential vendors know that an RFP is available.
- **Internet search**
- **Procurement Negotiations**

Conduct Procurements – Outputs

- **Selected Sellers**

- A seller may simply be selected and asked to sign a standard contract
- A seller may be asked to make a presentation and then, if all goes well, go on to negotiations
- The list of sellers may be narrowed down to a few
- The short-listed sellers may be asked to make presentations and the selected seller then asked to go on to negotiations
- The buyer can negotiate with more than one seller

- **Agreement**

- Agreements are known by many names: **Contracts, Purchase order, Memorandum of understanding**
- Or some combination of presentations and negotiations

Control Procurements

managing procurement relationships, monitoring contract performance, and making changes and corrections to contracts as appropriate

Inputs

1. Procurement documents
2. Agreements
3. Approved change requests
4. Work performance reports
5. Work performance data

Tools & Techniques

1. Contract change control system
2. Procurement performance reviews
3. Inspections and audits
4. Performance reporting
5. Payment systems
6. Claims administration
7. Records management system

Outputs

1. Work performance information
2. Change requests
3. Project management plan updates
4. Project documents updates
5. OPA updates

Ensures that both the seller's and buyer's performance meets procurement requirements according to the terms of the legal agreement.

Control Procurements

- **Claims Administration**

- A **claim** is an assertion that the buyer did something that has hurt the seller and the seller asking for compensation. Claims can get nasty
- Claims administration involves documenting, monitoring, and managing changes to the contract.
- Changes that cannot be agreed upon are called **contested changes**.
- Contested changes are also known as disputes, claims, or appeals. These can be settled directly between the parties themselves, through arbitration or the court system.
- The purpose of arbitration is to reach an agreement without having to go to court.

Close Procurements

- This process consists of finishing all the loose ends of the contract.
- This process is part of the close project process described in integration.

Contract closure is done:

- When a contract ends
- When a contract is terminated before the work is completed
- This process is concerned with completing and settling the terms of the contract.
- It supports the Close Project process because the Contract Closure process determines if the work described in the contract was completed accurately and satisfactorily.
- This is called product verification

Close Procurements

Process of completing each procurement

Inputs

1. Project management plan
2. Procurement documents

Tools & Techniques

1. Procurement audits
2. Procurement negotiations
3. Records management system

Outputs

1. Closed procurements
2. Organizational process assets updates

Documents agreements and related documentation for future reference.

PMBOK: Knowledge Areas

Chapter 13

PROJECT STAKEHOLDER MANAGEMENT

Knowledge Area	Process Groups				
	Initiating	Planning	Executing	Monitor / Controlling	Closing
Integration	4.1 Develop Project Charter	4.2 Develop Project Management Plan	4.3 Direct and Manage Project Execution	4.4 Monitor and Control Project Work 4.5 Perform Integrated Change Control	4.6 Close Project or Phase
Scope		5.1 Plan Scope Management 5.2 Collect Requirements 5.3 Define Scope 5.4 Create WBS		5.5 Validate Scope 5.6 Control Scope_	
Time		6.1 Plan Schedule Management 6.2 Define Activities 6.3 Sequence Activities 6.4 Estimate Activity Resources 6.5 Estimate Activity Durations 6.6 Develop Schedule		6.7 Control Schedule	
Cost		7.1 Plan Cost Management 7.2 Estimate Costs 7.3 Determine Budget		7.4 Control Costs	
Quality		8.1 Plan Quality Management	8.2 Perform Quality Assurance	8.3 Quality Control	
Human Resource		9.1 Plan Human Resource Management	9.2 Acquire Project Team 9.3 Develop Project Team 9.4 Manage Project Team		
Communications		10.1 Plan Communications Management	10.2 Manage Communications	10.3 Control Communications	
Risk		11.1 Plan Risk Management 11.2 Identify Risks 11.3 Perform Qualitative Risk Analysis 11.4 Perform Quantitative Risk Analysis 11.5 Plan Risk Responses		11.6 Control Risks	
Procurement		12.1 Plan Procurement Management	12.2 Conduct Procurements	12.3 Control Procurements	12.4 Close Procurements
Stakeholder	13.1 Identify Stakeholders	13.2 Plan Stakeholder Management	13.3 Manage Stakeholder Engagement	13.4 Control Stakeholder Engagement	

Project Stakeholder Management

- **Identify Stakeholders** — Identifying all people or organizations impacted by the project, and documenting relevant info regarding their interests, involvement, and impact on project success.
- **Plan Stakeholder Management**— Developing strategies to effectively engage stakeholders throughout the project life cycle.
- **Manage Stakeholder Engagement** — communicating and working with stakeholders to meet their needs/expectations.
- **Control Stakeholder Engagement** — monitoring overall project stakeholder relationships and adjusting strategies and plans.

