

PROCESS GROUPS & KNOWLEDGE AREAS TABLE

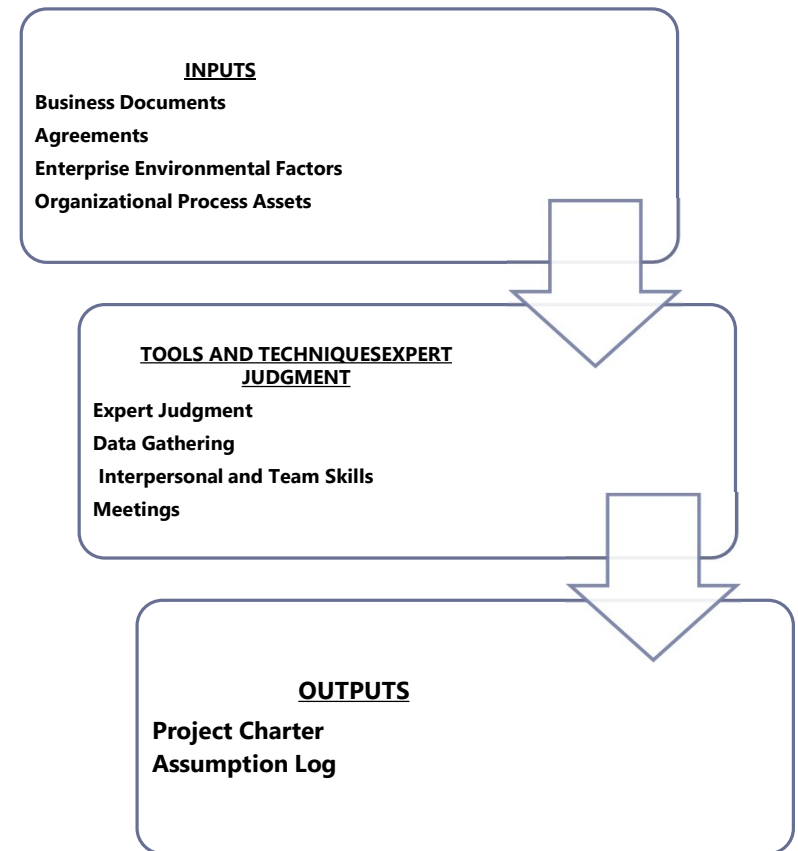
Page 22, PMI Process Groups
A Practice Guide

Project Management Process Groups				
Initiating	Planning	Executing	Monitoring & Controlling	Closing
Develop Project Charter Identify Stakeholders	Develop Project Management Plan Plan Scope Management Collect Requirements Define Scope Create WBS Plan Schedule Management Define Activities Sequence Activities Estimate Activity Durations Develop Schedule Plan Cost Management Estimate Costs Determine Budget Plan Quality Management Plan Resource Management Estimate Activity Resources Plan Communications Management Plan Risk Management Identify Risks Perform Qualitative Risk Analysis Perform Quantitative Risk Analysis Plan Risk Responses Plan Procurement Management Plan Stakeholder Engagement	Direct and Manage Project Work Manage Project Knowledge Manage Quality Acquire Resources Develop Team Manage Team Manage Communications Implement Risk Responses Conduct Procurements Manage Stakeholder Engagement	Monitor and Control Project Work Perform Integrated Change Control Validate Scope Control Scope Control Schedule Control Costs Control Quality Control Resources Monitor Communications Monitor Risks Control Procurements Monitor Stakeholder Engagement	Close Project or Phase

Develop Project Charter

- The process of developing a document to formally authorize a project or a phase
- Outlines the project objectives
- Defines the authority of the project manager
- Provides the project manager with the authority to put the resources together to project activities
- The approved project charter formally initiates the project

Develop Project Charter



Develop Project Charter - Inputs

- **Inputs**
 - **Business Documents** - Contain specific information as to why a project should be initiated. There are two main documents the business case and the benefits management plan.
 - ▶ **Business Case** - Necessary information that determines whether or not the project is worth the required investment
 - Market Demand, Customer Request, Organizational Need, Legal requirement
 - ▶ **Project Benefits Management Plan**
 - Describes the main benefits that the project will produce once it is completed and how to measure the benefits. The project benefit could be the product, service, or result.
 - It maybe created by doing a cost-benefit analysis a project.

Develop Project Charter - Inputs

■ **Agreements**

- Service Level Agreements (SLA)
- Letters of intent
- Contract between internal and external customer
- Work required to be performed for Payment

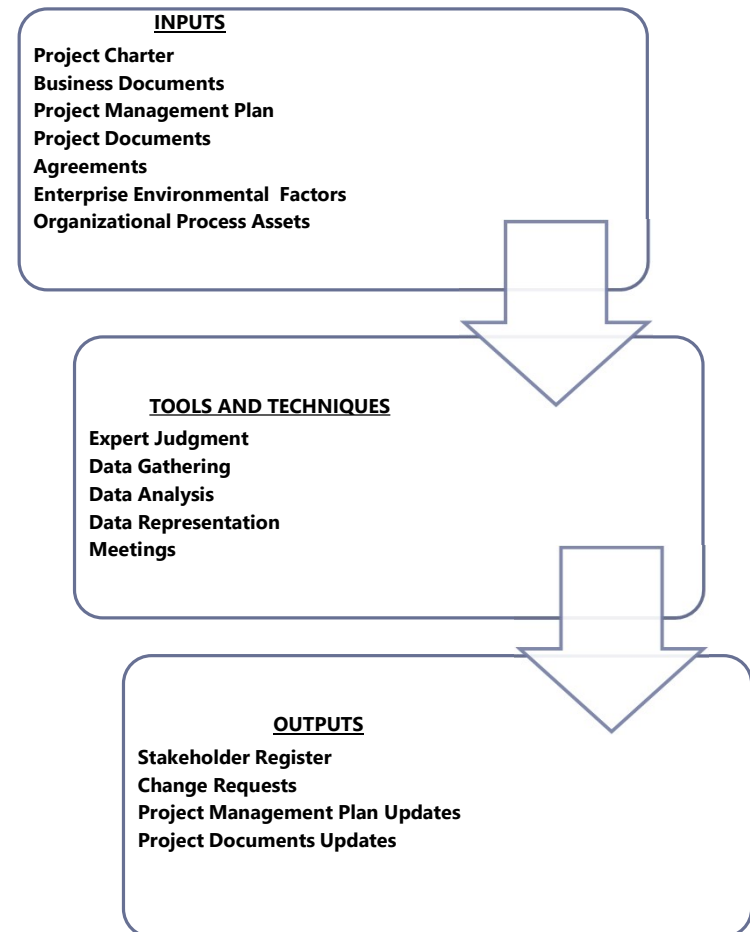
Develop Project Charter - Output

- **Output**
 - **Project Charter**
 - ▶ Formally authorizes the existence of the project and it assigns the Project Manager and their Authority Level
 - ▶ Signed by the organization Senior Management
 - ▶ High Level requirements & risks
 - ▶ Preliminary Project Budget and Schedule
 - ▶ Project Purpose or justification
 - **Assumption Log**
 - ▶ A list of things that you perceive to be true (assumptions) and things that might constrain the project.

Identify Stakeholders

- Identifying project stakeholders regularly
- Analyzing and recording relevant information regarding their interests and involvement
- It enables the project team to identify the appropriate focus for engagement of each stakeholder or group of stakeholders

Identify Stakeholders - ITTO



Identify Stakeholders - Tools

- Data Analysis
 - ▶ Stakeholder Analysis
 - analyzes who your stakeholders are and how they feel about the project
 - What would be the stakeholder's role such as a team member, sponsor, or functional manager etc.?
 - How would the project affect them, either in a positive or negative way?
 - Would they be active stakeholders, such as team members who work on the deliverable, or passive, such as customers who watch the project work get done?
 - What is their power authority, such as sponsors who will be paying for the project

Identify Stakeholders - Tools

- Data Representation
 - ▶ Stakeholder Mapping/Representation
 - Method to categorize stakeholders.
 - Power/interest grid, power/influence grid, or impact/influence grid
 - Stakeholder cube
 - ▶ A three-dimensional methodology to support the mapping of a stakeholder's interest, power, and influence
 - Salience model:
 - ▶ Power: Level of authority
 - ▶ Urgency: Immediate attention
 - ▶ Legitimacy: How appropriate is their involvement
 - Directions of Influence:
 - ▶ Upward: Senior management
 - ▶ Downward: Team members
 - ▶ Outward: Vendors, government, public, end-users
 - ▶ Sideward: peers such as other project managers
 - Prioritization

Identify Stakeholders - Output

- Stakeholder Register
 - ▶ Should contain:
 - Contact information
 - Role on the project, such as, sponsor or functional manager
 - Communication requirements
 - Expectations of the project
 - How are they affected by the project
 - Power influence level on the project
- Change Requests
- Project Management Plan Updates
 - ▶ Requirements Management Plan
 - ▶ Communications Management Plan
 - ▶ Risk Management Plan
 - ▶ Stakeholder Engagement Plan
- Project Documents Updates
 - ▶ Assumption Log
 - ▶ Issue Log
 - ▶ Risk Register

Planning

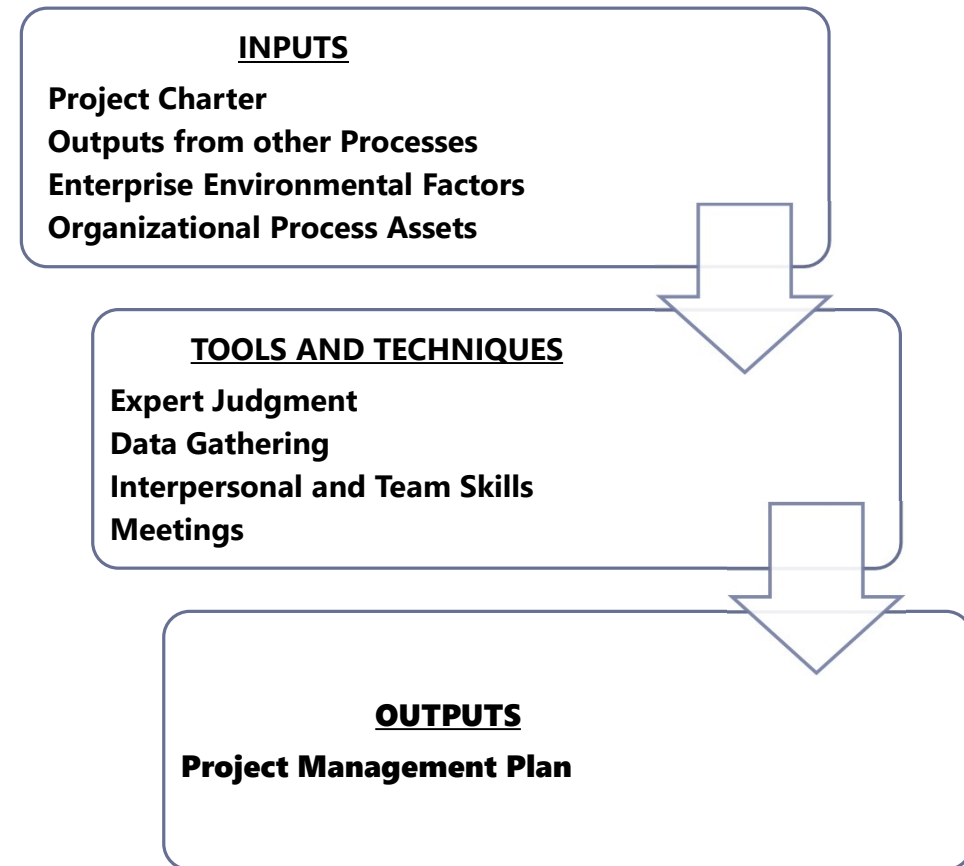
PROCESS GROUPS & KNOWLEDGE AREAS TABLE

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Develop Project Management Plan

- Process of defining, preparing, and coordinating all plan components and consolidating them into an integrated project management plan
- Comprehensive document that outlines the basis of all project work and how the work will be performed
- Either summary or detailed
- Contains baselines and plans

Develop Project Management Plan



Develop Project Management Plan - Outputs

■ **Outputs**

■ **Project Management Plan**

- ▶ Outlines how the project is executed, monitored and controlled, and closed.
- ▶ 4 Baselines
 - Scope, Schedule, Cost, Performance Measurement
- ▶ 14 Subsidiary plans
- ▶ Approved by either the Project Manager, Sponsor, Functional Manager, Program Manager, or in rare instances Senior Management
- ▶ Provides Guidance on project execution
- ▶ Formal Written piece of communication
- ▶ Only changed when a change request is generated and approved by the change control board

Develop Project Management Plan - Outputs

Project Plan	Process where made
Scope Management Plan	Plan Scope Management
Requirement Management Plan	Plan Scope Management
Schedule Management Plan	Plan Schedule Management
Cost Management Plan	Plan Cost Management
Quality Management Plan	Plan Quality Management
Resource Management Plan	Plan Resource Management
Communication Management Plan	Plan Communications Management
Risk Management Plan	Plan Risk Management
Procurement Management Plan	Plan Procurement Management
Stakeholder Management Plan	Plan Stakeholder Management
Change Management Plan	Develop Project Management Plan
Configuration Management Plan	Develop Project Management Plan
Scope Baseline	Create WBS
Schedule Baseline	Develop Schedule
Cost Baseline	Determine Budget
Performance Measurement Baseline	Develop Project Management Plan
Project Life Cycle Description	Develop Project Management Plan
Development Approach	Develop Project Management Plan

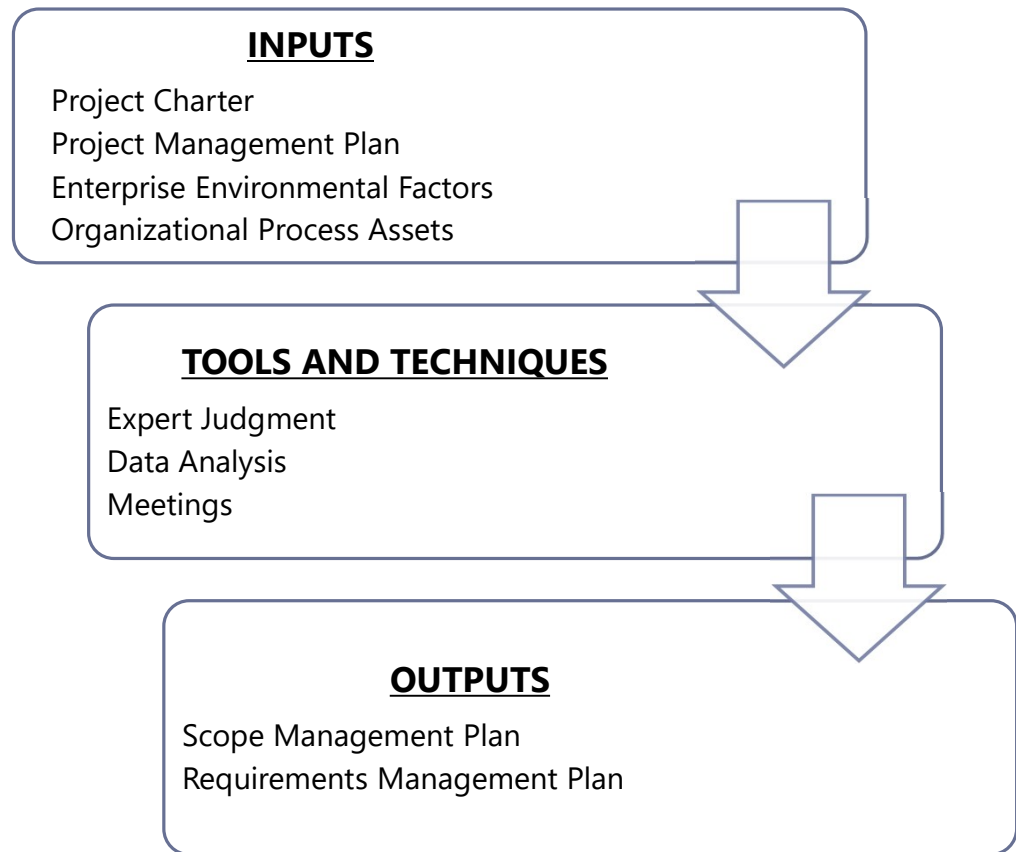
Plan Scope Management

- Process of creating a scope management plan that documents how the project and product scope will be defined, validated, and controlled.
- Guidance and direction on how scope will be managed throughout the project

Scope Terms

- **Product Scope** - features and functions that characterize a product, service, or result
- **Project Scope** - the work that is needed to be accomplished to deliver a product, service, or result with specified features and functions.
- Prevent Gold Plating, which is doing extra work not in the scope.
- Prevent Scope creep, which are unauthorized work added to the scope.

Plan Scope Management - ITTO



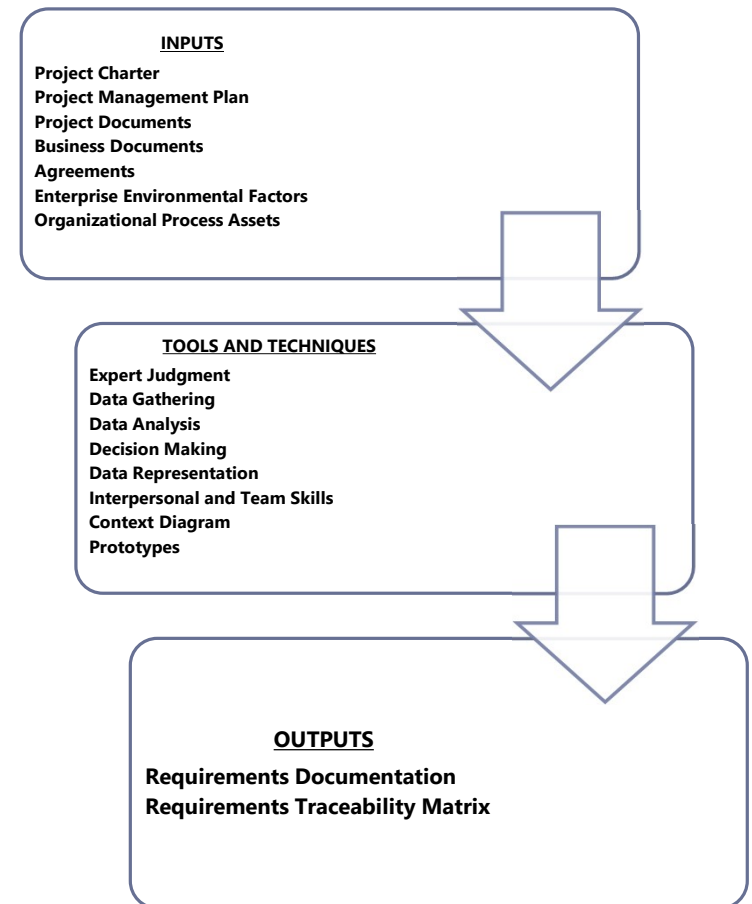
Plan Scope Management - Output

- **Scope Management Plan**
 - How the scope will be defined, developed, monitored, controlled and verified
 - ▶ Process for preparing & maintaining Scope Statement, WBS
 - ▶ How changes request to the scope statement will be process
- **Requirement Management Plan**
 - How the requirements will be analyzed, documented and managed.
 - Traceability structure to reflect which requirements need to be captured on the traceability matrix

Collect Requirements

- Process of determining, documenting, and managing stakeholder needs and requirements to meet objectives.
- Process plays a significant role in the success of the overall project since project schedule, budget, risk factors, quality specifications, and resource planning are closely linked to the requirements

Collect Requirements - ITTO



Collect Requirements - Tools

- Data Gathering
 - ▶ Benchmarking
- Data Analysis
 - ▶ Analyzing documents, agreements, policies, proposals, or business plans

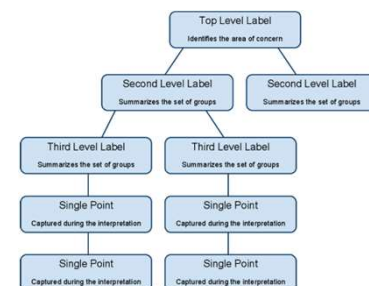
Collect Requirements - Tools

- Data Representation
 - ▶ Idea / Mind Mapping - Ideas gathered through brainstorming are mapped together to discover new considerations and conception variations
 - ▶ Affinity Diagram - Large ideas that are grouped and sorted together for further review and analysis.



Mind Mapper for Brainstorm

<https://www.mindvectorweb.com/blog/mind-mapping-for-brainstorming/>
Richa Shaily, Oct 1, 2016



Affinity Diagram

https://en.wikipedia.org/wiki/Affinity_diagram
Wikipedia, Oct 15, 2009

Collect Requirements - Tools

- Interpersonal and Team Skills
 - Observations/Conversations-Job shadowing, viewing personalities in their environment and work place. Recording how jobs, chores and tasks are executed.
- Context Diagrams
 - Used to visually show how a business process, other systems, and people interact.
- Prototypes
 - A working model of a product that stakeholders can interact with and provide feedback how they might want to change it to better meet their requirements. This gives the stakeholders a great view and feel of what the final product will be when the project is finished.

Collect Requirements – Outputs

- **Requirement Documentation**
 - ▶ How individual requirements are to be performed and why each requirement is important to the project.
 - **Components may include:**
 - Stakeholder and business requirements
 - Acceptance criteria
 - Quality requirements
 - Project objectives
 - Organizational impacts
 - Legal or ethical compliance
 - Requirements assumptions and constraints

Collect Requirements Outputs

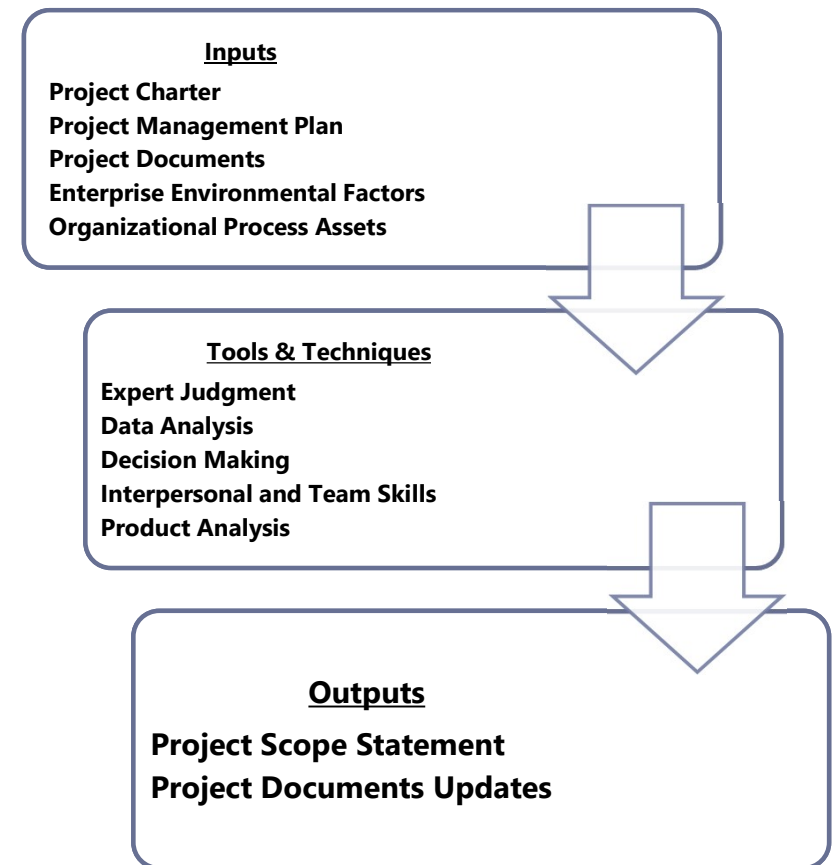
■ **Requirement Traceability Matrix**

- Once a requirement is created, a table is created that will link the requirement back to its source. This is used to help manage changes to the project scope.
- **The table is created to track, but not limited to:**
 - ▶ Who is the original stakeholder that provided the requirement
 - ▶ Why was the requirement added
 - ▶ Description of the requirement
 - ▶ Current status of the requirement, completed, in progress, delayed, cancelled, etc...

Define Scope

- Developing a detailed description of the project and product.
- A detailed project scope statement is critical to project success and builds upon the major deliverables, assumptions, and constraints that are documented during project initiation.