Project Stakeholders

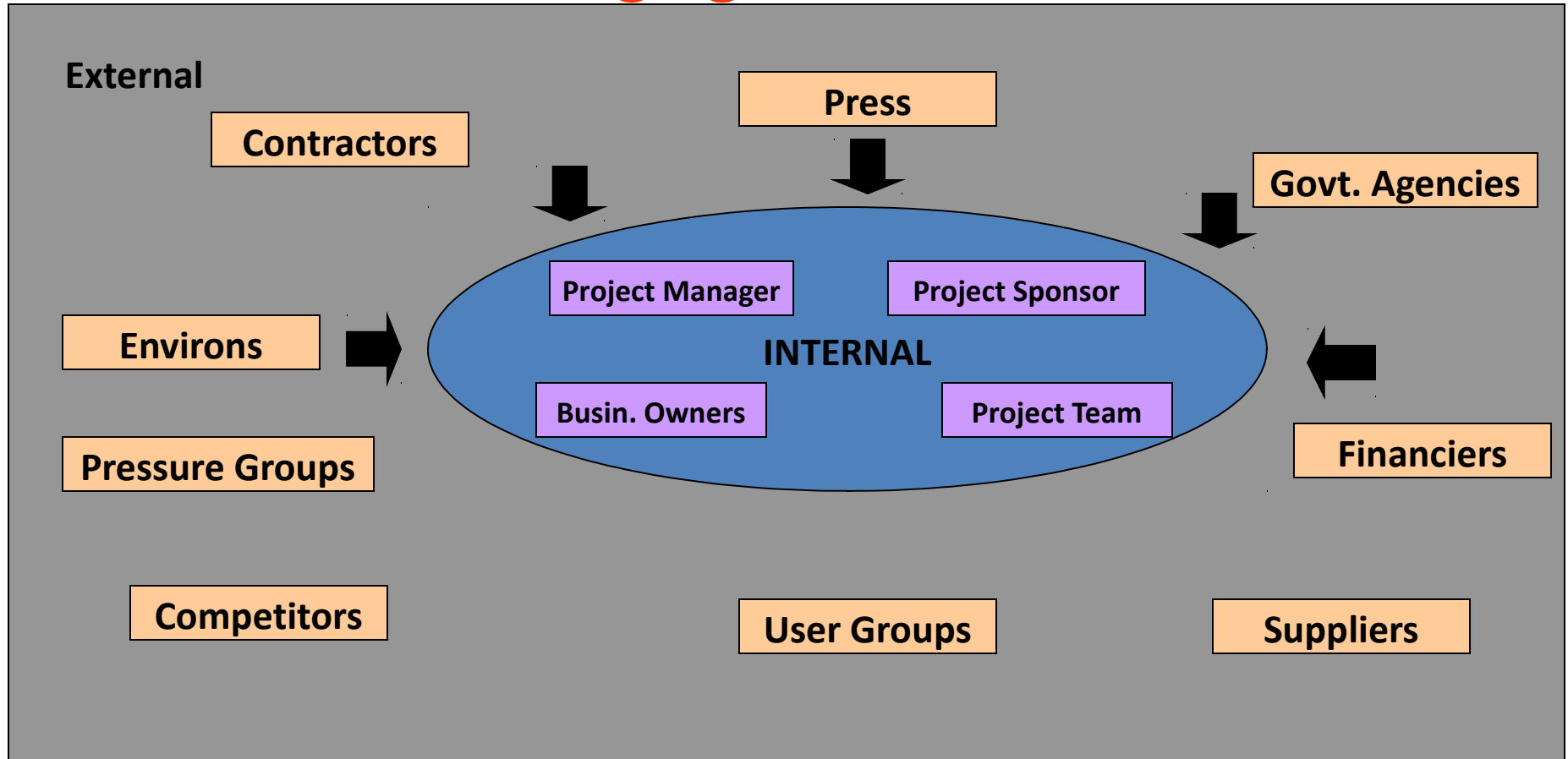
Project Managers
Customers
Sponsor
Team
Internal/External
End User
Society, citizens
Others: owner,
funders, supplier,
contractor



- **Individuals, groups or organizations** who **may affect, be affected by,** or **perceive** themselves to be affected by a **decision, activity, or outcome** of a project.