Define Scope - ITTO



Define Scope - Tools

- Product Analysis
 - ▶ Detailed understanding of the project's product, service, or result, with the commitment to improve the team's focus, it's knowledge base, the correct interpretation of requirements,
 - ▶ Some tools used are
 - Product breakdown
 - System analysis
 - System requirements

Define Scope Outputs

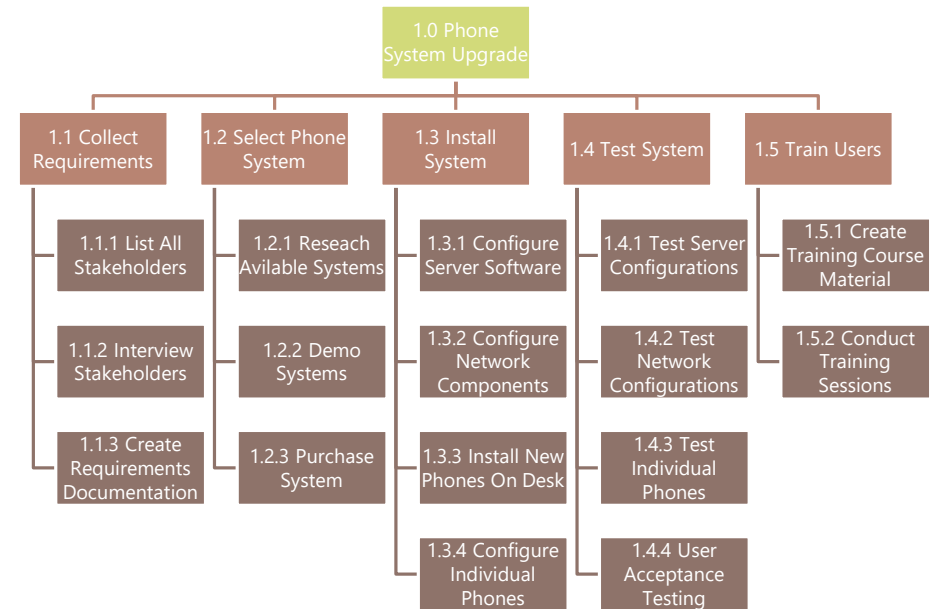
■ Project Scope Statement

- Describes in detail the project deliverables, and the work that is required to produce those deliverables. The greater the detail level of the scope allows the team the better understanding on how to reach the end state of the project successfully. The less detail of the scope statement creates a great chance of project risk, as well as offering the possibility of greater scope creep.
- **Details should include, but not limited to:**
 - ▶ Product description, Goals of the project
 - ▶ Identified risks
 - ▶ Project/Product acceptance criteria
 - ▶ Project constraints/exclusions

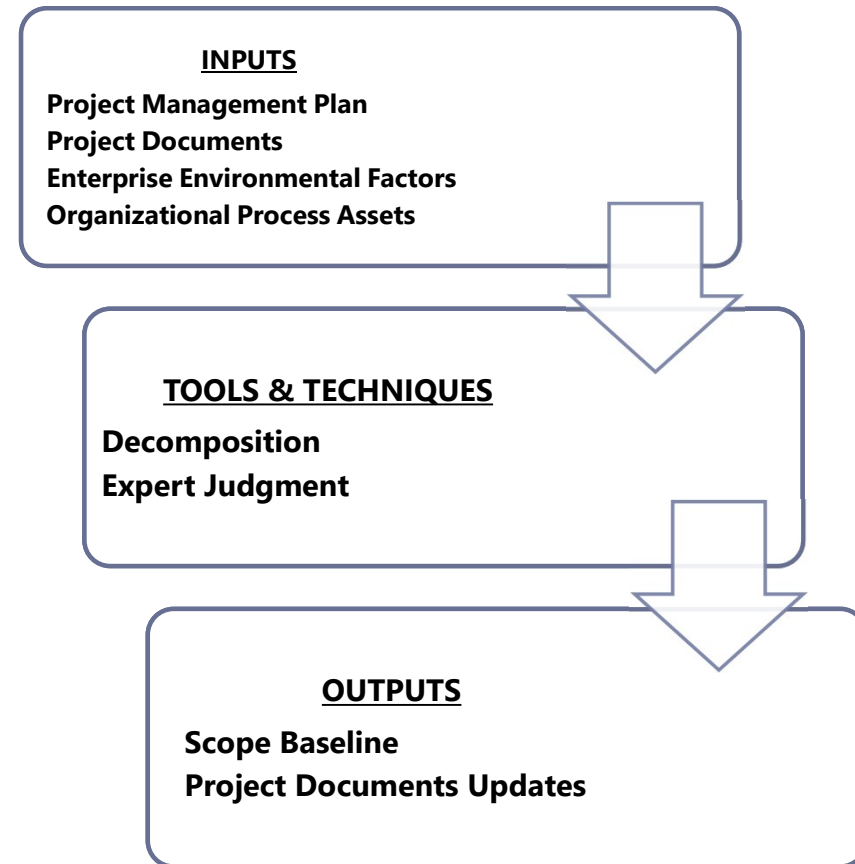
Create WBS (Work Breakdown Structure)

- Subdividing project deliverables and project work into smaller, more manageable components.
- Breakdown of the project deliverables from the scope statement

WBS Example



Create WBS - ITTO



Create WBS - Input

- Project Management Plan
 - ▶ Scope Management Plan
- Project Documents
 - ▶ Project Scope Statement
 - ▶ Requirement Documentation
- Enterprise Environmental Factors
- Organizational Process Assets

Create WBS - Tools

- Expert Judgment
- Decomposition
 - ▶ It comprises of breaking down each of the project deliverables into smaller components. The basic work package should be able to estimated its basic time, cost and effort.

Create WBS - Outputs

- Scope Baseline (3 Components)
 - ▶ Project Scope Statement
 - ▶ WBS
 - ▶ WBS Dictionary

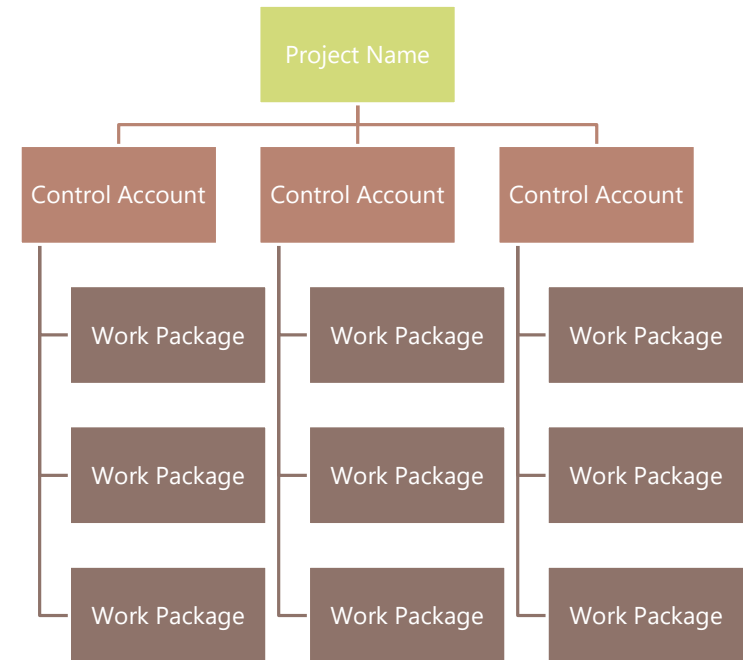
- Project Documents Updates
 - ▶ Assumption Log
 - ▶ Requirements Documentation

Create WBS

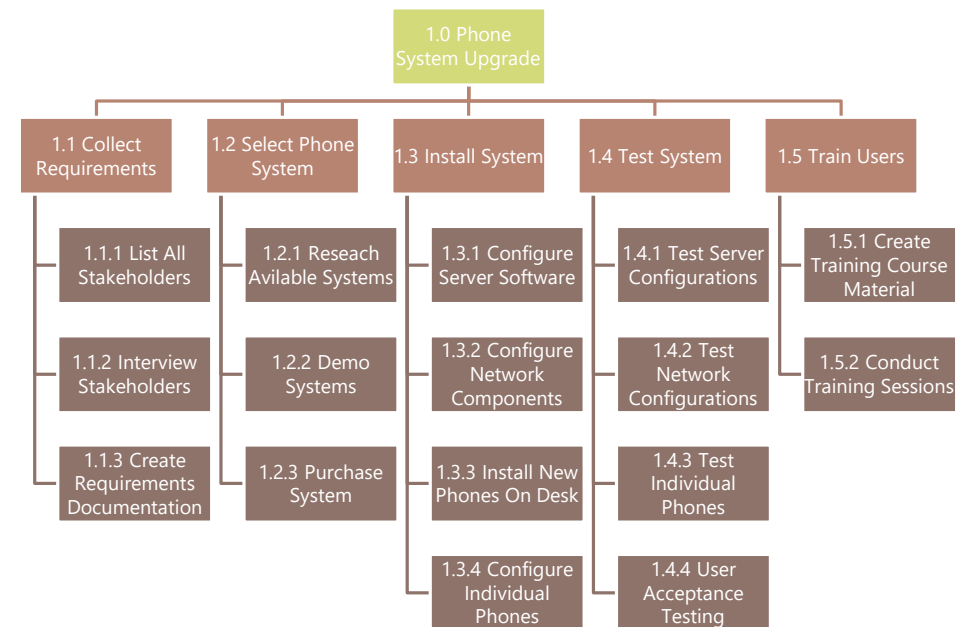
■ WBS

- It is essential to the success of the project, if it is not in the WBS, it is not part of the project
- Defines responsibilities of the team
- A communication tool
- It is created by the PM, SME's, the Project team, and it a great tool for team building
- A deliverable-oriented ranked decomposition of the work to be executed by the project team.
- Each node must have a unique identifying number. This is used to help locate and arrange each node. They can not be any gaps and any overlap of work packages. Nothing is eliminated and nothing is duplicated.

WBS Example



WBS Example



Create WBS Continued

■ **WBS Dictionary**

- A document that details the contents of the WBS
- It provides detailed information on each node of the WBS
- It captures additional qualities about each Work Package in a separate document
- It should include team member assigned to it, time estimate, cost estimate, account information, work package ID, quality requirements, contract information, Scheduled Milestone, plus detail overall of the task at hand

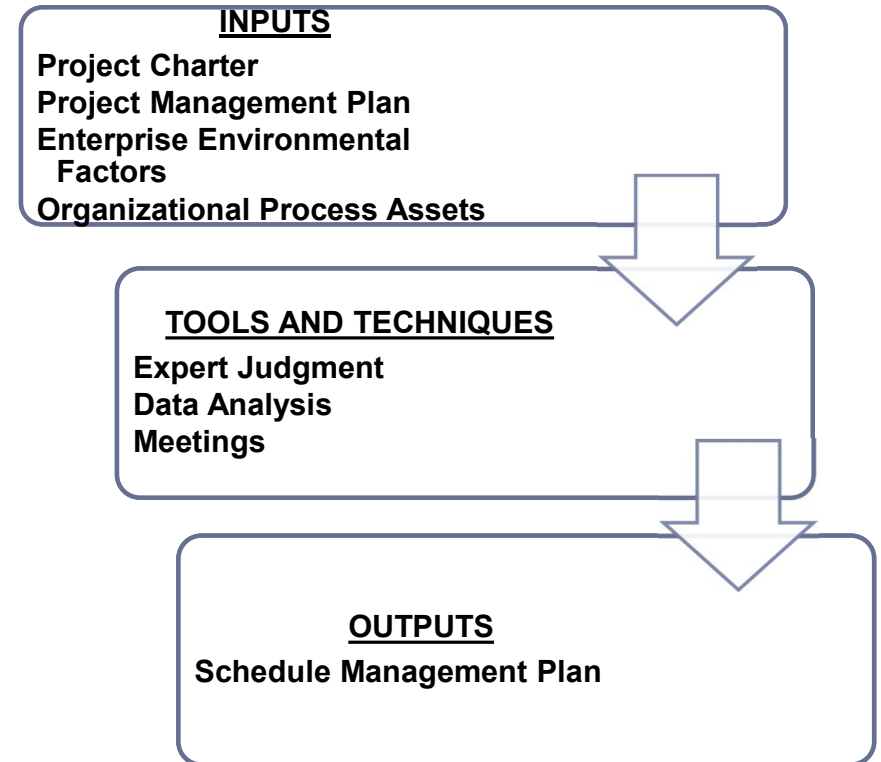
WBS Dictionary

Project Name: Phone System Upgrade	Work Package ID: 1.3.1
Work Package Name: Configure Server Software	
Work Package Description: Install a new virtual server. Install the phone server software. Configure the software to support 100 phones and voice mail to email. Ensure all updates are applied to the operating system before installing the phone system software.	
Assigned to: Bob Peterson	Duration: 5 days
Date Assigned: 12/30/2017	Due Date: 1/30/2018
Estimated Cost: \$5,000	Account Code: PSU-882.3

Plan Schedule Management

- Establishing the policies, procedures, and documentation for planning, developing, managing, executing, and controlling the project schedule.
- Provides guidance and direction on how the project schedule will be managed throughout the project.

Plan Schedule Management



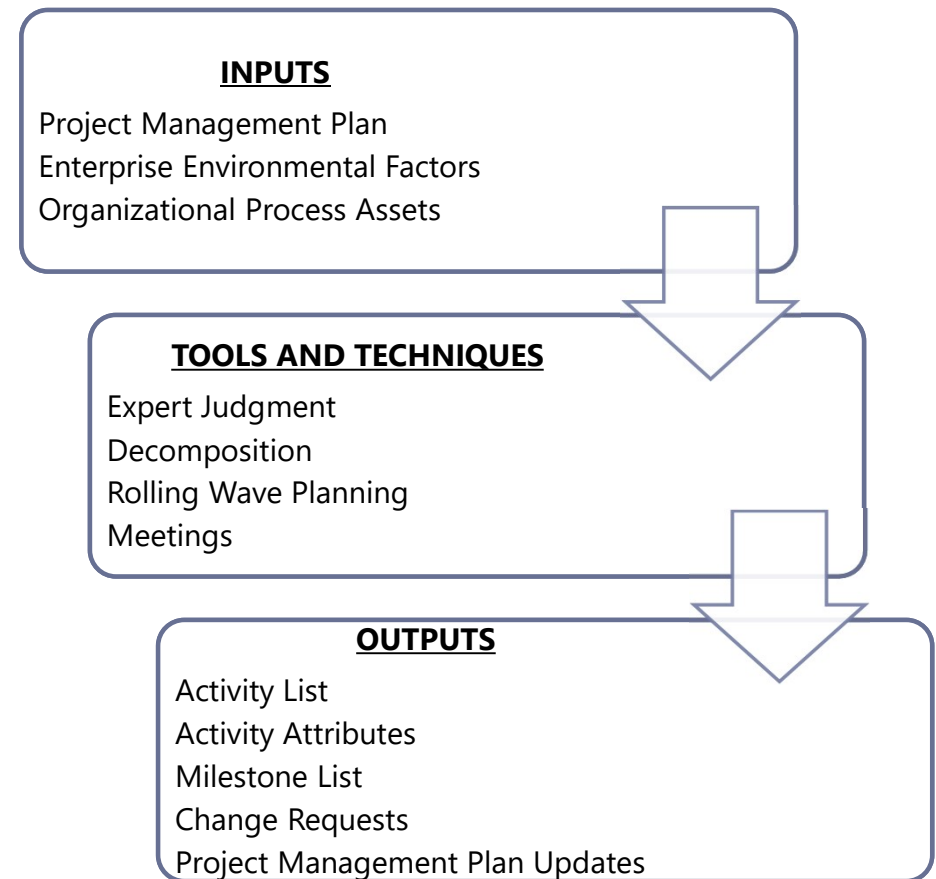
Plan Schedule Management - Outputs

- **Schedule Management Plan**
 - ▶ how the project schedule will be planned, developed, managed, executed, and controlled throughout the phase or project
 - ▶ It may establish the following:
 - Levels of Accuracy
 - Rules of Performance Measurement
 - Reporting formats
 - Release and Iteration Length
 - Project Schedule Model Development

Define Activities

- Process of identifying and documenting the specific actions to be performed to produce the project deliverables.
- Decomposes work packages into schedule activities that provide a basis for estimating, scheduling, executing, monitoring, and controlling the project work.

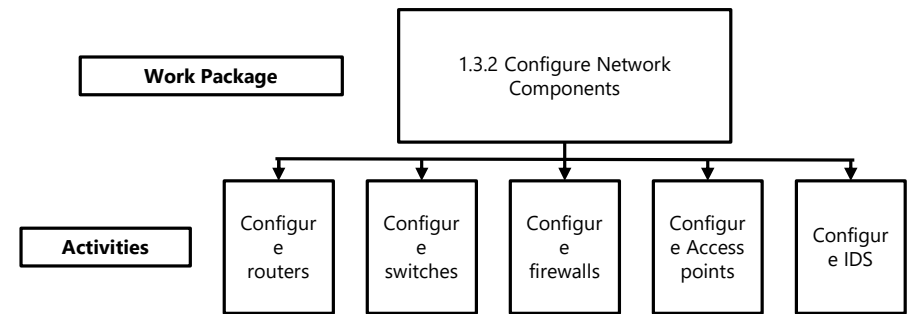
Define Activities - ITTO



Define Activities - Tools

- Decomposition
- Rolling Wave Planning
 - ▶ A form of Progressive Elaboration. Near term work packages are able to be defined in a much great detail. Long term work packages may not be able to be defined in any detail, a place holder maybe created for later date.
 - ▶ As the project moves along to completion, long term place holders will be removed and then allowed to be decomposed into work packages as more details become available.
 - ▶ This planning must always be revisited throughout the life cycle of the project when long term work pages can not be clearly define

Define Activities - Tools



Define Activities - Outputs

- Activity List
 - A complete list of all scheduled activities that is required to be performed on the project.
 - It should include a sufficient work description as well as an activity identifier. This is recommended so all stakeholders have better understanding of all work that is needed to be performed on the project
 - Work packages are Scope determined deliverable based,
 - Activities are focused in the work that needs to be executed the work packages
 - Schedule focused, not WBS focused
 - Each activity should map back to one and only one work package (work package could have many activities)

Define Activities - Outputs

- Activity Attributes
 - ▶ Any additional information required to execute the Activity list
 - Point of contact, location of work being performed
 - Used for scheduling development
- Milestone List
 - ▶ Key dates of the projects
 - ▶ Mandatory, optional, contractual, % complete

Sequence Activities

- Is the process of identifying and documenting relationships among the project activities.
- It defines the logical sequence of work to obtain the greatest efficiency given all project constraints.
- Taking the activity list defined earlier and arranging the activities in the order they must be performed
- Sequencing can be performed by using project management software or by using manual or automated techniques.

Sequence Activities

INPUTS

Project Management Plan
Project Documents
**Enterprise Environmental
Factors**
Organizational Process Assets

TOOLS AND TECHNIQUES

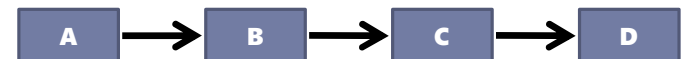
Precedence Diagramming Method
**Dependency Determination and
Integration**
Leads and Lags
**Project Management Information
System**

OUTPUTS

Project Schedule Network Diagrams
Project Documents Updates

Sequence Activities - Tools

- Precedence Diagramming Method, (PDM)
 - ▶ Graphical representation of all work that is needed to be performed on the project. This represents the flow of the project. What work packages tie into another work packages, in order as well as durations. Simply stated it is work packages relationships to each other.



Sequence Activities - Tools

- Relationships
 - ▶ Finish to Start (The most commonly used)
 - The start of the successor's work package depends upon the completion of its predecessor work package
 - ▶ Finish to Finish
 - The completion of the successor work package depends on the completion of the predecessor work package
 - ▶ Start to Start
 - The start of the successor's work package depends upon the start of its predecessor work package
 - ▶ Start to Finish
 - The completion of the successor work package depends upon the start of its predecessor work package

Sequence Activities - Tools

- Dependency Determination
 - Mandatory Dependencies (Hard Logic)
 - They are tangible limitations of work packages that are tie together. One work package **MUST** be completed prior to the subsequent work package beginning.
 - Foundation of the house erected prior to the house being built
 - Turning on the computer prior to writing code
 - Purchasing the paint prior to painting the walls
 - Discretionary Dependencies (Soft Logic)
 - Work packages that are tied together, but do not have physical limitations. Work packages may work in unison or tandem.
 - Painting the walls of a room, & laying carpet at the same time
 - Cooking both Dinner & Dessert at the same time in the oven
 - Designing the packing of a computer game, while it is in a finial testing stage

Sequence Activities - Tools

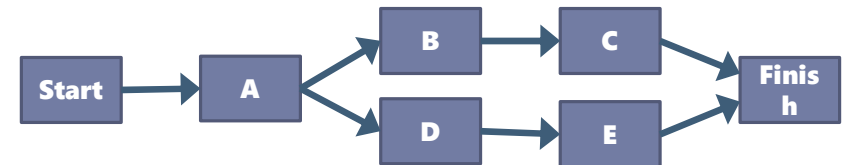
- External Dependencies
 - Work package relationship between project and non-project activities. Non-project Activities are usually outside the control of the project team.
 - The gas station receiving Gas prior to you filling up the Bulldozer gas tank
 - The Home Improvement store down stocking the paint prior to you buying it
- Internal Dependencies
 - Project Activities are within control of the team
 - How to test computer software after you installed it
 - Who does what tasks on a project

Sequence Activities - Tools

- Leads and Lags
 - ▶ The management team during the planning of activities will determine the order of work packages upon completion. During this phase of this process, work packages leads and lags must be processed.
 - A lead is the amount of time a successor activity can be advanced with respect to a predecessor activity
 - i.e. The windows may be scheduled to be installed in the house up to 3 weeks prior to the siding being installed.
 - A lag directs the delay in the successor work package or activity
 - i.e. The windows can not be scheduled to be installed in the house until the external walls have been installed

Sequence Activities - Outputs

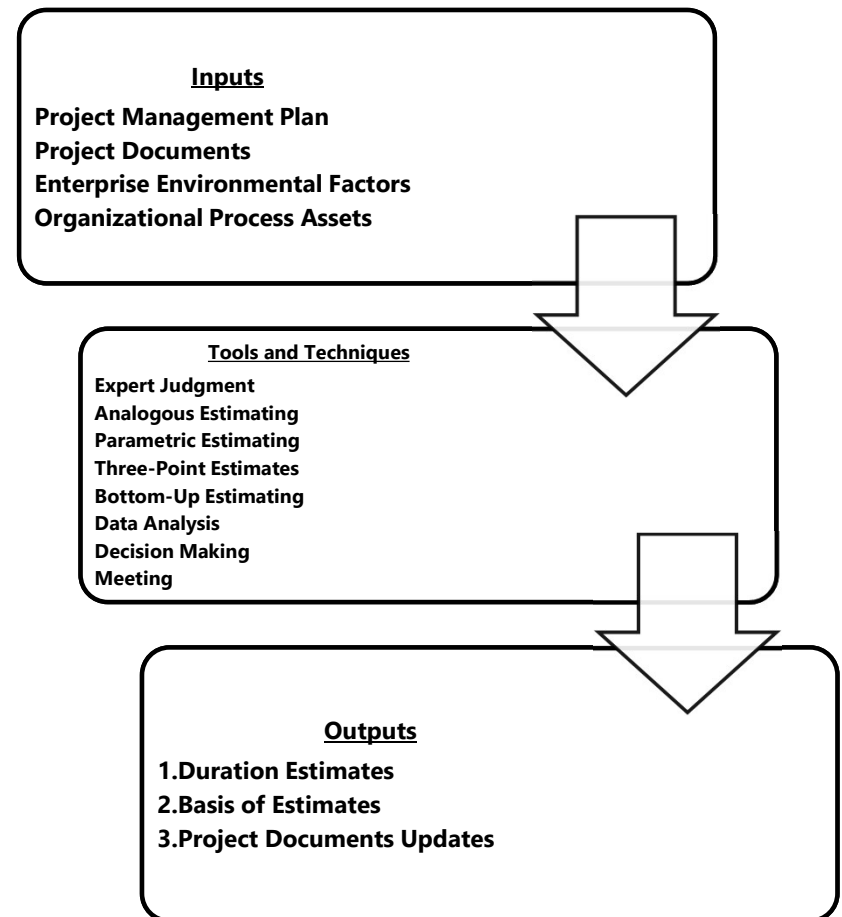
- **Project Schedule Network Diagrams**
 - These are system wide drawings which shows the entire project work packages/activities from start to finish. It shows logical relationships as well.
- **Project Document Updates**



Estimate Activity Durations

- Estimating the number of work periods needed to complete individual activities with estimated resources.
- It provides the amount of time each activity will take to complete.
- It should be calculated by the individual most familiar with the nature of work in the specific activity.
- Uses information from the scope of work, required resource types or skill levels, estimated resource quantities, and resource calendars.