Project Stakeholders

Managing Stakeholders



Identify Stakeholders

Identifying the people, groups, or organizations that could impact or be impacted by a decision, activity, or outcome of the project, analyzing and documenting relevant information regarding their interests, involvement, interdependencies, influence, and potential impact on project success.

Inputs

1. Project charter
2. Procurement documents
3. EEF
4. OPA

Tools & Techniques

1. Stakeholder analysis
2. Expert judgment
3. Meetings

Outputs

1. Stakeholder Register

Allows the project manager to identify the appropriate focus for each stakeholder or group of stakeholders.

What Should Be Done With Stakeholders Throughout the Project?

- **Identify all of them**
- **Determine all of their requirements**
- **Determine their expectations**
- **Determine their interests**
- **Determine their level of influence**
- **Plan how you will communicate with them**
- **Communicate with them**
- **Manage their expectations and influence**

Stakeholder Analysis

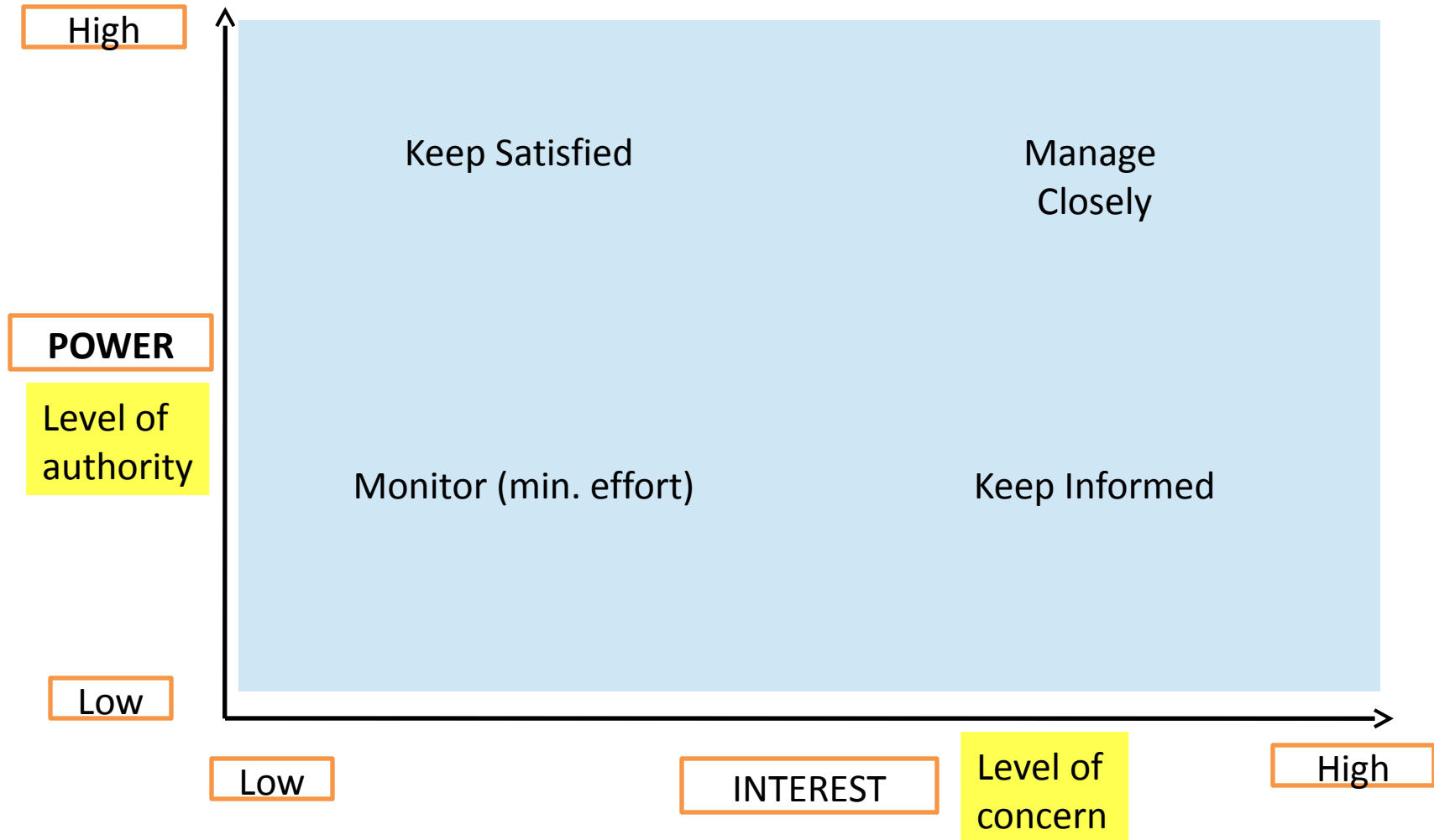
A technique of systematically gathering and analyzing quantitative and qualitative information to determine whose interests should be taken into account throughout the project.