Estimate Activity Durations - ITTO



Estimate Activity Durations - Tools

- Analogous Estimating(top-down estimating)
 - ▶ This relies on historical information to predict estimates, (i.e. Time, Budget, Difficulty), for current projects. Often used when there is limited amount of information available. Cost less in Time and Money to uses, but it gives the least accuracy when it comes to estimating.

Estimate Activity Durations - Tools

- Parametric
 - ▶ A technique that uses a statistical relationship between historical data and other variables (for example, square footage in construction, lines of code in software development) to calculate an estimate for activity parameters, such as scope, cost, budget, and duration.
- Three Point Estimate
 - ▶ Calculates an expected duration using a weighted average of 3 estimated, Optimistic, Pessimistic, Most Likely. $(O+P+4M)/6$.
 - If the Optimistic is 8 days, Pessimistic is 14 days, and Most likely is 10 days, Pert is 10.333.
 - $((8+14+4*10)/6)$
 - $(22+40)/6$
 - $62/6$
 - 10.33

Estimate Activity Durations - Tools

- Bottom-Up Estimating
 - ▶ The work has to be very detailed for this type of estimation to take place.
 - ▶ Takes a very long time to complete, but highly accurate.
 - ▶ You break down the work to the lowest levels and then aggregating the work back up to find an overall duration.
- Data Analysis
 - ▶ Reserve Analysis
 - Often call Slack Time, or Contingency Reserve, Time Reserves. Buffer
 - Maybe a percentage or a set determined time allowance
 - Usually added because of Risk Factors
- Decision Making

Estimate Activity Durations Output

- Duration Estimates
 - The likely number of work periods required to completed an activity or a work package. It does not have any leads or lags assigned to it. It is just a number. i.e. Painting room 6 with take at least 36 man hours, to a maximum of 42 man hours
 - May include some indication of the range of possible results
- Basis of Estimates
 - How the estimates were developed and their ranges.
 - It can also include all assumptions and constraints made to create the estimate

3-Point Estimate (PERT)

- **PERT(Program (or Project) Evaluation and Review Technique)**
 - Three-Point Estimate
 - A scheduling tool that uses a weighted average formula to predict the length of activities and the project.

- **Beta Distribution**

- Specifically, the PERT formula is $(O+R(4)+P)/6$

$(\text{Optimistic Estimate} + (4 \times \text{Realistic}) + \text{Pessimistic Estimate})$

6

- **Standard Deviation**

$(P-O)/6$

- **Triangle Distribution**

- The Triangle Distribution formula is $(O+R+P)/3$

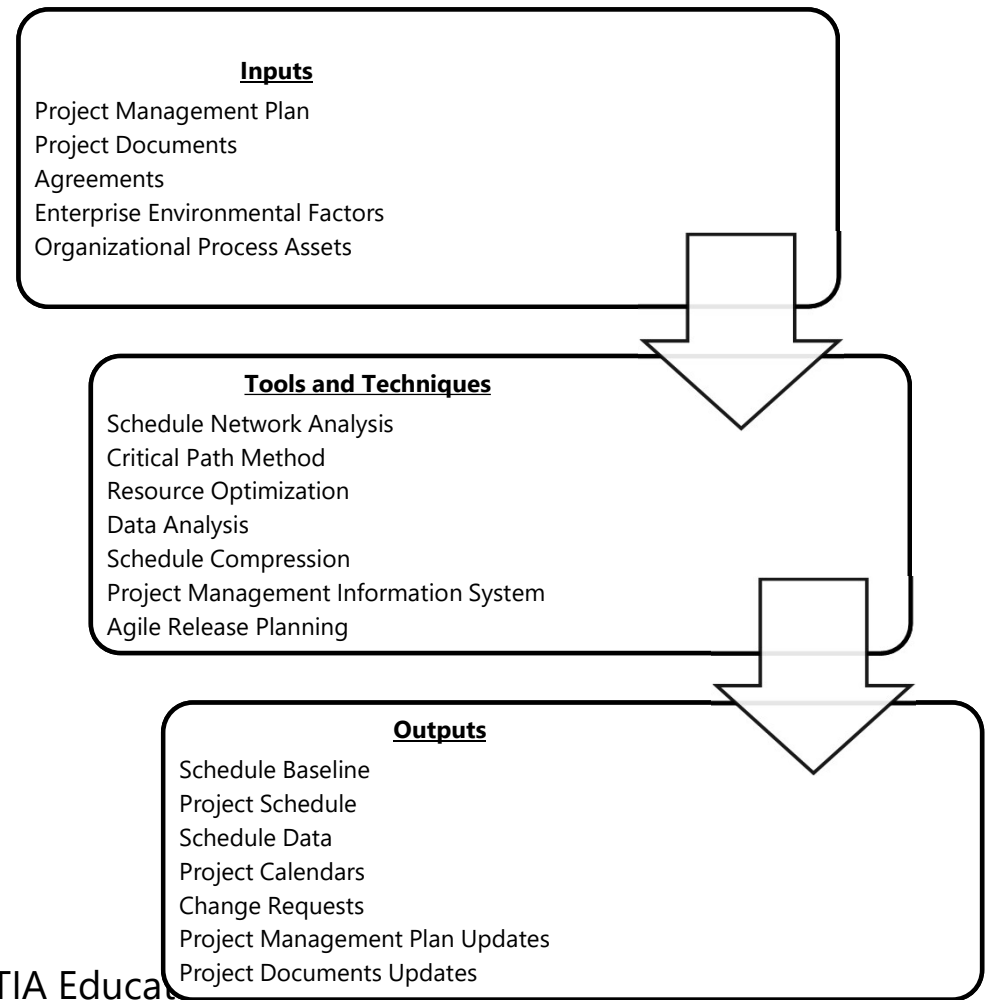
$(\text{Optimistic Estimate} + \text{Realistic} + \text{Pessimistic Estimate})$

3

Develop Schedule

- Analyzing activity sequences, durations, resource requirements, and schedule constraints to create a schedule model for project execution and monitoring and controlling.
- It generates a schedule model with planned dates for completing project activities.
- Entering the activities, durations and resources into the scheduling tool will generate a schedule with planned dates for completing the project activities.

Develop Schedule - ITTO



Develop Schedule - Tools

- **Schedule Network Analysis**
 - ▶ It employs several different techniques, (Critical path, Critical Chain, What-if analysis, and resource optimization techniques) to determine the length of the schedule. It is used to calculate the early start and early finish dates, late start and late finish dates.
- **Resource Optimization Techniques**
 - ▶ A method to flatten the schedule when resources are over-allocated or allocated unevenly. Resource leveling can be applied in different methods to accomplish different goals. One of the most common methods is to ensure that workers are not overextended on activities.

Develop Schedule - Tools

- **Critical Path Method**
 - ▶ Calculate the early start (ES), early finish (EF), late start (LS) and late finish (LF) dates, without require for any resource limitations. It is used to help determined Lags, Leads, activity relationships, schedule constraints
- **Critical Chain Method**
 - ▶ A method of planning and managing projects that puts more emphasis on the resources required to execute project tasks developed

Develop Schedule - Tools

- Data Analysis
 - ▶ What If Scenarios (Monte Carlo)
 - ▶ Simulations
- Leads and Lags
- Schedule Compression
 - ▶ Crashing(Adding resources to a project activity)
 - Always adds cost
 - May add additional Risk
 - ▶ Fast Tracking(Activates performed in parallel)
 - May not always add cost
 - May increase risk due to project rework

Develop Schedule - Tools

- PMIS
- Agile Release Planning
 - ▶ The schedule will be broken up into smaller iterations, verses to a traditional project where the schedule is for the entire product release. Smaller increments allows the customers an opportunity to give feedback on the product with a quicker turnaround
 - ▶ Iteration plan is a plan that will be used to create a single iteration for part of the product.
 - ▶ Release plan is a set of iterations that will help to create a product that would be given to the customers for feedback

Develop Schedule - Outputs

- **Project Schedule**
 - ▶ Project start and end date. Each activity start & end date. The project schedule maybe a high level document, or as detail as having each activities resourced assign to it. Most often showed as a graphically presentation.
 - Project Network Diagrams
 - Bar charts
 - Activities represented by horizontal bars on a horizontal axis that represents the calendar.
 - Milestone Chart
 - A list of only key dates in the project. A very high level detail of the status of the project.
- **Schedule Baseline**
 - ▶ Original Schedule baseline with any approved changes to the schedule

Develop Schedule - Outputs

- Schedule data
 - ▶ Schedule templates that the team used to calculate durations, assumptions, constraints or resource requirements
- Project Calendars
 - ▶ Identifies Project shifts and work days

Plan Cost Management

- Defining how the project costs will be estimated, budgeted, managed, monitored, and controlled.
- It provides guidance and direction on how the project costs will be managed throughout the project.

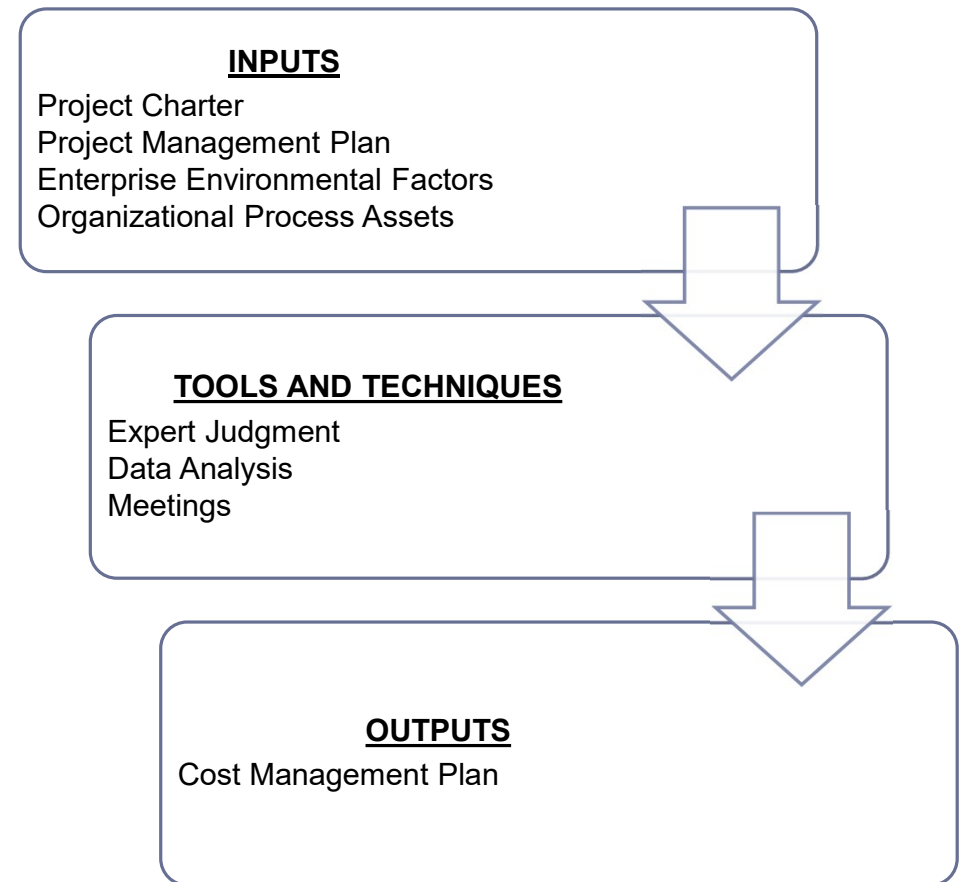
Project Cost Management - Terms

■ **Value Engineering**

- Aka, value analysis is finding a less costly way of doing work. It will look how to achieve a goal/scope the less costly way

Cost Type	Explanation
Fixed	Costs that stay same throughout the life of a project . I.E. bulldozer
Variable	Costs that vary on a project. I.E. hourly labor, fuel for bulldozer
Direct	Expenses billed directly to the project. I.E. materials used to construct bldg
Indirect	Costs that are shared & allocated among several or all projects. i.e. mgr's salary.
Sunk	Costs that have been invested into or expended upon the project. Sunk costs are like spilt milk.

Plan Cost Management - ITTO



Plan Cost Management - Output

- Cost Management Plan
 - ▶ How costs will be planned, structured and controlled
 - ▶ Units of measure
 - ▶ Level of accuracy
 - ▶ Reporting formats
 - ▶ Control thresholds

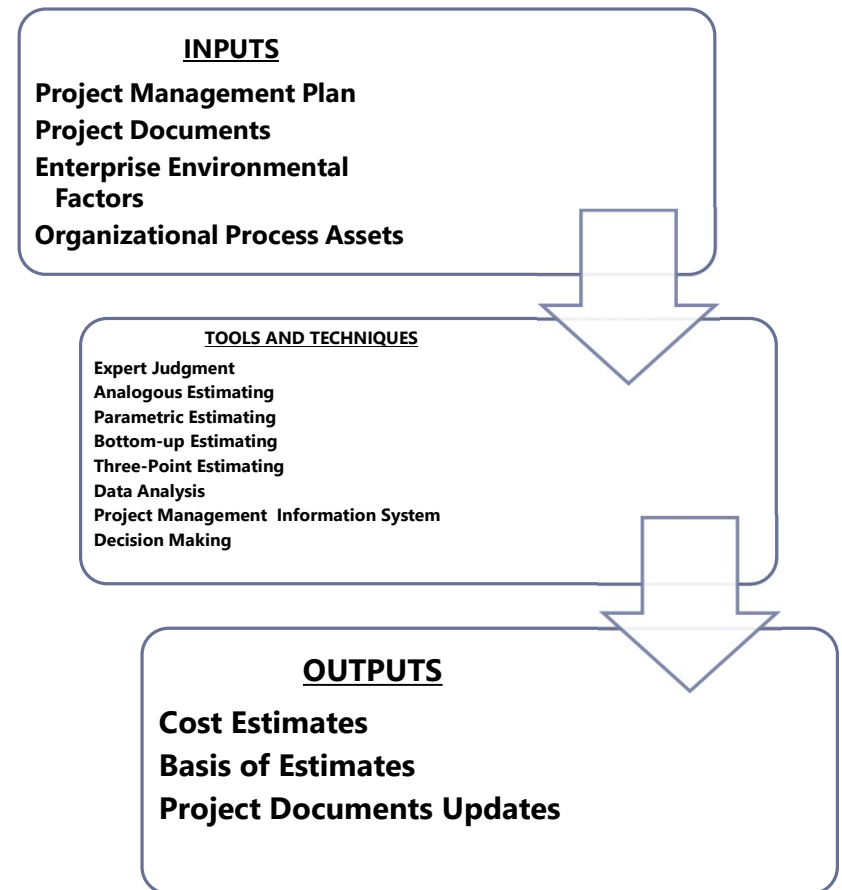
Estimate Costs

- Developing an approximation of the cost of resources needed to complete project work.
- Usually expressed in some form of currency, \$, Euro, Yen, Won, etc..
- Accuracy of a project estimate will increase as the project progresses through the project life cycle
- Costs are estimated for all resources that will be charged to the project including but is not limited to labor, materials, equipment, services, and facilities, as well as special categories such as an inflation allowance, cost of financing, or contingency costs.

Estimate Cost - Types

- **Definitive Estimates:** –5% to +10%
- **Budget Estimates:** –10% to +25%
- **Rough Order of Magnitude Estimates:** –25% to +75%

Estimate Costs



Estimate Costs - Tools

- Expert Judgment
- Analogous Estimating
 - ▶ Top down, Pasted projects, Not very detailed
- Parametric Estimating
 - ▶ Statistical relationships between historical data and variables
 - 8 hour work period, lay 50 cubic feet of concrete
 - 1 hour work period, paint 32 square feet of drywall
- Bottom-up Estimating
 - ▶ Separate estimate for each activity and aggregated up to summary nodes on WBS
 - ▶ Greatest Level of specified detail
 - ▶ Highly accurate, labor intensive

Estimate Costs - Tools

- Pert, Three point Estimating (Covered in Schedule Management)
- Data Analysis
 - ▶ Reserve Analysis (Money set aside for Risk)
 - ▶ Cost of Quality
 - Failure
 - Internal caused, (may need to rework, scrap)
 - External caused, (Warranty work, Lost of business)
 - Leads to rework and increasing spend rate
 - Success
 - Training, proper equipment, inspections
- PMIS
- Decision Making

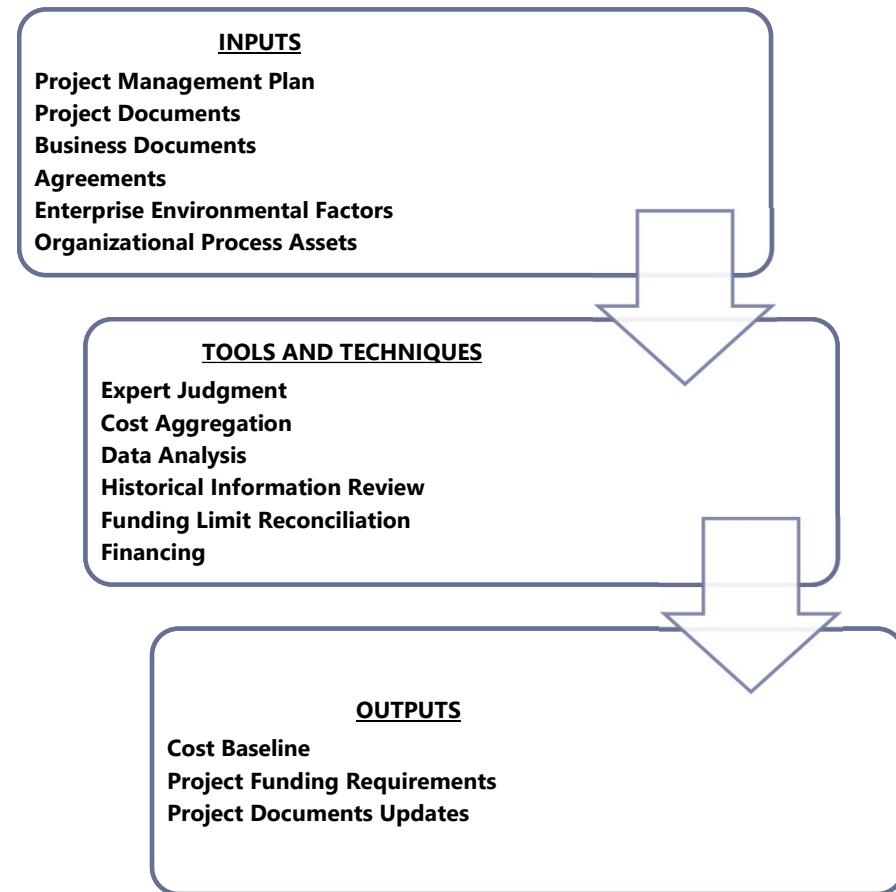
Estimate Costs - Output

- Cost Estimates
 - ▶ Costs associated with each activity. This includes labor, materials, equipment, facilities, inflation, services, etc...
- Basis of Estimates
 - ▶ Range of possible estimates
 - ▶ Confidence level of estimates
 - ▶ How estimates were developed and by whom
- Project Document Updates

Determine Budget

- Process of aggregating the estimated costs of individual activities or work packages to establish an authorized cost baseline.
- It determines the cost baseline against which project performance can be monitored and controlled.

Determine Budget - ITTO



Determine Budget - Tools

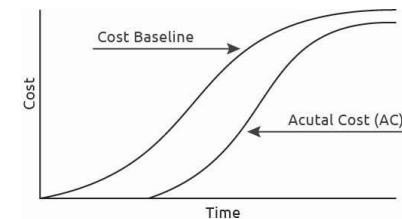
- Cost Aggregation
 - Details on what each schedule activity is scheduled to cost. These will be rolled up to each parent work package to determined total cost and budgetary requirements
- Data Analysis
 - Reserve Analysis, Possible Contingency reserves for the project
 - Contingency Reserves: The PM determines, manages, and controls the contingency reserves, which will address the cost impact of the remaining or known/unknown risks
 - Management Reserve: The management determines the funds to cover unknown/unknown risks to the project
 - Designed for possible risk obstacles to the Baselines
- Historical Information Review
 - Parametric or Analogous estimates based off historical projects
 - Best used when project are very similar in nature

Determine Budget - Tools

- Funding Limit Reconciliations
 - ▶ Projects current run rate vs. what was planned over the life cycle of the project.
Sections of the project may need to be reschedule due to budget limitations
- Financing
 - ▶ Acquiring money for the project from an external source

Determine Budget Output

- Cost Baseline
 - Includes the cost of all the activities, that are aggregated to work packages. The work packages and the contingency reserves are aggregated into control account. The sum of all control account is the cost baseline.
 - Typically displayed in a S-Curve graph.
 - The cost baseline represents the project cost, which includes the contingency reserves. The project budget is the cost baseline + management reserves.
- Project Funding Requirements
 - What gets funded when and by how much. Is there a trigger point, Milestone point, etc..
- Project Document Updates



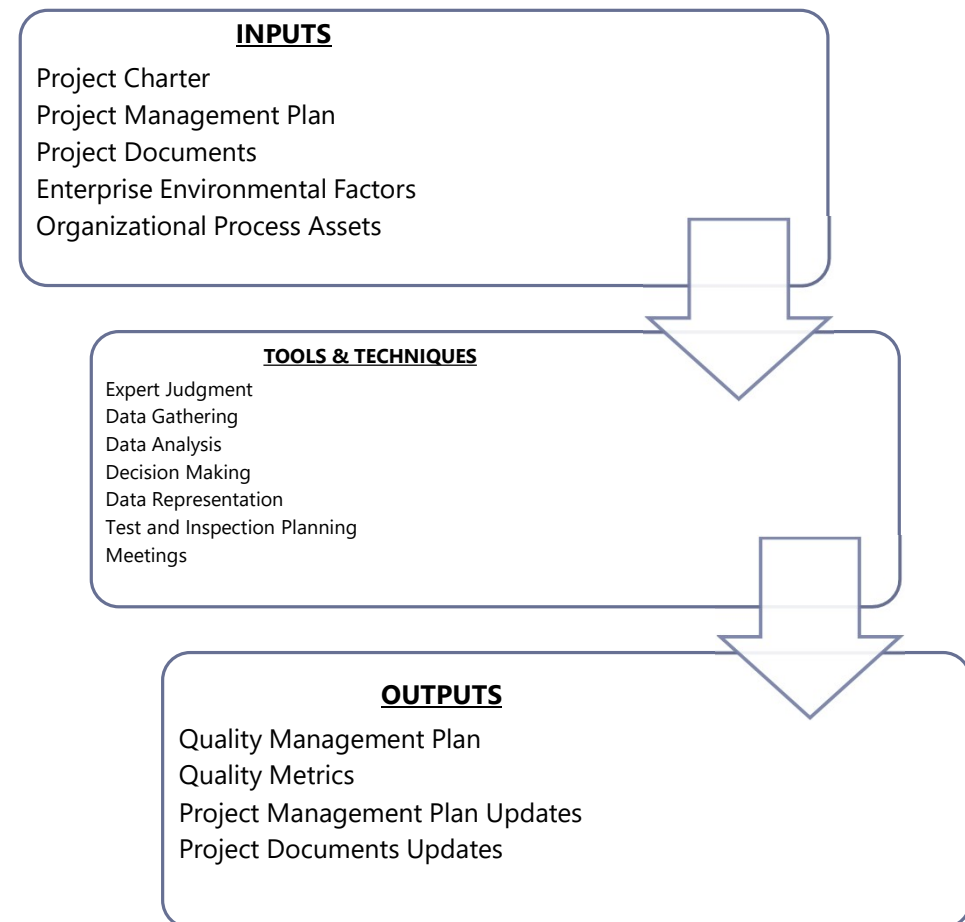
How To Ensure Effective Quality Management

- Always cost more if the customers find the defects. Prevent defects from going to the customers
- Build quality into the planning and design of a project
- Build a culture in the organization that wants to produce quality work.

Plan Quality Management

- “The standard of something as measured against other things of a similar kind; the degree of excellence of something.”
- Identifying quality requirements and/or standards for the project and its deliverables, and documenting how the project will demonstrate compliance with quality requirements and/or standards.
- Guidance and direction on how quality will be managed and verified throughout the project.
- Identifies what the quality specifications are for this project and how these specifications will be met

Plan Quality Management



Plan Quality Management - Tools

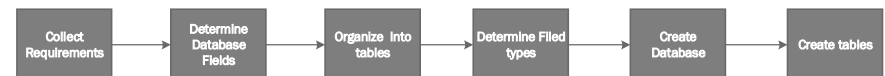
- Data Analysis
 - ▶ Cost Benefit Analysis
 - Does the activities, work packages performed cost more than the expected results. The benefits must outweigh their costs.
 - ▶ Cost of Quality, (COQ)
 - All costs incurred over the life of the product ensuring it meets quality of the product
 - Conformance, Prevention costs, Appraisal costs
 - Non-Conformance, Internal and external failure costs

Plan Quality Management - Tools

- Test and Inspection Planning
 - ▶ PM and team determine how to test or inspect the project output to ensure it meets the stakeholders needs and expectations.

Plan Quality Management - Tools

- Data Representation
 - ▶ Logical Data Model
 - A visual representation of the data and you can then use it to identify the best methods to sort and organize it
 - ▶ Matrix Diagram
 - The relationship between two or more groups within the project
 - ▶ Mind Mapping
 - Visually organize data
 - ▶ Flowcharts
 - A graphical representation of the process and any room for improvements



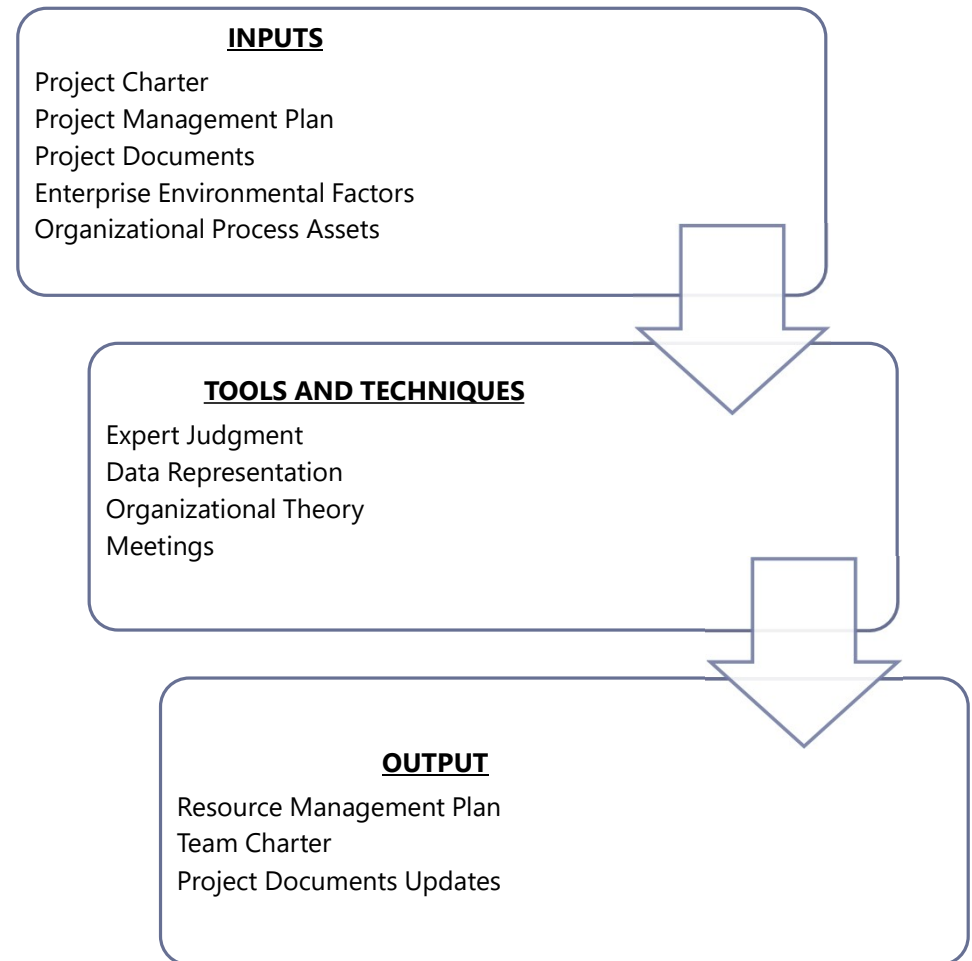
Plan Quality Management - Output

- Quality Management Plan
 - ▶ Quality standards that will be used by the project
 - ▶ Quality control and management activities for the project
 - ▶ Quality tools that will be used
 - ▶ How to continually improve our processes
- Quality Metrics
 - ▶ Specifications on how quality will be measure during the control quality process. Such as, error per line of code

Plan Resource Management

- Describing how to estimate, acquire, manage, and use team and physical resources.
- Team resources are the people working on the project to build the deliverables
- Physical resources such as supplies, materials, services, facilities, and equipment will be measured, acquired, managed, and used in the project

Plan Resource Management - ITTO



Plan Resource Management - Tools

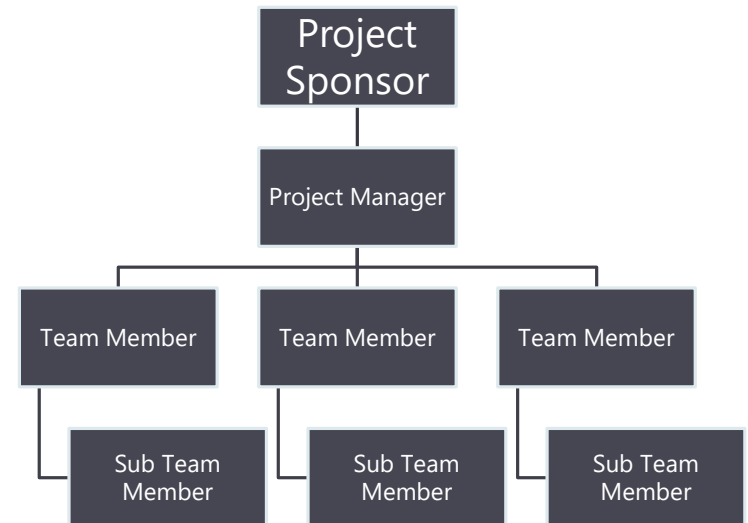
- Data Representation
 - ▶ Organization Charts and Positions Descriptions
 - ▶ 3 Types
 - Hierarchical
 - Graphic, Top-Down Format, (similar format to the WBS)
 - Matrix-Based Chart
 - Responsibility Assignment Matrix, (RAM). RACI Charts
 - Text-Oriented Format
 - Detail description of roles, qualifications, responsibilities, etc.

Plan Resource Management - Tools

	Project Manager	Team member	Sponsor	Customer
Develop Project charter	A	I	R	I
Define scope	A	R	C	I
Create WBS	C	A	I	I
Validate scope	A	I	C	R

RACI Charts

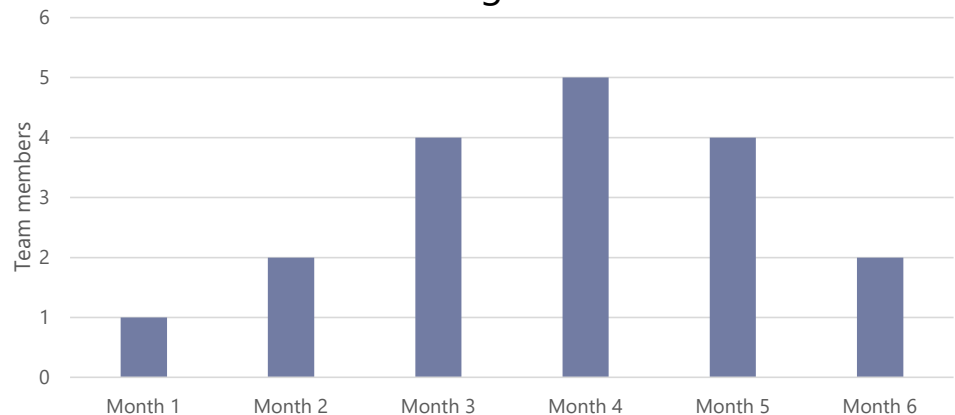
Plan Resource Management - Tools



Hierarchical Chart

Plan Resource Management – Output

- Resource Management Plan
 - ▶ part of the project management plan and is used to manage both physical and team resources
 - ▶ It will guide the remaining five resource management processes
 - ▶ Contains the roles and responsibilities, the organization chart, and project team resource management.



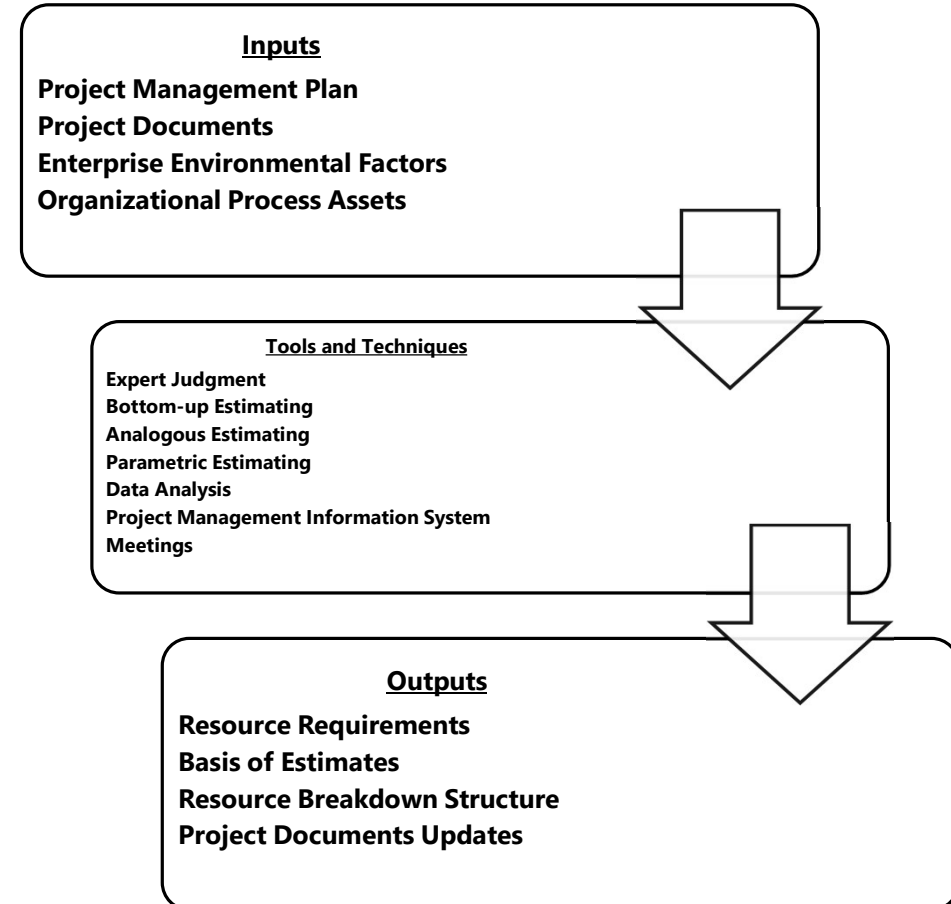
Plan Resource Management – Output

- Team Charter
 - ▶ Document that outlines what will be acceptable behavior within the project.
 - ▶ Should include things like the general rules of conduct for meetings, decision-making, and one-on-one conversations

Estimate Activity Resources

- Where you look at each individual activity and determine what and how many resources are needed to accomplish that activity
- Resources are not just people, but also include equipment, machines, and different types of supplies needed to finish the activity

Estimate Activity Resources - ITTO



Estimate Activity Resources - Tools

- Bottom-Up Estimating
 - Break down the activities in more detail until you can assign the resources. You can then aggregate them back up to the full activity
- Analogous Estimating
 - Also known as top-down estimation. Analogous estimation relies on historical information to assign the current duration to the activities. It is based on a limited amount of information.
- Parametric Estimating
 - Uses a math algorithm to calculate cost or duration

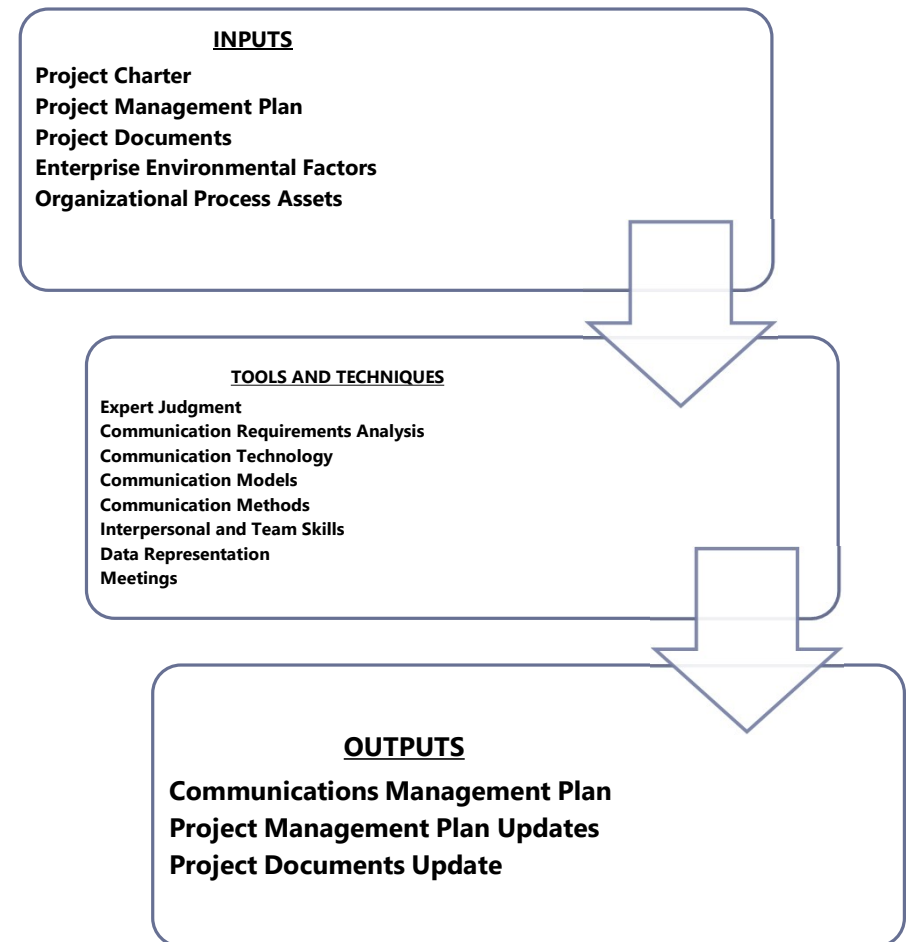
Estimate Activity Resources - Output

- Resource Requirements
 - ▶ will document the number and types of resources needed to complete each activity. This should be very detailed.
- Resource Breakdown Structure
 - ▶ Hierarchical breakdown of resources by their categories and types.
- Basis of Estimates
 - ▶ How the estimates were created.

Plan Communication Management

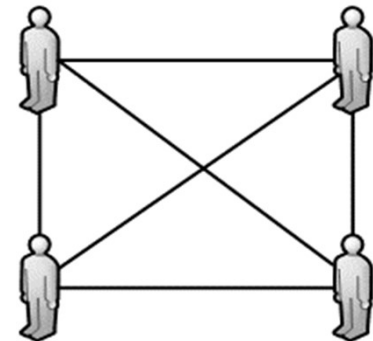
- Developing an appropriate approach and plan for project communications activities
- Based on the information needs of the project stakeholders
- Documented approach to effectively and efficiently engage stakeholders

Plan Communication Management - ITTO



Plan Communication Management - Tools

- Expert Judgement
- Communication Requirements Analysis
 - Analyzing the communications needs of the stakeholders
 - Lack of communication leads to failure
 - Communications Channels
 - **Channels = $n(n-1)/2$**
 - N=The number of people on the project
 - 4 Team Members= 6 lines of communication
 - $4(4-1)/2=x$
 - $6=x$
 - There are 10 stakeholders on a project, how many channels will the project manager need to analyze?
 - $10(10-1)/2 = 45$



Plan Communication Management - Tools

- **Communication Technology**
 - Method of communication
 - Technology, Email, phone, fax, Web page, in-person
 - Level of Urgency
 - Ease of use
 - Sensitivity and confidentiality of the information
- **Communication Methods**
 - Informal Written
 - Email, Memorandums
 - Formal Written
 - Contracts, Project Documents, Legal Notices
 - Informal Verbal
 - Phone calls, random discussions
 - Formal Verbal
 - Presentations, Speeches
 - Push- Email Blast
 - Pull-Download information
 - Interactive- Joint Discussions

Plan Communication Management - Tools

- **Communication Models**
 - ▶ Sender - The person or group sending the message to the receiver.
 - ▶ Encoder - The device or technology that encodes the message to travel over the medium.
 - ▶ Decoder - This is the inverse of the encoder.
 - ▶ Receiver - This is of course the recipient of the message.
 - ▶ Paralingual - The pitch, tone, & inflections in the sender's voice affect the message being sent.
 - ▶ Nonverbal
 - ▶ Communication Blocker

Plan Communication Management - Tools

- Interpersonal and Team Skills
 - ▶ Communication styles assessment
 - Technique to determine the ideal communication method, format, and substance for planned communication
 - ▶ Political awareness
 - Achieved through a good perception of strategies, hidden agenda, and power structure and relationship within and around the project
 - ▶ Cultural awareness
 - Understanding the differences among individuals, groups, and organizations and adjusting the project's communication to these differences.

Plan Communication Management - Output

- Communications Management Plan
 - ▶ Who should receive project communications
 - ▶ What communications they should receive
 - ▶ Who should send the communication
 - ▶ How the communication will be sent
 - ▶ How often it will be updated
 - ▶ Definitions so that everyone has a common understanding of terms.

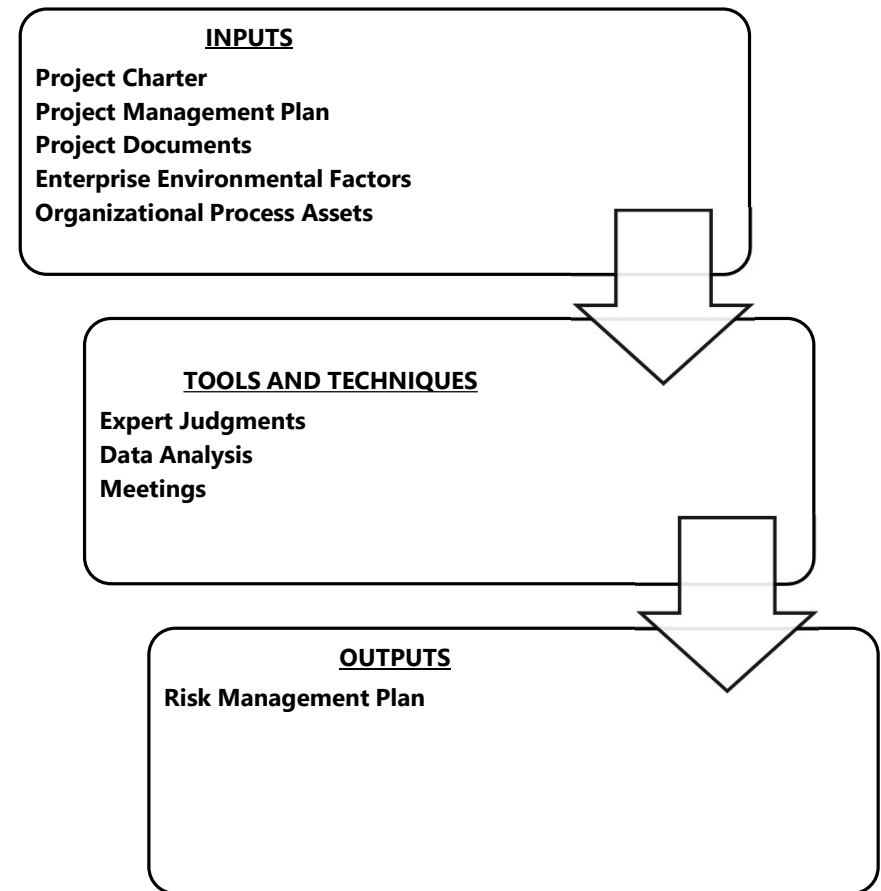
Project Risk Management

- Conducting risk management planning, identification, analysis, response planning, response implementation, and monitoring risk on a project.
- **Individual project risk:** is an uncertain event or condition that, if it occurs, has a positive or negative impact on one or more parts of the project
- **Overall project risk:** The risk exposure of the project as a whole. It's made up of the sum of individual project risks plus other sources of uncertainty.
- Risk is negative or positive. Negative risk are threats and positive risks are opportunities.
- Increase the probability and/or impact of positive risks and to decrease the probability and/or impact of negative risks

Plan Risk Management

- Defining how to conduct risk management activities for a project
- Planning how to identity, assess, response, implement responses and monitor risk
- Risk Management is a proactive approach and should be done early in the project

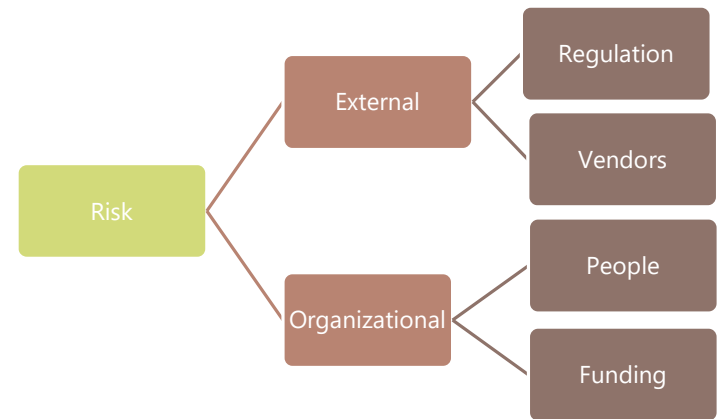
Plan Risk Management - ITTO



Plan Risk Management - Outputs

- Risk Management Plan, (Roadmap to the other 6 risk processes)
 - ▶ Used to determine
 - How risks will be categorized/identified
 - How quantitative/ qualitative analysis will be completed
 - How risk response planning will happen
 - How will the risk response be implemented
 - How risks will be monitored
 - How ongoing risk management activities will happen throughout the project life cycle
 - Roles and responsibilities for the project team
 - Stakeholders risk appetite, helps to determine what is acceptable risk vs. non acceptable
 - Risk Breakdown structure(RBS) is used to categories risks.