- **Identify all potential project stakeholders and relevant information**
- **Analyze the potential impact or support**
- **Assess how key stakeholders are likely to react or respond**

Stakeholder Analysis

- Power/Interest Grid
- Power/Influence Grid
- Influence/Impact Grid
- Salience Model

Stakeholder Analysis



Output of Identify Stakeholder

- Stakeholder Register

Name	Contact Information	Role in Project	Department/Supervisor	Company	Impact	Influence	Main expectations	Attitude about the project	Major requirement
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Plan Stakeholder Management

Developing appropriate management strategies to effectively engage stakeholders throughout the project life cycle, based on the analysis of their needs, interests, and potential impact on project success.

Inputs

1. Project management plan
2. Stakeholder register
3. EEF
4. OPA

Tools & Techniques

1. Stakeholder analysis
2. Meetings
3. Analytical techniques

Outputs

1. Stakeholder management plan
2. Project documents updates

Provides a clear, actionable plan to interact with project stakeholders to support the project's interests.

Plan Stakeholder Management – T&T

- **Current Engagement vs Planned Engagement Levels**
 - **Unaware.** Unaware of project and potential impacts.
 - **Resistant.** Aware of project and potential impacts and resistant to change.
 - **Neutral.** Aware of project yet neither supportive nor resistant.
 - **Supportive.** Aware of project and potential impacts and supportive to change.
 - **Leading.** Aware of project and potential impacts and actively engaged in ensuring the project is a success.

Stakeholder	Unaware	Resistant	Neutral	Supportive	Leading
Stakeholder 1	C			D	
Stakeholder 2			C	D	
Stakeholder 3				D C	

Figure 13-7. Stakeholders Engagement Assessment Matrix

Plan Stakeholder Management – Output

Stakeholder Management Plan... elements of

- Engagement levels of key stakeholders
- Scope and impact of change to stakeholders
- Stakeholder communication requirements
- Information to be distributed to stakeholders
- Time frame and frequency for the distribution of required information
- Method for updating and refining the stakeholder management plan

Managing Stakeholder Engagement

Communicating and working with stakeholders to meet their needs/expectations, address issues as they occur, and foster appropriate stakeholder engagement in project activities throughout the project life cycle.

Inputs

1. Stakeholder management plan
2. Communications management plan
3. Change log
4. OPA

Tools & Techniques

1. Communication methods
2. Interpersonal skills
3. Management skills

Outputs

1. Issue log
2. Change requests
3. Project management plan updates
4. Project documents updates
5. OPA updates

Allows the project manager to increase support and minimize resistance from stakeholders, significantly increasing the chances to achieve project success.

Managing Stakeholder Engagement

- Engage stakeholders
- Management stakeholders expectations
- Address potential concerns
- Clarifies and resolves issues that have been identified or those that can occur

Managing Stakeholder Engagement – T&T

- Interpersonal Skills
 - Building trust,
 - Resolving conflict,
 - Active listening, and
 - Overcoming resistance to change

Control Stakeholder Engagement

Monitoring overall project stakeholder relationships and adjusting strategies and plans for engaging stakeholders.

Inputs

1. Project management plan
2. Issue log
3. Work performance data
4. Project documents

Tools & Techniques

1. Information management systems
2. Expert judgment
3. Meetings

Outputs

1. Work performance information
2. Change requests
3. Project management plan updates
4. Project documents updates
5. OPA updates

Maintain or increase the efficiency and effectiveness of stakeholder engagement activities as the project evolves and its environment changes.

PMBOK: Supplemental

Ethics & Professional Responsibilities

What Is Ethics?

- The term ethics refers to *knowing what is right from wrong and choosing to do what's right*, regardless of the circumstances.
- The word *ethics* originated from the Greek word, **Ethos**, which means *character* – our reputation/our good name.
- We develop a character which is in line with our mindset or attitude; therefore, *ethics* is generally considered to be a mindset or a way of thinking.

What Is Ethics?

- Ethics are about making choices that may not always feel good or seem like they benefit you but are the “right” choices to make.
- They are the choices that are examples of “model citizens” and examples of the golden rules.
- We’ve all heard the golden rules: Don’t hurt, don’t steal, don’t lie, or one of the most famous: “Do unto others as you would have done to you.”

Ethical Dilemma

A situation in which one has to decide between what's right and wrong conduct. Examples:

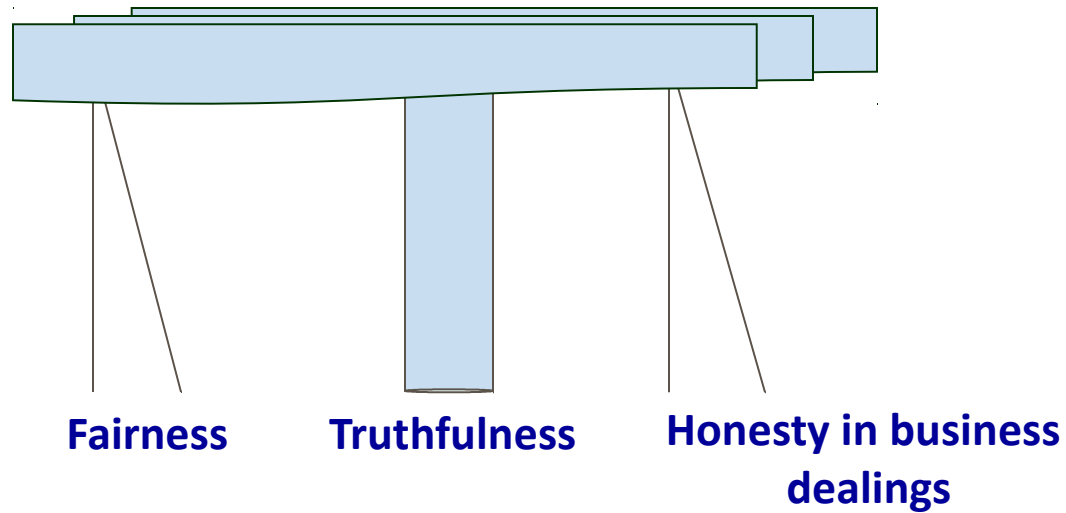
- “Play politics” to help your career?
- “Blow the whistle” if you discover illegal activities on your project?
- ***“Let your conscience be your guide”*** is an unreliable approach. Conscience varies with person and time.

Acquiring Ethical Values

- We engage in project activities with a set of ethical values which have been influenced by:
 - Family
 - Peers
 - Religious Beliefs
 - The Constitution
 - Other Experiences
 - etc.

Business Ethics

- Business ethics is built upon three (3) pillars



What is an ethical response?

- One of the important matters to consider when thinking about difficult issues is the need to distinguish between an ethical and a legal issue, and to identify whether an issue has both legal and ethical implications.
- Some ethical issues do not have legal implications. For example, it is ethical to be honest with colleagues but there are no legal requirements for this professional behaviour.

Impact Of Ethical Decisions

- It is important to manage ethics on a project.
- Once proper attention is given to business ethics, the following benefits can be reaped:
 - **Employees** – motivated, teamwork, more productive, more honest
 - **Customers** – more loyal, less opportunities to sue
 - **Community** – will view the company as being responsible

Code of Professional Conduct or Ethics

- In every field of study, there is a Code of Professional Conduct or Ethics to govern the practitioners in order to protect the integrity of the profession.
- For instance, there is a Code of Conduct / Ethics for the medical profession, the legal profession, the nursing profession, the financial profession and the project management profession.
- Everyone is expected to act ethically.

PROFESSIONAL

RESPONSIBILITY



Professional Responsibility

- The PMP Code of Professional Conduct is the authoritative guide on how the PMP should act as a professional, and how the PMP should behave with customers and the public in general.
- The PMP exam candidate will be tested on their knowledge of the PMP Code of Professional Conduct.