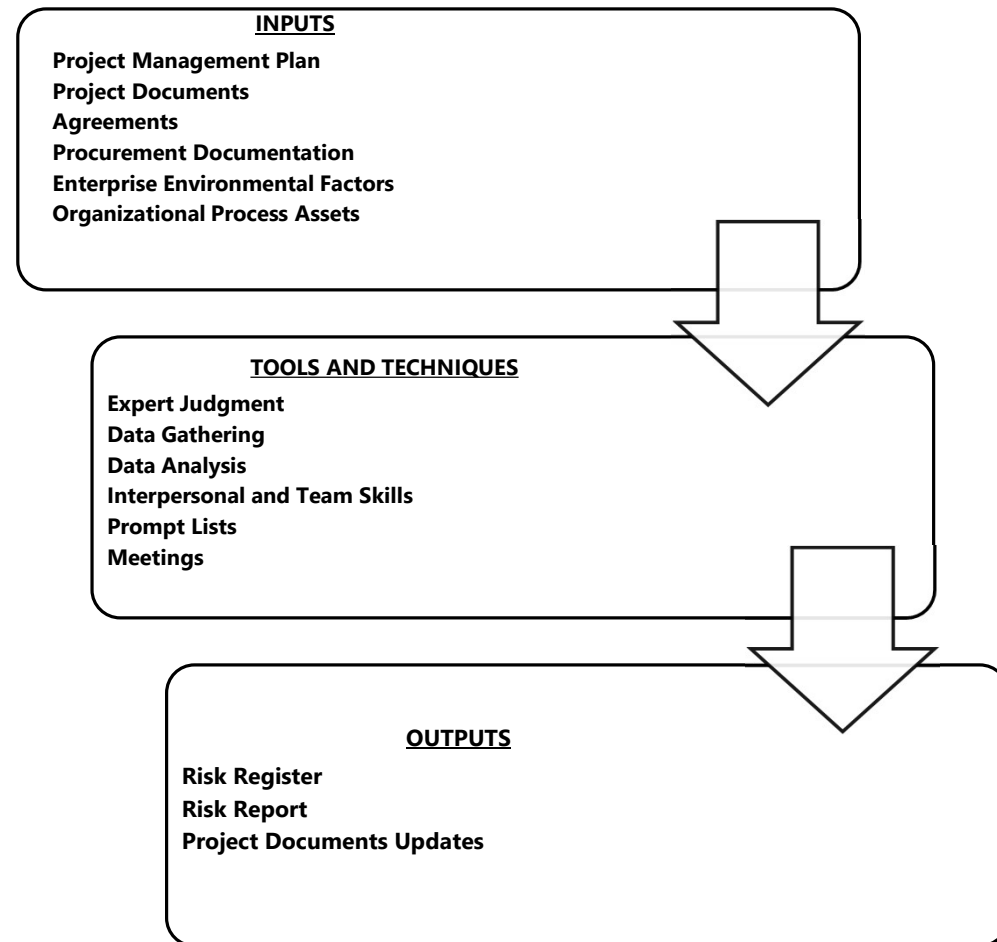
Sample Risk Breakdown Structure



Identify Risks

- Identifying individual project risks as well as sources of overall project risk, and documenting them in the risk register and risk report
- All personnel should be encouraged to identify risks.
- Should be done throughout the project. Risk changes daily.
- Identify both positive and negative risk

Identify Risks

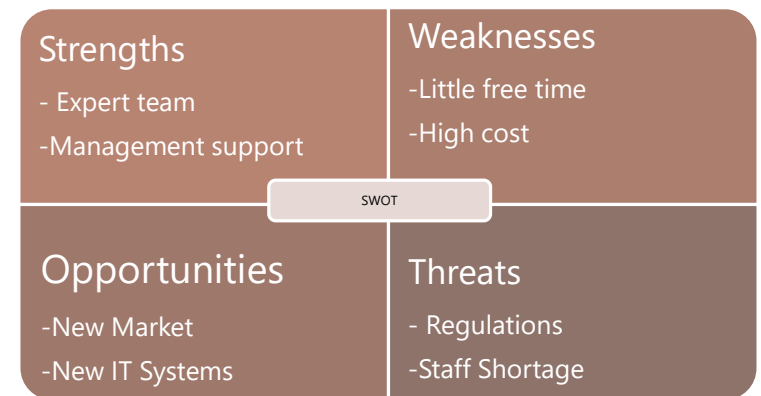


Identify Risks - Tools

- Prompt Lists
 - ▶ A predetermined list of risk categories. RBS can be used to used to identity both individual and overall risk

Identify Risks - Tools

- Data Analysis
 - ▶ Documentation Analysis
 - Structure review of all project documentation
 - ▶ Assumptions and constraints analysis
 - ▶ Root Cause Analysis
 - ▶ SWOT Analysis



Identify Risks

- Risk Register - (Individual Project Risks)
 - ▶ List of all Identified Risks
 - ▶ List of Potential Responses
 - ▶ Provides a list of all identified risks on the project, what reactions to this risk are, what the root causes are, and what categories the risks fall into.

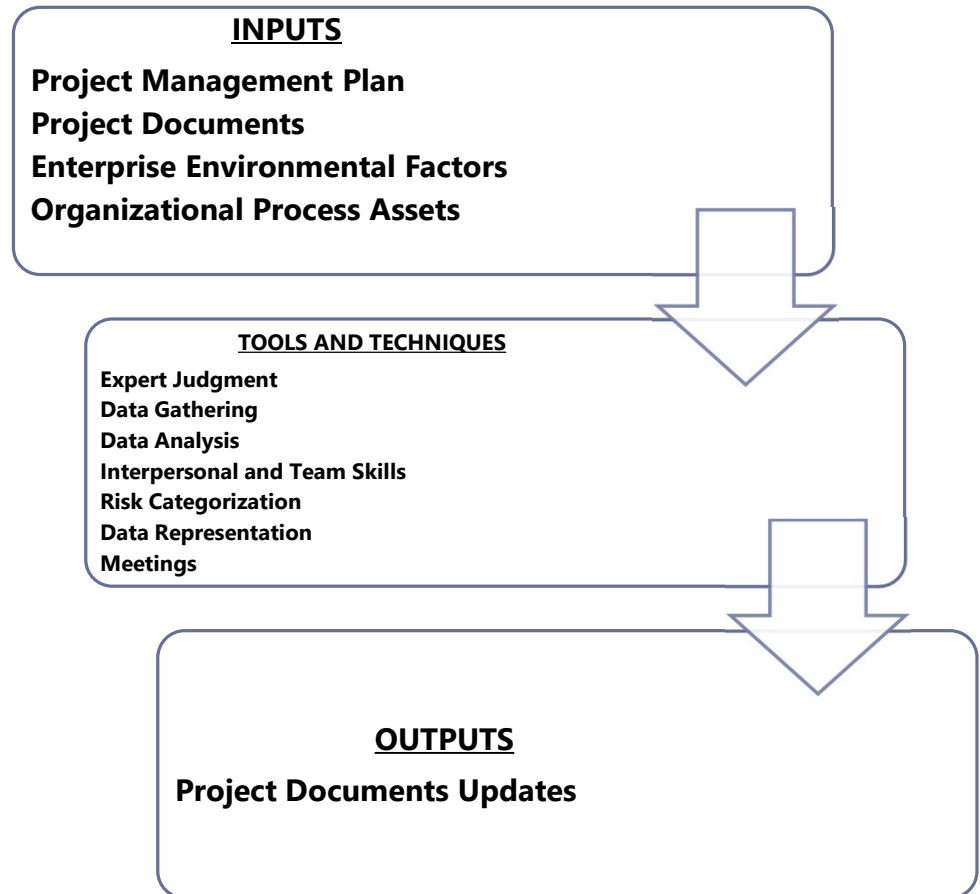
Risk ID	Risk	Response	Cause	Project Area
S1	Bad weather	Add 3 more days to schedule	Environment	Time
C1	Cost overrun	Add 10% more to budget	Supplier might increase cost	Cost

- Risk Report
 - ▶ Sources of overall project risk and summary information on identified individual risk.

Perform Qualitative Risk Analysis

- Prioritizing individual project risks by assessing their probability of occurrence and impact as well as other characteristics.
- Done in order to determine which risks are the highest priority on the project.
- Creates a ranking
- Performed throughout the project

Perform Qualitative Risk Analysis - ITTO



Perform Qualitative Risk Analysis - Tools

- **Data Analysis**

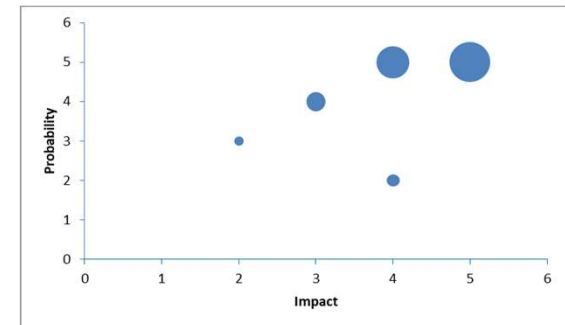
- ▶ Risk Probability and Impact Assessment
 - The likelihood that each specific risk will occur, level of probability
 - Investigate the potential effect on the project, Cost, Schedule, Quality, Performance, Positive or Negative
- ▶ Risk Data Quality Assessment
 - The degree of which the risk is understood and the accuracy, quality, reliability and the integrity of the data
- ▶ Assessment of other risk parameters
 - Other parameters such as urgency, proximity, manageability, and detectability.

- **Risk Categorization**

- ▶ Sources of Risk
- ▶ Grouped by root cause

Perform Qualitative Risk Analysis - Tools

- Data Representation
 - Probability and Impact Matrix
 - Outlines the probability and impact on the project
 - Sorted by High Risk, Medium Risk, Low Risk
 - Hierarchical Char
 - Bubble Chart



Risk bubble chart

Risk	Probability	Impact	Score	Ranking
Bad Contractor	4	5	20	High
Bad Weather	3	3	9	Medium
Earthquake	1	5	5	Low

Probability = 1-5 Impact = 1-5

Probability and Impact Matrix

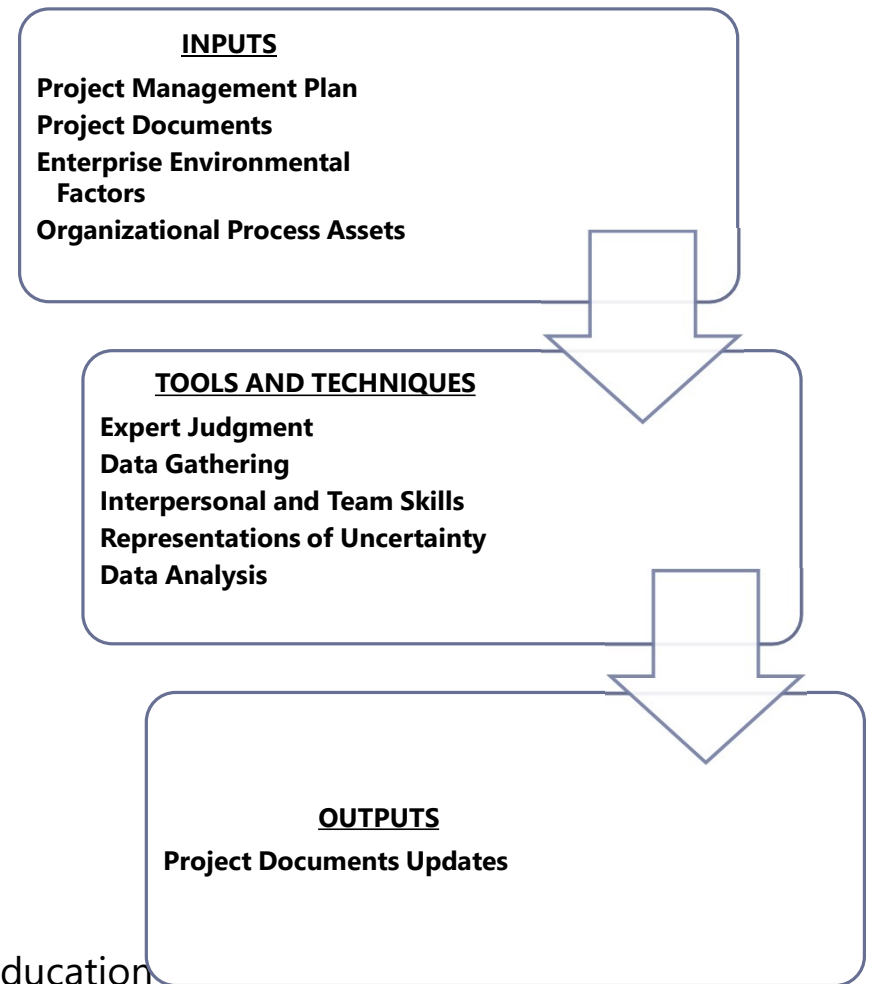
Perform Qualitative Risk Analysis - Outputs

- Project Documents Updates
 - ▶ Risk Register
 - ▶ Risk Report

Perform Quantitative Risk Analysis

- Numerically analyzing the effect of individual project risks on the overall project objectives.
- Assigns a value to the risk that have been ranked by qualitative risk analysis.
- Usually requires specific risk software and knowledge in the development and interpretation of risk models.

Perform Quantitative Risk Analysis - ITTO

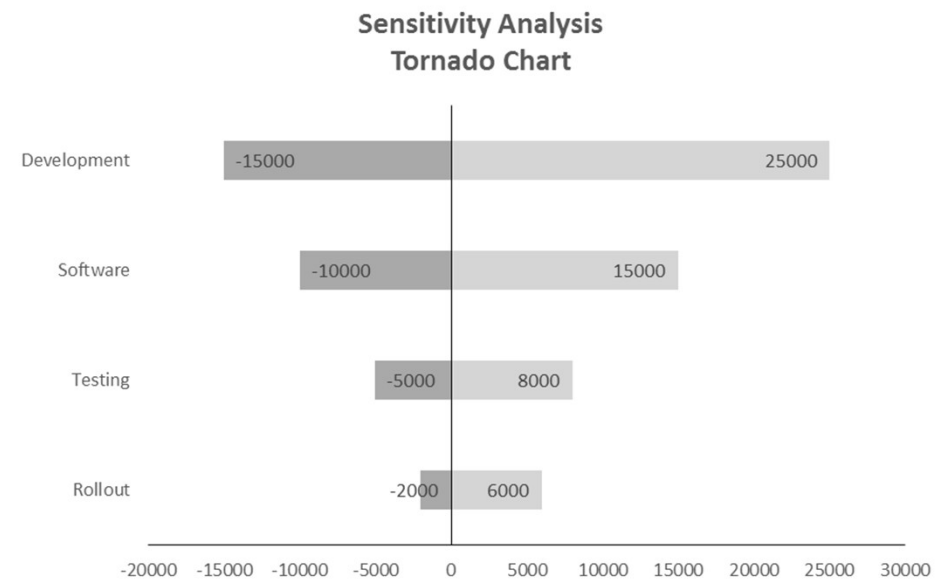


Perform Quantitative Risk Analysis – Tools

- Representation of Uncertainty
 - ▶ Probability distribution, looking at the probability of risks actually taking place
 - ▶ Triangular or beta distributions

Perform Quantitative Risk Analysis – Tools

- Data Analysis
 - ▶ Sensitivity Analysis
 - Tornado Chart



Perform Quantitative Risk Analysis – Tools

- Data Analysis
 - Sensitivity Analysis
 - Decision Tree Analysis
 - Make or buy analysis

	Initial Cost	Risk Cost	Probabilit y	EMV	Total
New Constructed House	1,000,000	400,000	25%	100,000	1,100,000
Remodel older house	800,000	500,000	10%	50,000	850,000
	To calculate the EMV you would take the probability multiply the risk costs. To get the total, add the EMV to the initial cost.				

Perform Quantitative Risk Analysis – Output

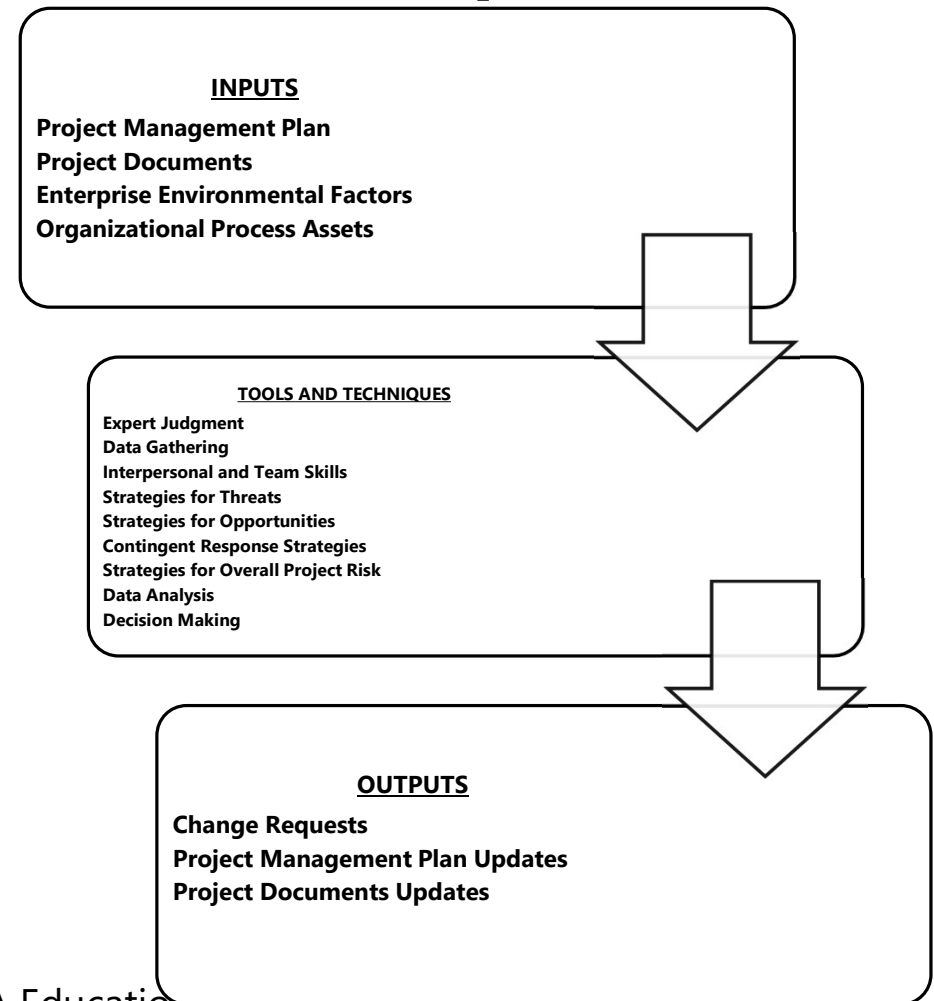
- Project Documents Updates
 - ▶ Risk register

Plan Risk Responses

- Developing options, selecting strategies, and agreeing on ways to address risk on the project
- Will allocate resources needed to response to risk if they happen
- Will address all risk



Plan Risk Responses - ITTO



Plan Risk Responses - Tools

- Strategies for Negative Risk or threats
 - ▶ **Escalate**-Outside the Project Team Level
 - ▶ **Avoid**-eliminate the risk entirely
 - ▶ **Transfer**-transfer ownership to a 3rd party
 - ▶ **Mitigate**- reduce the probability of the risk event
 - ▶ **Accept**- Deal with the Risk at hand

Plan Risk Responses - Tools

- Strategies for Opportunities (Positive Risk)
 - ▶ **Escalate**-Outside the Project Team Level
 - ▶ **Exploit**-Remove any and all uncertainty
 - ▶ **Share**-Some or all ownership to a 3rd party
 - ▶ **Enhance**-Increase the probability of the event happening
 - ▶ **Accept** -Take advantage of the opportunity, but not seek it
- Strategies for Overall Project Risk
 - ▶ **Avoid**
 - ▶ **Exploit**
 - ▶ **Transfer/Share**
 - ▶ **Mitigate/Enhance**
 - ▶ **Accept**

Plan Risk Responses - Tools

- Contingent Response Strategies
 - ▶ May undertake certain risk events, if certain conditions apply

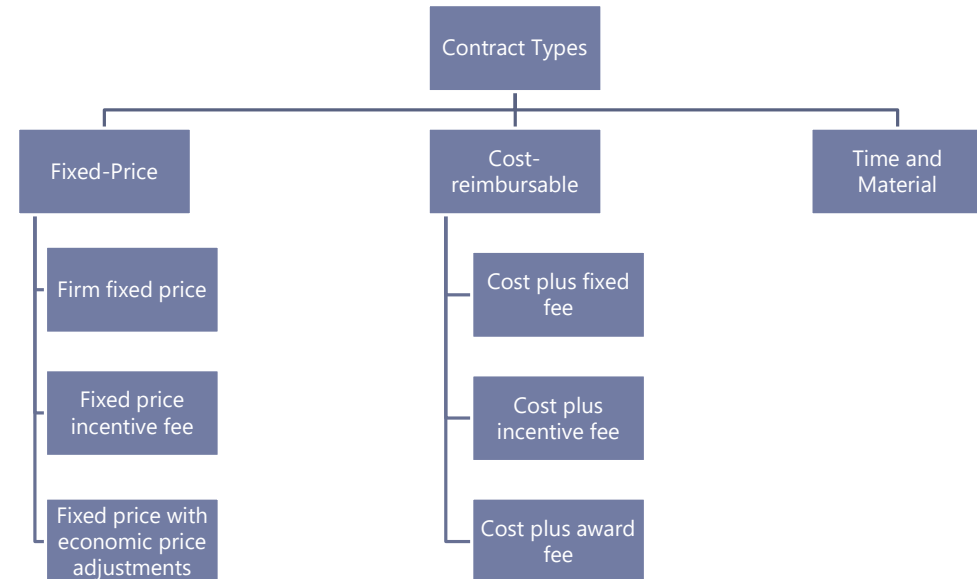
Plan Risk Responses - Outputs

- Project Documents Updates
 - ▶ Risk register

Agreements (Contracts)

- Should clearly outline the deliverables and results anticipated, including any knowledge transfer from the seller to the buyer.
- Know the laws and regulations from the local country that could affect the contract
- Generally considered a legally binding documents between buyers and sellers
- Should outline:
 - Formal written document
 - Scope of work to be performed
 - Roles and responsibilities
 - How to perform the work, including locations and times?
 - Terms and conditions
 - Warranties and penalties
 - Payment terms
 - Termination clauses
 - Change request process
 - Incentives
 - Insurance and performance bonds

Types of Contracts



Fixed Price (Lump Sum)

- When the buyer pays one flat price (lump sum) for all work in the contract
- This would include all labor and materials
- Use when the scope is well-defined and understood
- All risk is with the seller
- 3 Types:
 - Firm Fixed Price (FFP): This contract is when the price is fixed and cannot be changed.
 - Fixed Price Incentive Fee (FPIF): This contract is when the fixed price includes an additional fee for meeting a target set forth in the contract.
 - Fixed Price Economic Price Adjustment (FP-EPA): This contract is used to adjust the fixed cost over the life of the contract because of economic conditions.

Cost-reimbursable

- When the buyer pays for the work expenses and then pays the seller a fee for his profit
- The risk is with the buyer because the cost overrun of work expense is covered by the buyer
- 3 Types
 - Cost plus fixed fee (CPFF): This contract is when the buyer pays the work expense and then a fixed fee to the seller for profit.
 - Cost plus incentive fee (CPIF): This contract is when the buyer pays the work expense and an additional fee, if a target is met, such as, finishing two weeks earlier.
 - Cost plus award fee (CPAF): This contract is when the buyer pays the work expense and pays an award fee that is based on satisfaction of work.

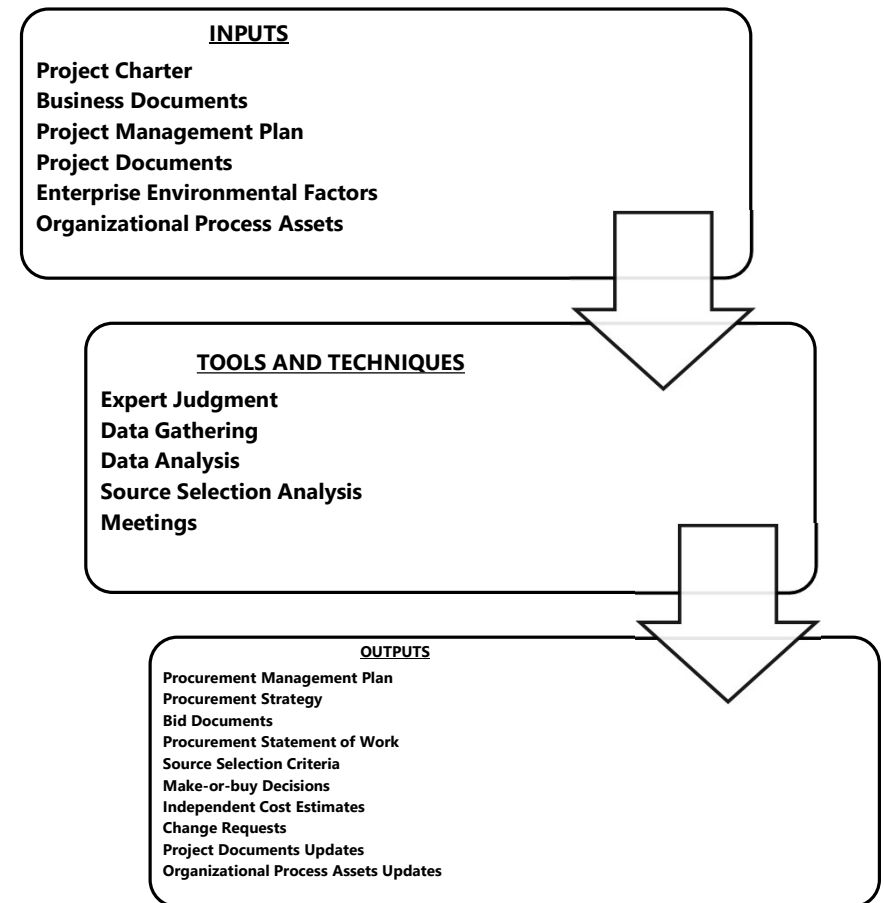
Time and material

- Time and material contract is when the buyer pays for both labor and material
- The buyer takes all the risk of cost overrun for both the labor and materials
- Should only be used when the scope is high-level.