Responsibilities to the Profession

- The PMP must adhere to a high set of principles, rules, and policies.
- This includes the organizational rules and policies, the certification process, and the advancement of the profession.
- On the exam, always choose the answer which best supports the PMP profession and the higher set of principles the candidate is expected to adhere to.

Professional Responsibility

The five areas of professional responsibility consist of the following:

- Ensuring integrity
- Contributing to the knowledge base
- Applying professional knowledge
- Balancing stakeholder interests
- Respecting differences

Ensure Individual Integrity

- Tell the truth in reports, conversations and other communications
- Follow copyright and other laws
- Don't divulge company data to unauthorized parties
- Value and protect intellectual (non-tangible) property
- Don't put personal gain over the needs of the project
- Prevent conflicts of interest or the appearance of conflicts of interest and deal with them when they do occur

Ensure Individual Integrity

- Don't give or take bribes or inappropriate gifts
- Treat everyone with respect
- Follow PMI's Code of Professional Conduct
- Do the right thing
- Follow the right process
- Report violations of laws, business policies, ethics and other rules

Contribute to the Project Management Knowledge

- Share lessons learned from the project with other project managers in the company .
- Write articles about project management
- Support the education of other project managers and stakeholders about project management.
- Coach or mentor other project managers and project team members
- Perform research to discover best practices for the use of project management and share the results with others
- Perform research on projects done within the company for the purpose of calculating performance metrics

Advancing the Profession

- The PMP must respect and recognize the intellectual work and property of others.
- The PMP can't claim others' work as their own.
- He/ She must give credit where credit is due.
- Work, research, and development sources must be documented and acknowledged by the PMP when relying on others' work.

Complying with Rules and Policies

Honesty is expected in all areas regarding the PMP examination process including:

- Exam applications must be honest and reflect actual education and work experience.
- Test items, questions, answers, and scenarios are not to be shared with other PMP candidates.
- PMP renewal information must reflect an honest assessment of education and experience.
- Continuing education information must be honest and accurate; continuing education reporting must reflect actual courses completed

Applying Honesty to the Profession

- The candidate is expected, at all times, to provide honesty in experience documentation, the advertisement of skills, and the performance of services.
- The PMP must, of course, adhere to and abide by all applicable laws governing the project work. In addition, the ethical standards within the trade or industry should also be adhered to.

Balancing Stakeholders Needs

- Balance Stakeholder's Objectives
 - Understand the various competing stakeholders' interests and needs
 - Comprehend the conflict resolution techniques useful in handling differing objectives
 - Be able to resolve conflicts in a fair manner
 - Exercise negotiation skills based on proper information

Responsibilities to the Customer & to the Public

- The candidate also has a responsibility to the customer of the project and the public.
- Projects that affect internal customers are expected to meet requirements and standards, and fulfill the business need of the performing organization.
- Essentially, the candidate is working for the customer.

Enforcing Project Management Truth & Honesty

- The candidate must represent themselves and their projects truthfully to the general public.
- This includes statements made in advertising, press releases, and in public forums.
- When project managers are involved in the creation of estimates, truth is also expected.
- The candidate must provide accurate estimates on time, cost, services to be provided—and realistic outcomes of the project work.

Eliminating Inappropriate Actions

- A PMP must avoid conflicts of interest and scenarios where conflicts of interest could seem apparent, opportunistic, or questionable to the customer or other stakeholders.
- In addition, the candidate must not accept any inappropriate gifts, inappropriate payments, or any other compensation for favors, project management work, or influence of a project.

Respecting Differences

- Interact with team and stakeholders in a professional and cooperative manner
 - Understand cultural diversity, norms and stakeholders' communication styles
 - Show flexibility towards diversity, tolerance and self control
 - Becoming empathetic to differences

Summary

- **Be Responsible**
- **Be Respectful**
- **Be Fair**
- **Be Honest**

Be Responsible

- Make decisions based on the best interests of the company rather than your own personal interest
- Only accept assignments you are qualified to complete
- Protect proprietary information
- Report unethical behaviour and violations

Be Respectful

- Maintain an attitude of mutual cooperation
- Respect cultural differences
- Engage in good faith negotiations
- Be direct in dealing with conflict
- Do not use your power or position to influence others for your own benefit

Be Fair

- Act impartially without bribery
- Continuously look for conflicts of interest and disclose them
- Do not discriminate against others
- Do not use your position for personal or business gain

Be Honest

- Try to understand the truth
- Be truthful in all communications
- Create an environment where others tell the truth

THE END