Plan Procurement Management

- Determines whether to obtain goods and services from outside the project and, if so, what to acquire as well as how and when to acquire it.
- The process of documenting what procurements are needed for the project, detailing the approach, defining selection criteria to identify potential sellers, and putting together a Procurement management plan.

Plan Procurement Management - ITTO



Plan Procurement Management - Tools

- Data Gathering
 - ▶ Market Research
- Data Analysis
 - ▶ Make-or-buy analysis
- Source Selection Analysis
 - ▶ Understanding of work
 - ▶ Risk
 - ▶ Cost
 - ▶ Past Performance
 - ▶ References
 - ▶ Production ability
 - ▶ Warranty

Plan Procurement Management - Output

- Procurement Management Plan
 - Outlines the activities to be undertaken during the procurement processes
 - Make contain a prequalified sellers list
- Procurement Strategy
 - Determine how to deliver the deliverables, types of contracts to use, what phases will be used to complete procurements
- Bid Documents
 - Used to Solicit Proposals from potential sellers
 - RFI, Request for information
 - IFB, Invitation for bid
 - RFP, Request for proposal
 - RFQ, Request for quote
- Procurement Statement of Work
 - Developed from the Scope Baseline, Lists the needs of the buyer
 - Allows prospective sellers to determine if they can meet the requirements set forth by the Buyer

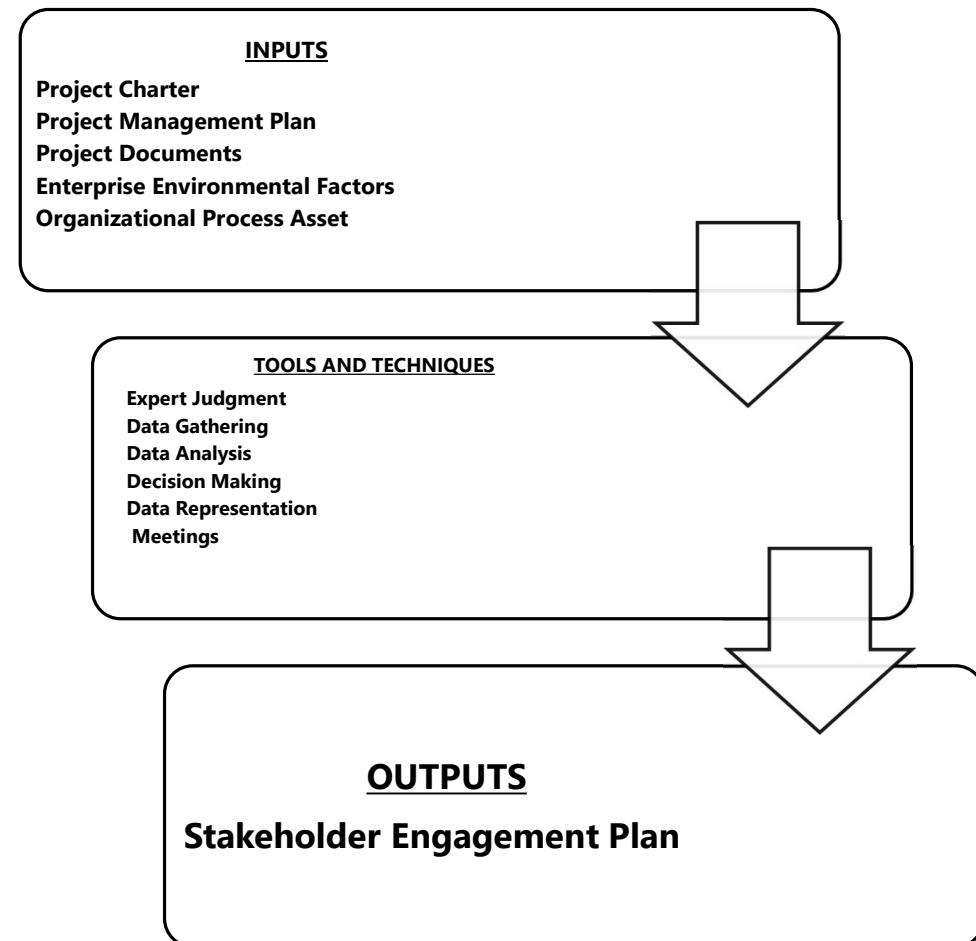
Plan Procurement Management - Output

- Source Selection Criteria
 - ▶ Cost, location, license, certification, reference, warranty, or experience. This needs to be determined before seller is selected.
- Make or buy Decisions
 - ▶ What will the project make or buy
- Independent Cost Estimates
 - ▶ Cost estimate done by an outside professional
- Change Requests

Plan Stakeholder Engagement

- Developing methods to involve project stakeholders
- Centered on their needs, expectations, interests, and potential impact on the project.
- It creates an actionable plan to interact effectively with stakeholders

Plan Stakeholder Engagement - ITTO



Plan Stakeholder Engagement

- Data Representation
 - ▶ Stakeholder Engagement Assessment Matrix
 - 5 levels of engagement
 - Unaware
 - Resistant
 - Neutral
 - Supportive
 - Leading

Stakeholder	Unaware	Resistant	Neutral	Supportive	Leading
Mary		Current		Desired	
Jane	Current				Desired
Bob			Desired		

Plan Stakeholder Engagement - Outputs

- Stakeholder Engagement Plan
 - ▶ How will the team keep the stakeholders engaged on the project.
 - ▶ What type of communication will be needed to engage them on the project.

Executing

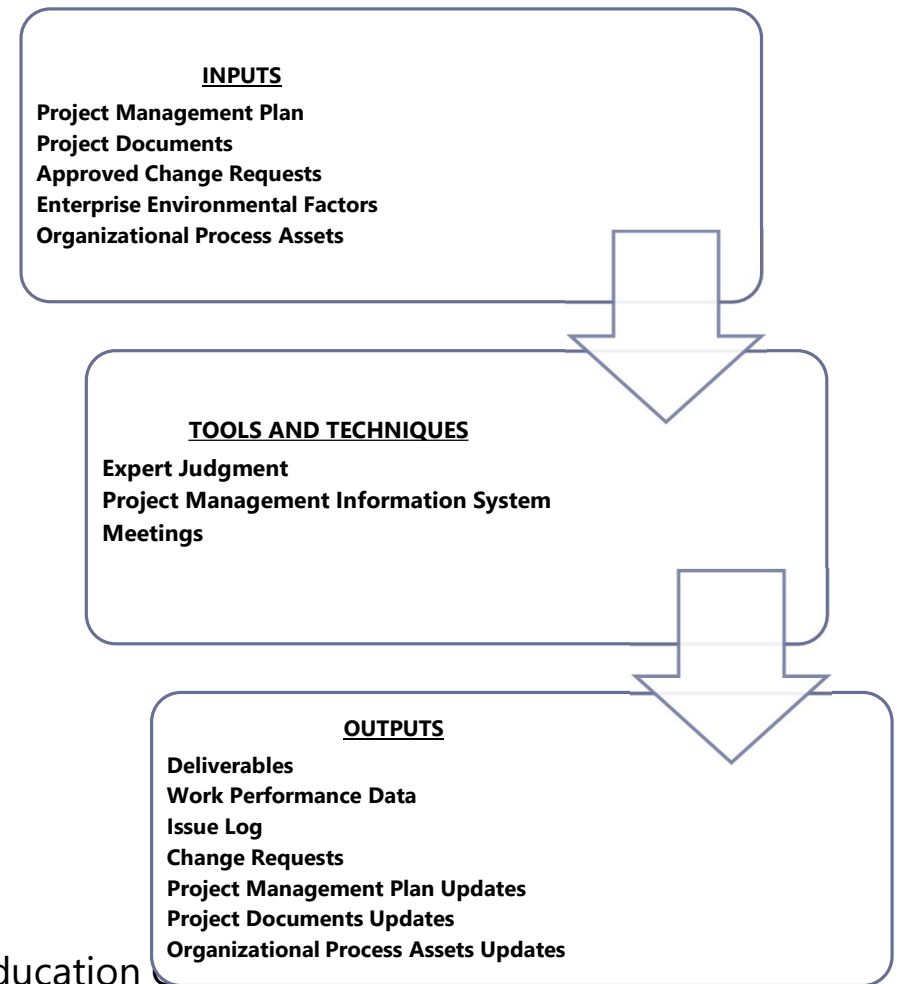
PROCESS GROUPS & KNOWLEDGE AREAS TABLE

Project Management Process Groups				
Initiating	Planning	Executing	Monitoring & Controlling	Closing
Develop Project Charter	Develop Project Management Plan	Direct and Manage Project Work	Monitor and Control Project Work	Close Project or Phase
Identify Stakeholders	Plan Scope Management	Manage Project Knowledge	Perform Integrated Change Control	
	Collect Requirements	Manage Quality	Validate Scope	
	Define Scope	Acquire Resources	Control Scope	
	Create WBS	Develop Team	Control Schedule	
	Plan Schedule Management	Manage Team	Control Costs	
	Define Activities	Manage Communications	Control Quality	
	Sequence Activities	Implement Risk Responses	Control Resources	
	Estimate Activity Durations	Conduct Procurements	Monitor Communications	
	Develop Schedule	Manage Stakeholder Engagement	Monitor Risks	
	Plan Cost Management		Control Procurements	
	Estimate Costs		Monitor Stakeholder Engagement	
	Determine Budget			
	Plan Quality Management			
	Plan Resource Management			
	Estimate Activity Resources			
	Plan Communications Management			
	Plan Risk Management			
	Identify Risks			
	Perform Qualitative Risk Analysis			
	Perform Quantitative Risk Analysis			
	Plan Risk Responses			
	Plan Procurement Management			
	Plan Stakeholder Engagement			

Direct and Manage Project Work

- Performing the work defined in the project management plan
- Involves managing people and keeping them engaged, improving the processes, requesting changes, and implementing approved changes
- Summary of all other executing processes

Direct and Manage Project Work - ITTO



Direct and Manage Project Work - Inputs

- Approved Change Requests

Direct and Manage Project Work - Output

- Deliverables
 - Any product, service, or result required to complete the project
- Work Performance Data
 - Information on the status of these deliverables
 - Is it tracking Positive or Negative against the plan/baselines, (cost/durations)
 - Work completed, start/end dates of activities, # of changes requests, # of defects,
- Issue Log
 - A record of all the issues/problems you have encountered on the project
 - All issues are described, assigned, prioritized, and addressed.

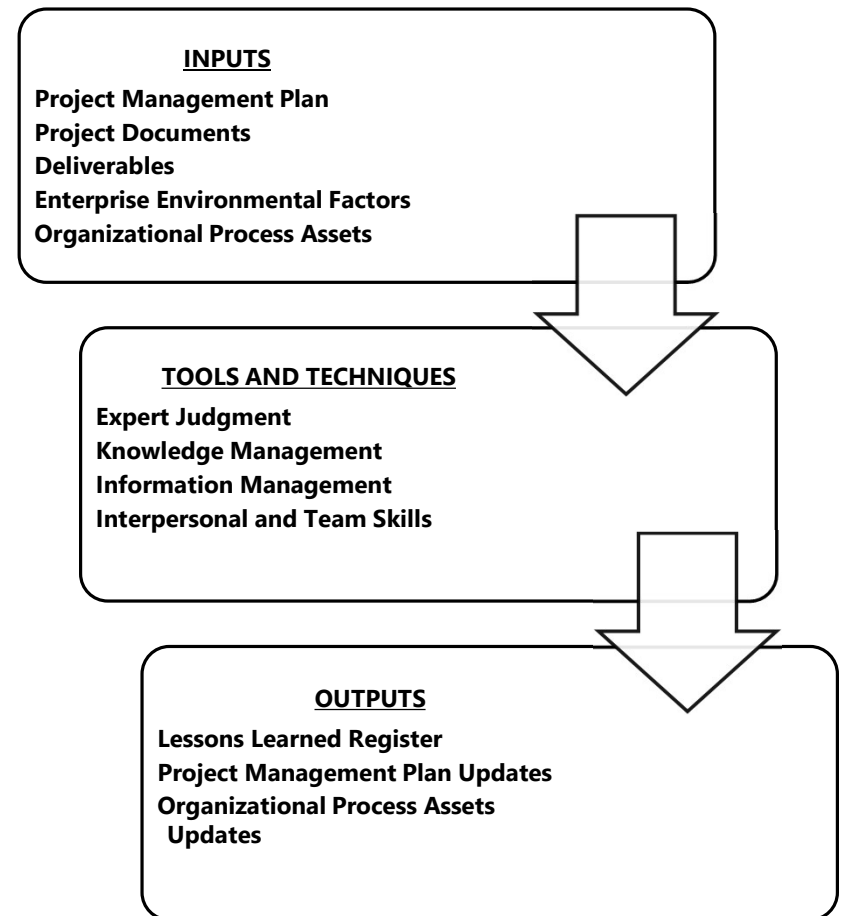
Direct and Manage Project Work - Output

- Change Requests
 - Corrective Action
 - Fixing past errors
 - Realigns the project performance
 - Preventive Action
 - Fixing future errors
 - Questions if everything is aligned with the project plan
 - Defect Repair
 - Modify a nonconforming product or result

Manage Project Knowledge

- Using existing knowledge and creating new knowledge
- Contribute to organizational learning
- Knowledge created by the project will be made available to support organizational operations and future projects or phases
- Commonly split into explicit and tacit.
 - **Explicit knowledge** can be formally documented and shared,
 - Data
 - Documents
 - Records
 - **Tacit knowledge** exists inside the heads of your employees
 - Experience
 - Thinking

Manage Project Knowledge - ITTO



Manage Project Knowledge - Tools

■ Knowledge Management

- The sharing of knowledge between stakeholders on a project. Used to foster project interaction. Sure as:
 - ▶ Networking
 - ▶ Workshops
 - ▶ Meetings

■ Information Management

- The collection, storage, dissemination, archiving and destruction of information

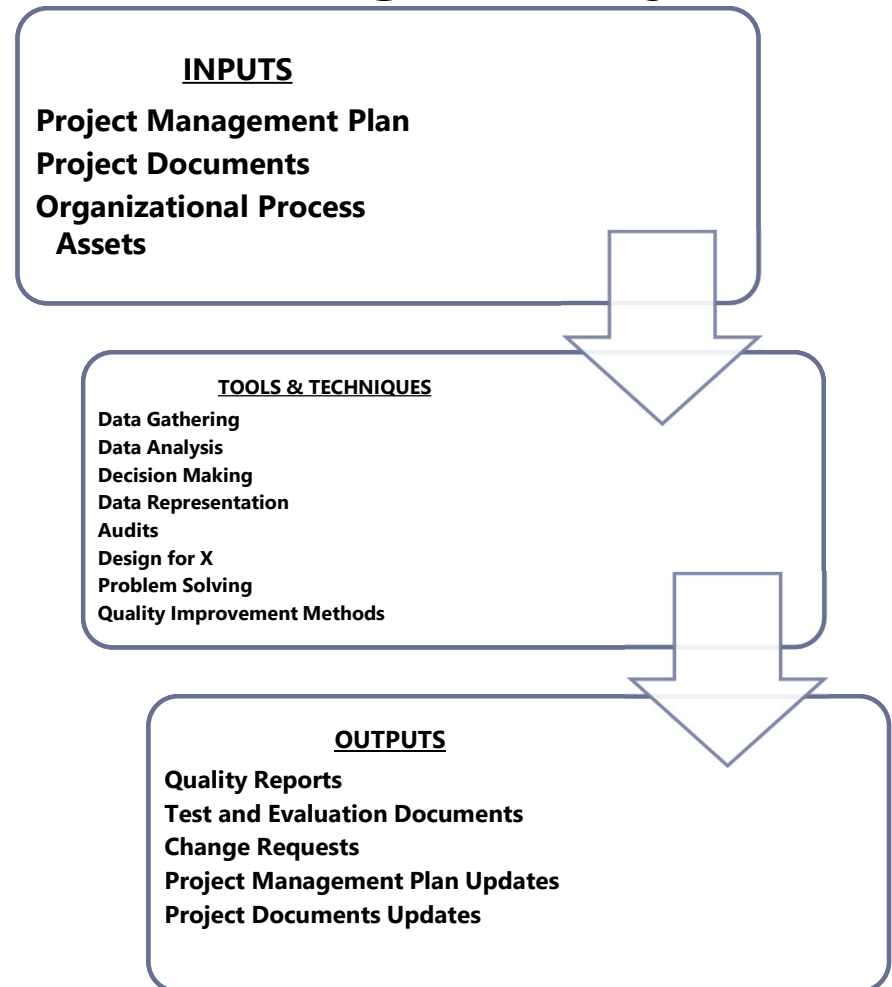
Manage Project Knowledge - Outputs

- Lessons Learned Register
 - Gathered throughout the project, not just at the end
 - Updated whenever new knowledge within the project is discovered by any stakeholder

Manage Quality

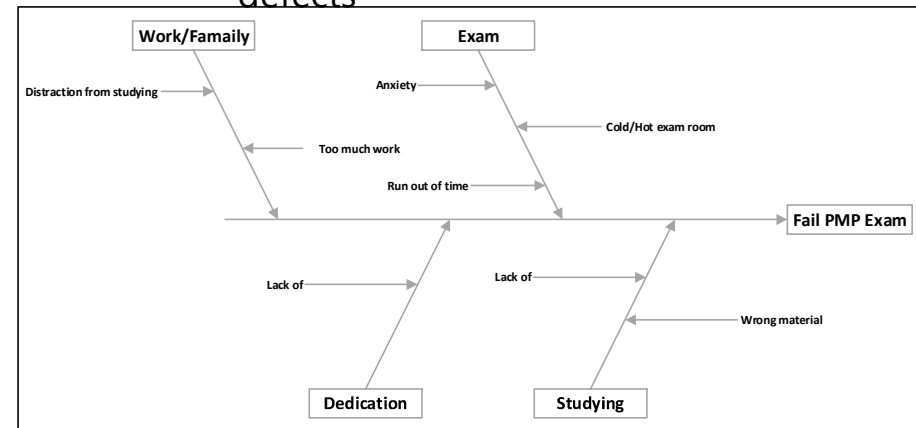
- Translating the quality management plan into executable quality activities
- It increases the probability of meeting the quality objectives as well as identifying ineffective processes and causes of poor quality.
- Maybe called Quality Assurance.
- Confirm the quality processes used are meeting the quality objectives.

Manage Quality



Manage Quality - Tools

- Data Representation
 - ▶ Affinity Diagrams
 - Used to group ideas together
 - ▶ Matrix Diagrams
 - Shows the relationship among processes
 - ▶ Cause and Effect Diagrams
 - Also known as Ishikawa or Fishbone diagram, it will tell you the causes of defects



Manage Quality - Tools

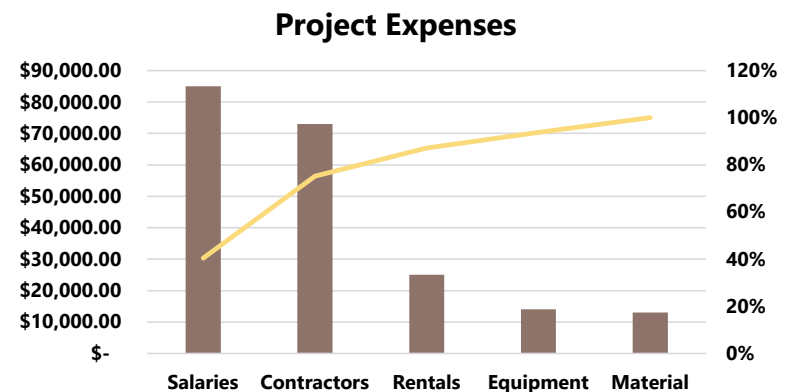
■ Data Representation

► Flowcharts

- Flowcharts show you a graphical representation of the process and any room for improvements.

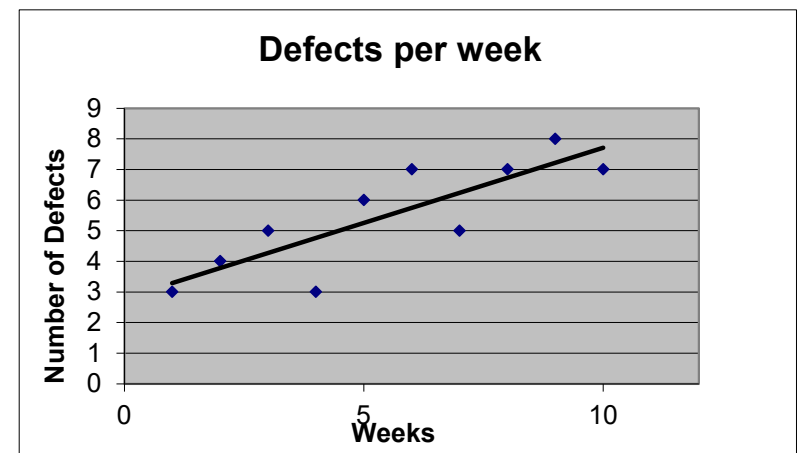
► Histograms

- Histograms are bar charts that show the distribution of numerical data. One example of a histogram is a Pareto diagram. Pareto diagrams use the Pareto principle of 80/20.



Manage Quality - Tools

- Data Representation
 - ▶ Scatter Diagram
 - Scatter diagrams show trends in relation to different variables



Manage Quality - Tools

- Audits
 - Identify all best practices are being executed
 - Identify all short comings and gaps in the process
- Design for X
 - Used by engineers in order to design a particular aspect of a product
- Problem Solving
 - Finding solutions to problems. identifying the problem, determining what's causing it, looking at possible solutions, selecting a solution, implementing a solution, and verifying that it solves the problem.
- Quality Improvement Methods
 - Find ways to improve the quality processes

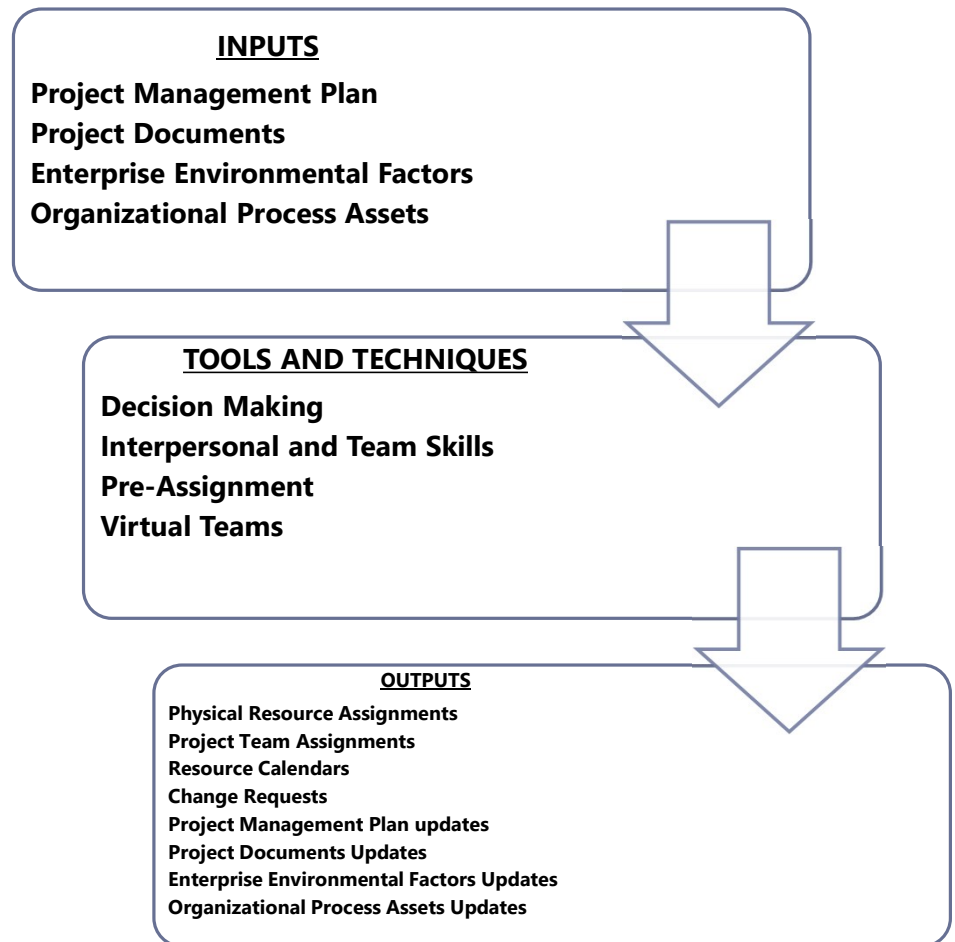
Manage Quality - Output

- Quality Reports
 - ▶ Report generally includes information about quality issues on the project and recommendations on how to improve the processes being used.
- Test and Evaluation Documents
 - ▶ Documents generally take the form of a checklist that can be used when checking the quality of the deliverables

Acquire Resources

- Getting the staff and physical resources needed to build the deliverables on the project.
- Done continuously throughout the project or phase
- Both internal and external resources

Acquire Resources - ITTO



Acquire Resources - Tools

- Decision Making
 - Multi-Criteria Decision Analysis
 - Availability, Cost, Experience, Ability
 - Knowledge, Skills, Attitude, International Factors
- Interpersonal and Team Skills
 - Negotiation
 - Functional Managers for particular resources
 - Other PM teams in motion, Vendors, Contractors, 3rd parties
- Pre-Assignment
 - Team Members are selected in advance of the project
- Virtual Teams
 - Wide Spread Geographical areas, Another city, Country, etc...
 - Work from home, Different Shifts

Acquire Resources - Outputs

- Physical resource Assignments
 - ▶ Document how you allocated the physical resources on the project. This usually includes assigning materials, supplies, equipment, or locations to the project work.
- Project Team Assignments
 - ▶ Assign the project team to their roles and responsibilities
- Resource Calendars
 - ▶ Shows working shifts for resources. Shows availability.

Develop Team

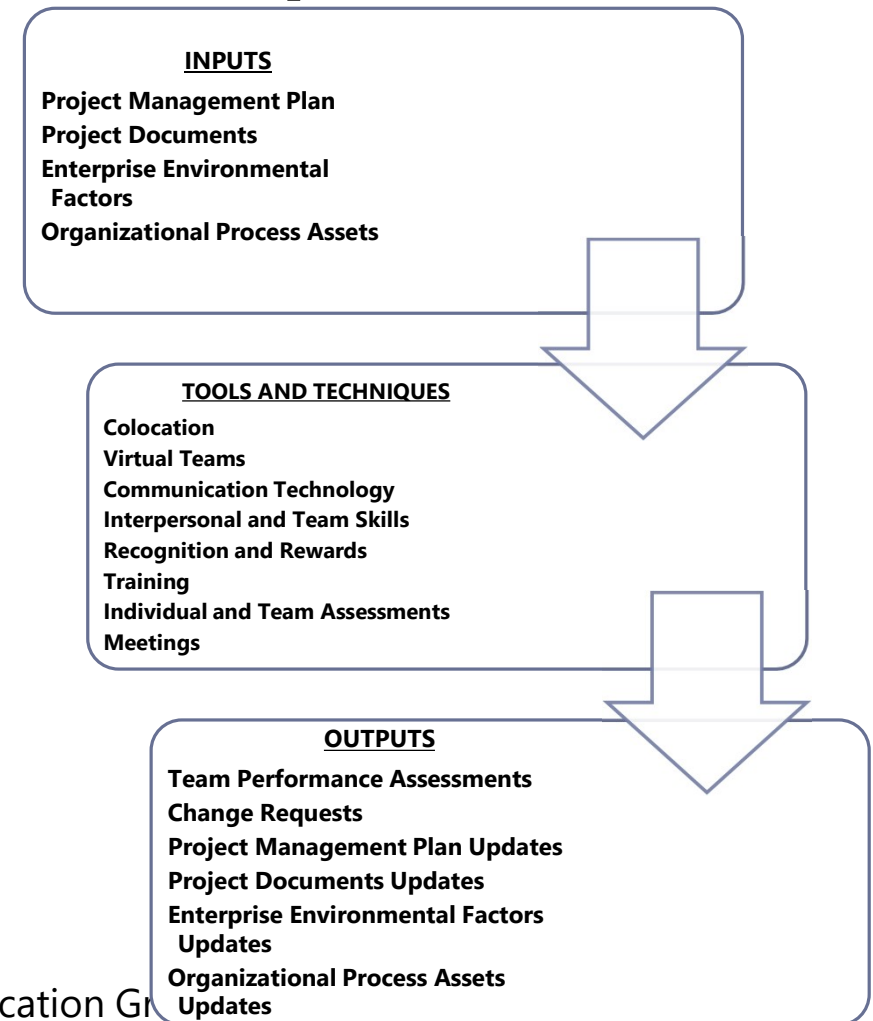
- Process of improving abilities, team member communication, and the overall team atmosphere.
- Critical factor for the project success
- Focuses on building a sense of team and improving its performance
- PM primary responsible
Bringing together multiple personalities into one working group

Develop Team

■ **Tuckman's Ladder, (Five Stages)**

- ▶ Forming
 - People getting to know one another
- ▶ Storming
 - Speaking about issues on the project
- ▶ Norming
 - Coming to a solution to issues
- ▶ Performing
 - Doing the work
- ▶ Adjourning
 - Team is release

Develop Team - ITTO



Develop Team - Tools

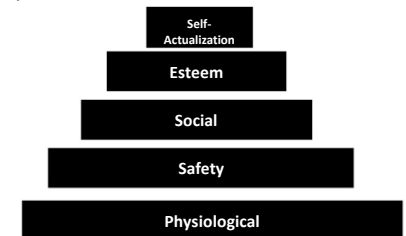
- Co-Location (Tight Matrix)
 - Moving the entire team into one physical location, War room
 - Maybe temporary or long term
- Virtual teams
- Communications Technology
 - The way the team communicates, Email, phone, fax, text messages
- Interpersonal and Team Skills, (Soft Skills)
 - Anticipating the team needs, acknowledging their concerns
 - Conflict Management
 - Influencing
 - Motivation
 - Negotiations
 - Team building

Develop Team - Tools

- Training
 - ▶ Ensuring all team members get required training for the project
- Meetings
- Individual and Team Assessments
 - ▶ Individual's strengths and weaknesses
 - ▶ How does the team makes decisions, resolves conflicts, communicates, a builds trust with each other

Develop Team - Tools

- Recognition and Rewards
 - ▶ Rewarding good behavior, Only desirable behavior should be rewarded, used to increase morale
 - ▶ Maslow's hierarchy of needs
 1. Physiological: The necessities to live: air, water, food, clothing, and shelter.
 2. Safety: People need safety and security; this can include stability in life, work, and culture.
 3. Social: People are social creatures and need love, approval, and friends.
 4. Esteem: People strive for the respect, appreciation, and approval of others.
 5. Self-actualization: At the pinnacle of needs, people seek personal growth, knowledge, and fulfillment.



Develop Team - Tools

- ▶ Herzberg's Theory of Motivation
 - Hygiene agents (What factors influence satisfaction at work) are expected by and can only demotivate if they are not present. Motivating agents provide opportunity to exceed, and advance.
- ▶ McGregor's Theory X and Y
 - Theory X- is bad. These people need to be watched all the time, micromanaged, and distrusted, people avoid work, responsibility, and have no ability to achieve.
 - Theory Y is good. These people are self-led, motivated, and can accomplish new tasks proactively.
- ▶ Theory Z
 - Increased Loyalty at the workplace. Theory emphasizes the well-being of the employees, both at work and outside of work, it encourages steady employment

Develop Team - Tools

- ▶ Expectancy Theory
 - People behave based on what they expect as a result of their behavior.
- ▶ McClelland 3 need theory
 - Achievement
 - Power
 - Affiliation
- ▶ Forms of Power
 - Reward Power - Ability to give rewards
 - Expert Power - SME
 - Legitimate(formal power)
 - Referent- Respect /Personality of the Manger
 - Punishment- Punish associates when they fail (least desirable)

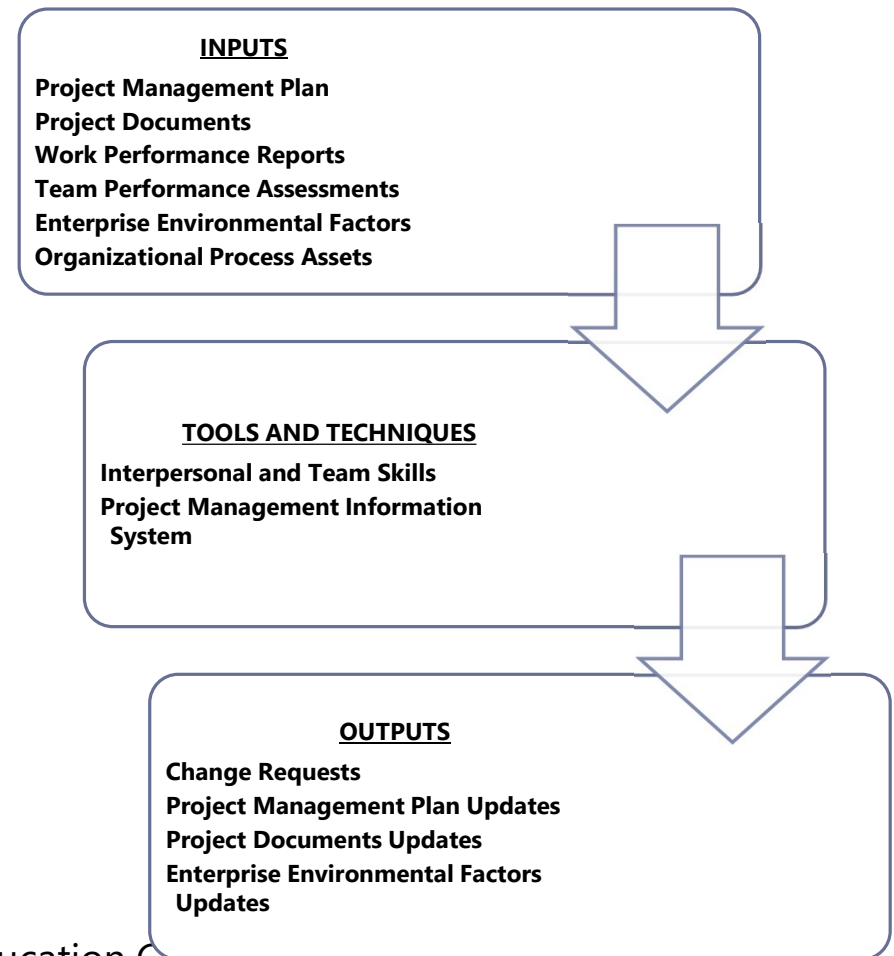
Develop Team - Outputs

- Team Performance Assessments
 - ▶ Evaluation of the team
 - ▶ Task-oriented or result-oriented
 - ▶ Improve team members skills
 - ▶ Reduce staff turn over rate
 - ▶ Increase team members cohesiveness
 - ▶ Additional training, mentoring, coaching assistance needed?

Manage Team

- Manage Team is the process of tracing team member performance, providing feedback, resolving issues, and managing team changes.
- Team management involves a combination of skills with special emphasis on communication, conflict management, negotiation, and leadership.

Manage Team - ITTO



Manage Team - Tools

- Project Management Information System (PMIS)
- Interpersonal and Team Skills
 - Conflict Management
 - Sources of Conflict
 - Greatest project conflict occurs between project managers and functional managers. Disagreements over schedules, priorities, and resources.

Conflict Resolution	Quick Example
Problem Solving (confronting)	Let's put our heads together, study the problem and find the best solution. Win-Win
Forcing	Bob's got priority here, so we'll go with his opinion on the solution. Win-Lose
Compromising	Let's take a little of both sides of the arguments and create a mixed solution. Lose-Lose
Smoothing	It's really not that big of a problem. Can be considered a Lose-Lose
Withdrawal	I'm leaving. Do whatever solution works. The conflict is not resolved and it is considered a Yield-Lose solution

Manage Team - Tools

- Interpersonal and Team Skills
 - ▶ Steps to follow:
 - Define the cause of the problem (not just the symptoms).
 - Analyze the problem (cause-and-effect diagram).
 - Identify solutions.
 - Implement the selected solution.
 - Review the solution.
 - Confirm that the solution solved the problem.
 - ▶ Emotional Intelligence
 - Manage the personal emotions of oneself, other people and groups.
 - ▶ Leadership
 - Drive the project vision, and inspire high quality work
 - ▶ Influencing
 - Excellent listening skills, being able to articulate key details and positions
 - Reach agreements
 - ▶ Effective Decision Making
 - Manage risk, develop team creativity, focus on project goals and milestones, analyze all project information

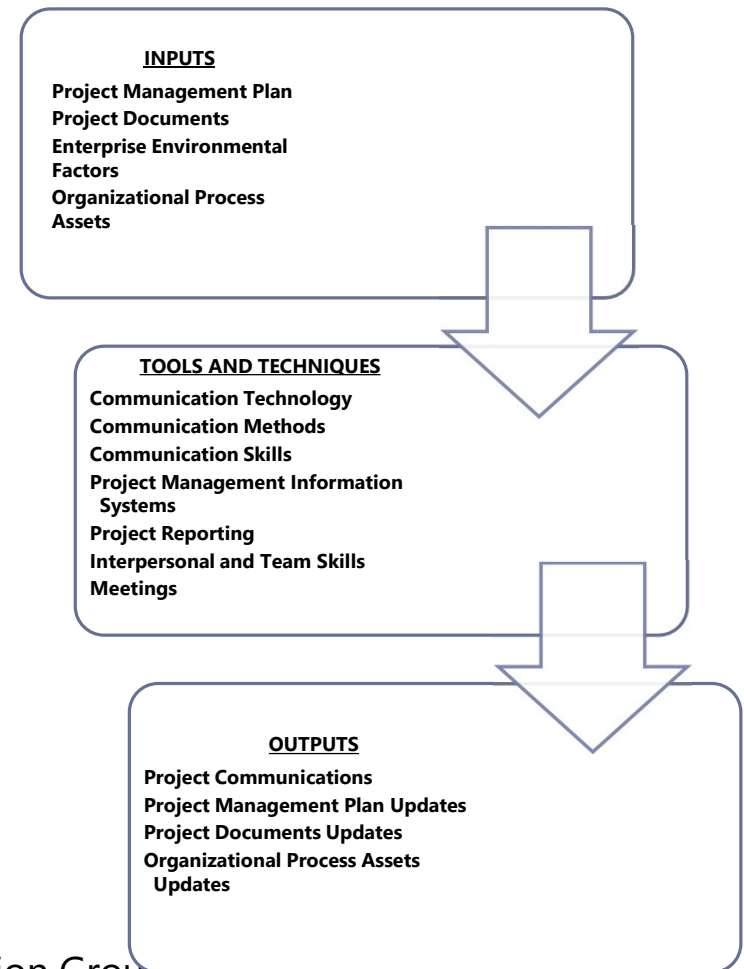
Manage Team - Output

- Change Request

Manage Communication

- Ensuring timely and suitable gathering, creation, distribution, storage, retrieval, management, and monitoring, of project communications
- Follow the communication management plan

Manage Communications - ITTO



Manage Communication - Tools

- Communication Technology
- Communication Methods
- Communication Skills
 - ▶ Communication competence
 - ▶ Feedback
 - ▶ Nonverbal
 - ▶ Presentations
- Project Reporting
 - ▶ Collecting and distributing project information

Manage Communication - Tools

- **Interpersonal and Team Skills**
 - ▶ Active Listening
 - ▶ Conflict Management
 - ▶ Cultural Awareness
 - ▶ Meeting Management
 - Agendas
 - Stay on Topic
 - Minutes
 - ▶ Networking
 - ▶ Political Awareness

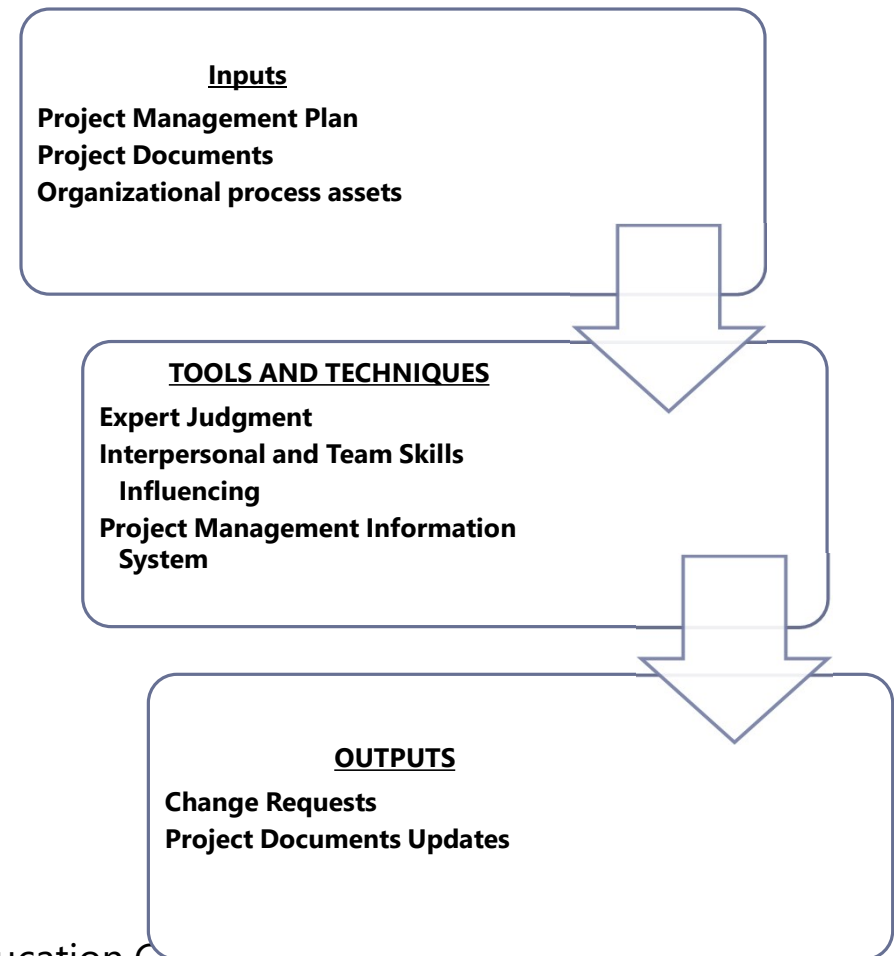
Manage Communication - Output

- Project Communications
 - ▶ Performance reports, deliverables status, baseline reporting

Implement Risk Responses

- Executes risk response plans when risk has taken place
- Minimizes the project threats and maximizes the project opportunities

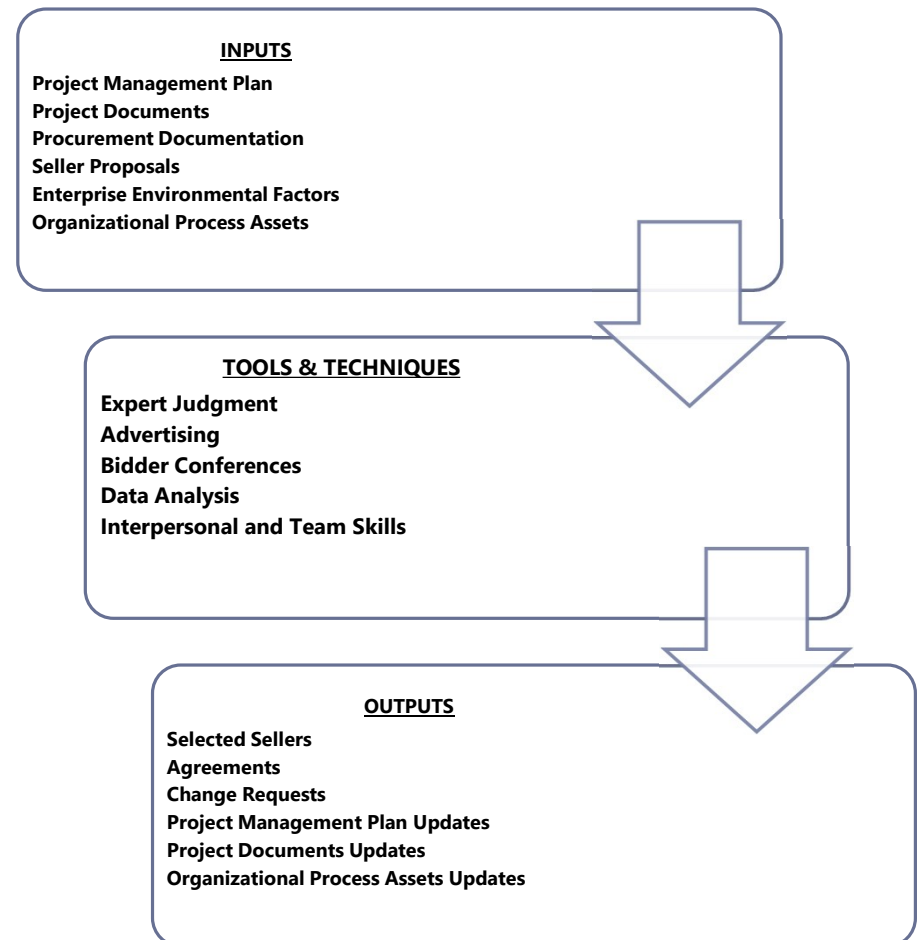
Implement Risk Responses - ITTO



Conduct Procurements

- The process of obtaining a seller response, selecting a seller, and awarding a contract.
- It selects a qualified seller and implements the legal agreement for delivery.

Conduct Procurements - ITTO



Conduct Procurements - Inputs

- Procurement Documentation
 - Bid Documents
 - Procurement Statement of Work
 - Independent Cost Estimates
 - Source Selection Criteria
- Seller Proposals

Conduct Procurements - Tools

- Advertising
 - ▶ Some contracts may be required to be advertised, i.e. Government
- Bidder Conference (Contractor, Vendor, or Pre-bid conferences)
 - ▶ Meeting between buyer and sellers
- Data Analysis
 - ▶ Proposal evaluation
- Interpersonal and Team Skills
 - ▶ Negotiations

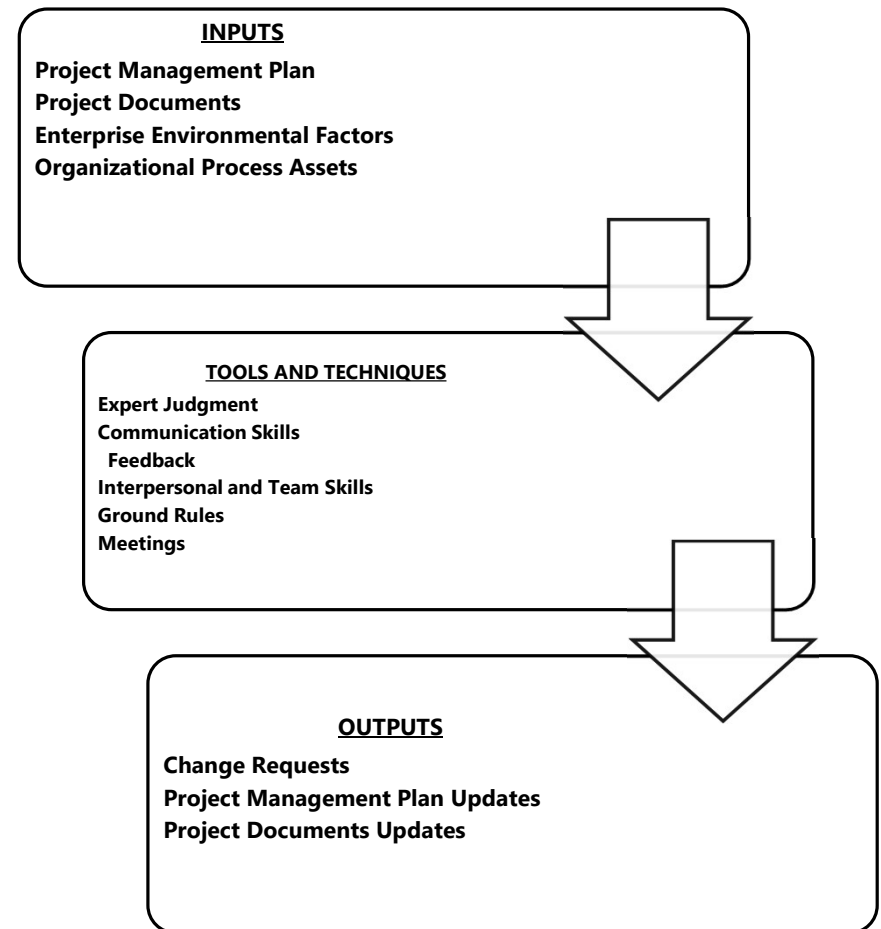
Conduct Procurements - Outputs

- Selected Sellers
- Agreements

Manage Stakeholder Engagement

- Communicating and working with stakeholders to meet their needs and expectations
- Addressing issues, and get them involve

Manage Stakeholder Engagement - ITTO



Manage Stakeholder Engagement - Tools

- Grounds rules
 - ▶ Defined in the team charter for team members and stakeholders

Manage Stakeholder Engagement - Output

- Change Requests

PROCESS GROUPS & KNOWLEDGE AREAS TABLE

Project Management Process Groups				
Initiating	Planning	Executing	Monitoring & Controlling	Closing
Develop Project Charter Identify Stakeholders	Develop Project Management Plan Plan Scope Management Collect Requirements Define Scope Create WBS Plan Schedule Management Define Activities Sequence Activities Estimate Activity Durations Develop Schedule Plan Cost Management Estimate Costs Determine Budget Plan Quality Management Plan Resource Management Estimate Activity Resources Plan Communications Management Plan Risk Management Identify Risks Perform Qualitative Risk Analysis Perform Quantitative Risk Analysis Plan Risk Responses Plan Procurement Management Plan Stakeholder Engagement	Direct and Manage Project Work Manage Project Knowledge Manage Quality Acquire Resources Develop Team Manage Team Manage Communications Implement Risk Responses Conduct Procurements Manage Stakeholder Engagement	Monitor and Control Project Work Perform Integrated Change Control Validate Scope Control Scope Control Schedule Control Costs Control Quality Control Resources Monitor Communications Monitor Risks Control Procurements Monitor Stakeholder Engagement	Close Project or Phase

Monitor and Control

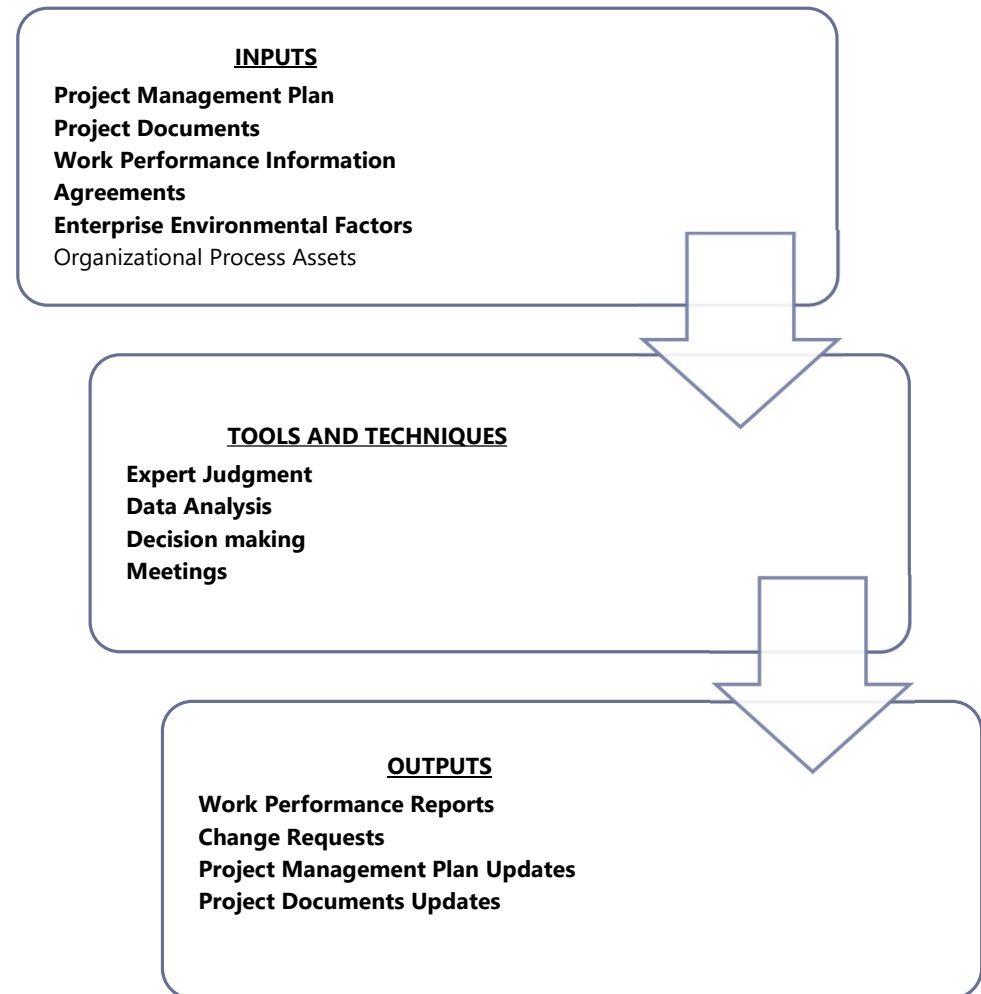
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Monitor and Control Project Work

- Process of tracking, reviewing, and recording the progress to meet the performance defined in the PM Plan.
- Ensures that the plan is working, identifies any areas in which changes to the plan are required, and initiates the corresponding changes
- Takes all the Work Performance Information and creates the Work Performance Reports.

Monitor and Control Project Work - ITTO



Monitor and Control Project Work - Inputs

- Work Performance Information
 - Status of the deliverables, project forecasts, status of change request

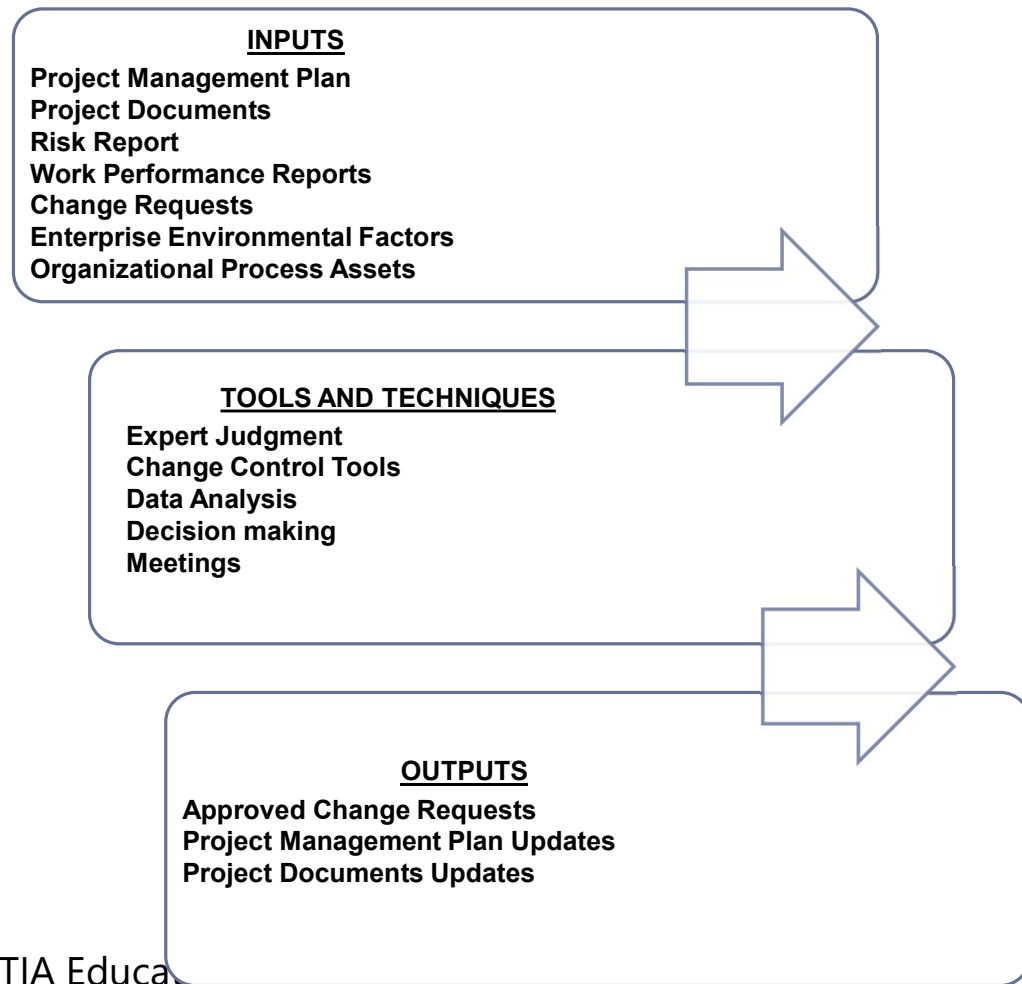
Monitor and Control Project Work - Outputs

- Change request
- Work Performance Reports

Perform Integrated Change Control

- Review all change requests; approving changes and managing changes to deliverables, project documents, and the project management plan
- Communicating the decisions.
- Process where you assess the change's impact on the project
- Any Stakeholder may request a change
- Should be submitted in written form
- Change Control Board – Group responsible for reviewing, evaluating, approving, deferring, or rejecting changes to the project and for recording and communicating such decisions.

Perform Integrated Change Control - ITTO



Perform Integrated Change Control

■ **Process for making change**

1. A stakeholder needs to identifies a need for a Change request
2. A written change request is submitted it to the Project Manager
3. The Project Manager assess the change and looks for any other options for the Change Request. Looks at the impact of the change request
4. The Change request is submitted to the Change Control Board
5. The Change request is either approved or rejected by the Change Control Board
6. If approved, The PM will adjust the Project Management Plan
 - Then manage the project to the new plan
7. If it is not approved, the team goes back to the issue and develop a new change request, repeat step 1

Perform Integrated Change Control - Inputs

- Work Performance Reports
- Change requests

Perform Integrated Change Control - Tools

- Change Control Tools
 - To manage the change requests, status, and resulting decisions
 - Update the Stakeholders with current information

Perform Integrated Change Control - Outputs

- Approved Change Requests
 - Once the change control board members approve a change request, it will be implemented in the Direct and Manage Project Work process
- Project Document updates
 - Change log

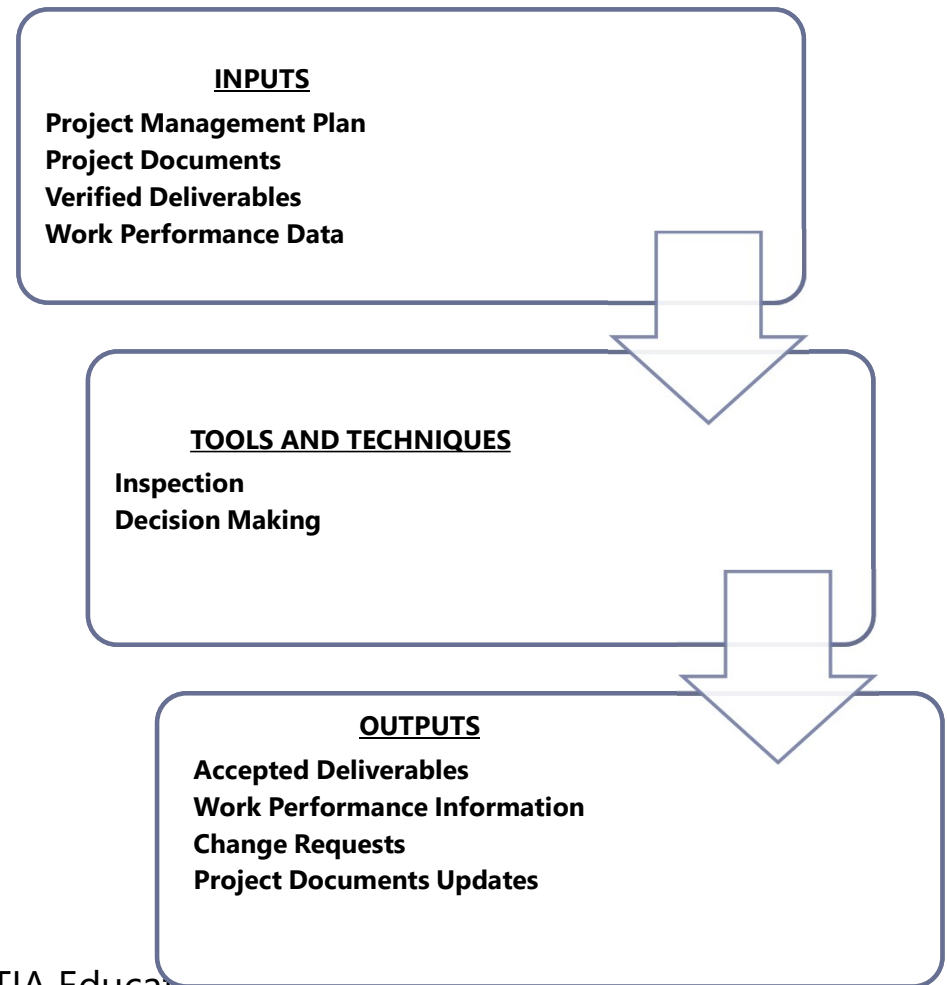
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Validate Scope

- Formalizing acceptance of the completed project deliverables.
- The verified deliverables obtained from the Control Quality process are reviewed with the customer or sponsor to ensure they are completed satisfactorily and have received formal acceptance of the deliverables by the customer or sponsor
- Done at the same time or immediately after Quality Control
- Close Project or Phase may start upon completion of this process
- Concerned with correctness of the deliverable

Validate Scope - ITTO



Validate Scope - Inputs

- Verified Deliverables (Created during the Perform Quality Control Process)

Validate Scope - Tools

- Inspection
 - ▶ The measuring, examining, testing and verifying to determine whether the work and the deliverables have met the requirements set forth in the Scope Baseline, and you have successful product/result/service acceptance.
 - ▶ It can also be called a product review, audit, walkthrough.
- Decision Making

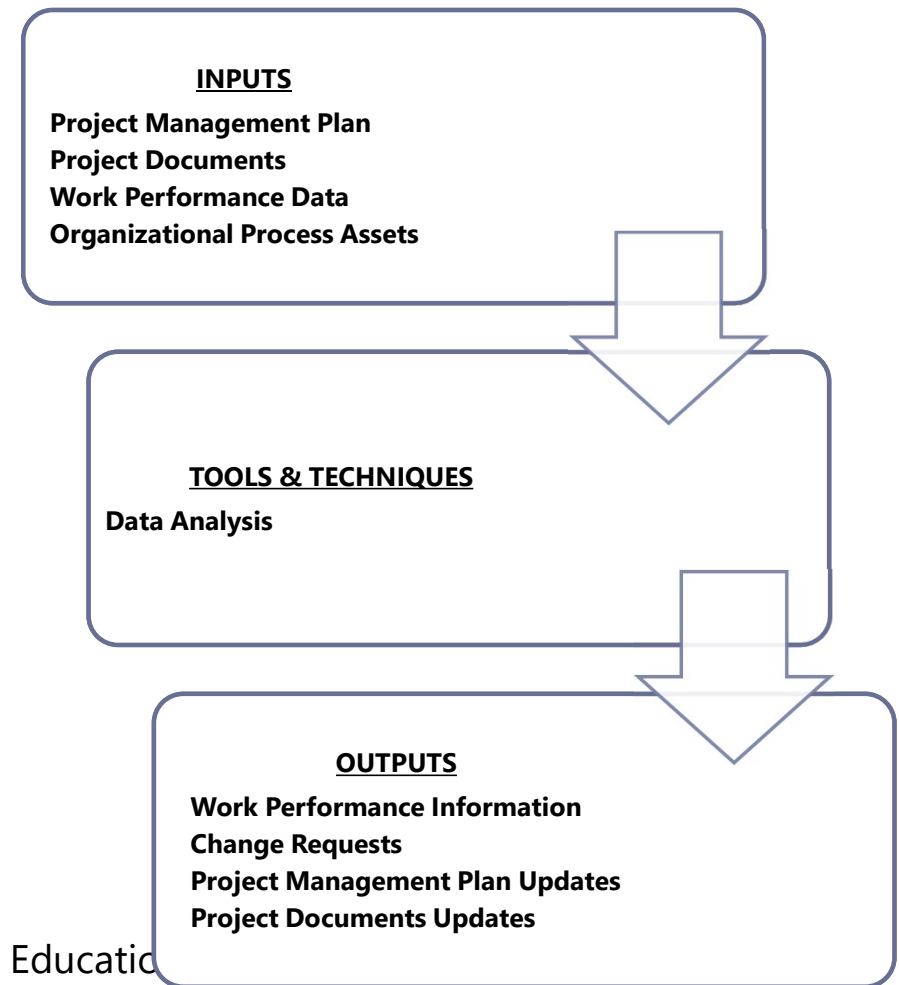
Validate Scope - Outputs

- Accepted Deliverables
 - ▶ Deliverables that have met the acceptance criteria, and that have been signed off and approved by the sponsor or the customer.
- Change Requests
 - ▶ Deliverables that have not met the acceptance criteria, are dealt with via Perform Integrated Change Control process. Product rework is necessary to repair the defect.
- Work Performance Information
 - ▶ Information about Project progress

Control Scope

- Process of monitoring the status of the project and product scope and managing changes to the scope baseline.
- The uncontrolled expansion to product or project scope without adjustments to time, cost, and resources is referred to as scope creep.
- Determines if a scope change has happened.
- When changes are made and approved, the project baselines will need to be adjusted to reflect these changes

Control Scope - ITTO



Control Scope Control - Tools

- Data Analysis
 - Variance Analysis
 - ▶ Determining whether work being perform has a degree of variance as it relates to the scope baseline
 - ▶ What is the cause of the variance, how extensive is the variance
 - ▶ Is corrective/preventative action required
 - Trend Analysis
 - ▶ Performance of the scope over time

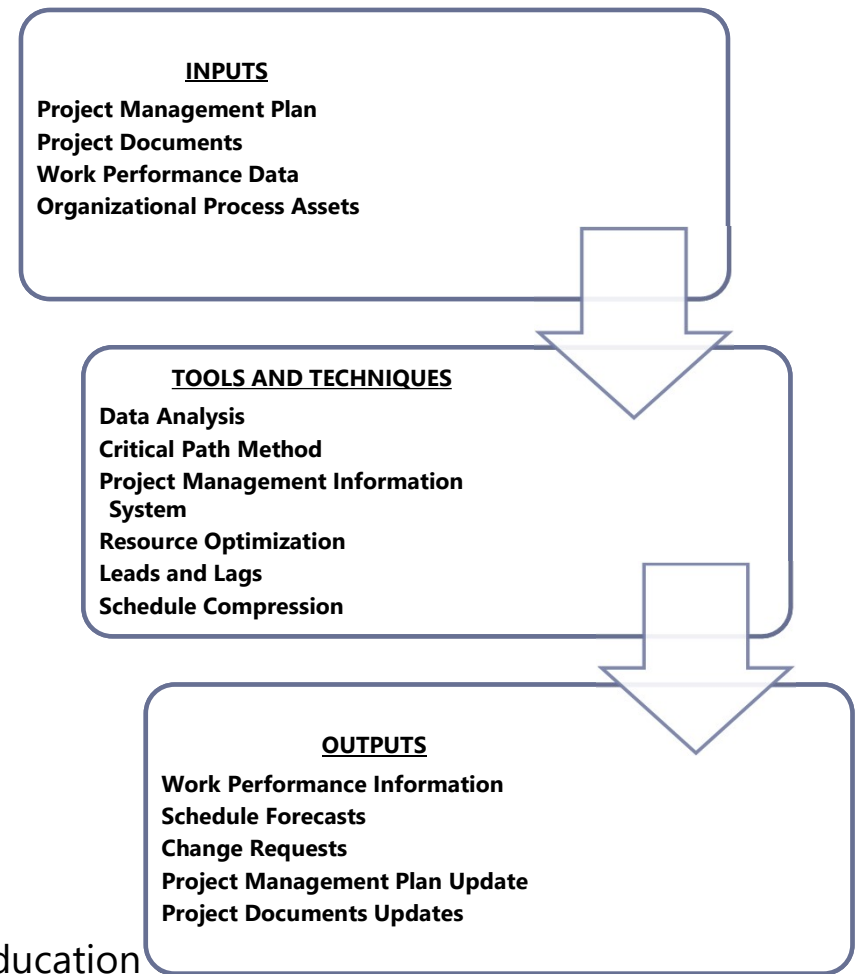
Control Scope Control - Outputs

- Work Performance Information
 - ▶ Planned vs. actual performance
- Change Requests

Control Schedule

- Monitoring the status of the project to update the project schedule and managing changes to the schedule baseline.
- The schedule baseline is maintained throughout the project.
- Compare the work results to the plan to see if they line up
- What is the status of the project, how did it reach this point?

Control Schedule - ITTO



Control Schedule - Tools

- Data Analysis
 - ▶ Performance Reviews
 - Measuring actual start/finish dates vs. planned start/finish dates
 - If negative variance is in place, is the project in jeopardy
 - ▶ Earned Value Analysis
 - ▶ Performance Reviews
 - ▶ What-If Scenarios
- PMIS
- Critical Path Method
- Resource Optimization Techniques
- Leads and Lags
- Schedule Compression, (Fast Track or Crash)

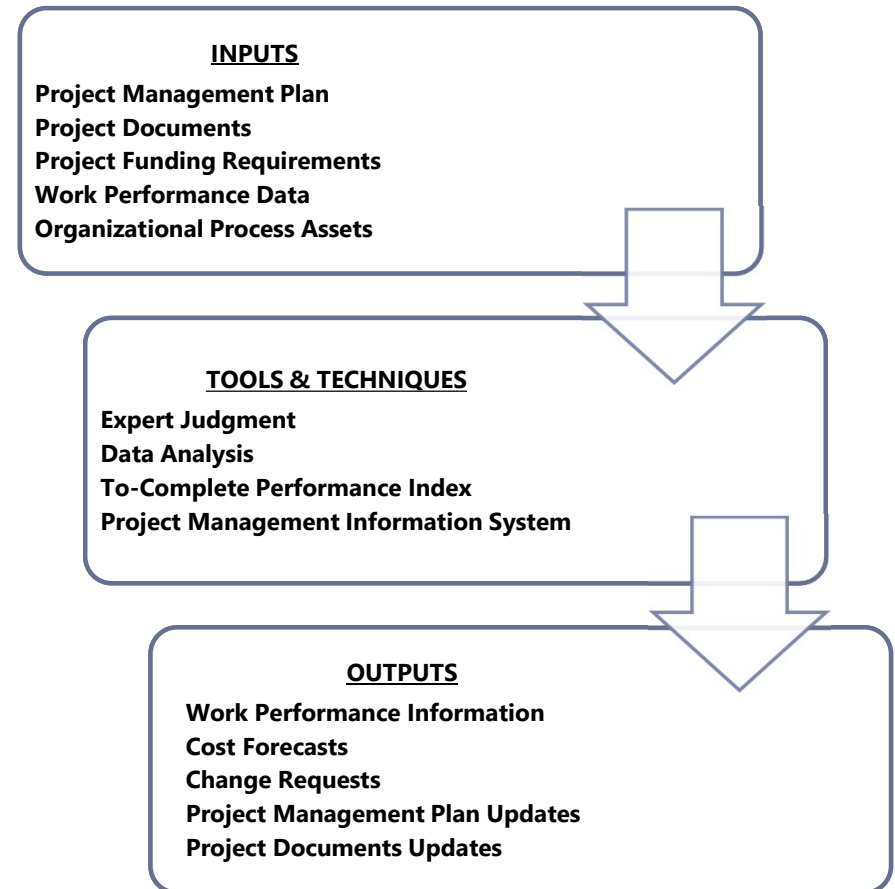
Control Schedule - Output

- Work Performance information
- Schedule Forecast
 - ▶ Based on Past performance and expected future performance
- Change Requests

Control Costs

- Monitoring the status of the project to update the project costs and managing changes to the cost baseline.
- Primarily Concern with cost variance
- Any increase to the authorized budget can only be approved through the Perform Integrated Change Control process

Control Cost - ITTO



Control Costs - Tools

- Data Analysis(Formulas to be covered in EVM Section)
 - ▶ Earned Value Analysis
 - ▶ Variance Analysis
 - ▶ Trend Analysis
 - ▶ Reserve Analysis
- To-Complete Performance Index (TCPI)
 - ▶ Formula to be covered in EVM Section.
- PMIS

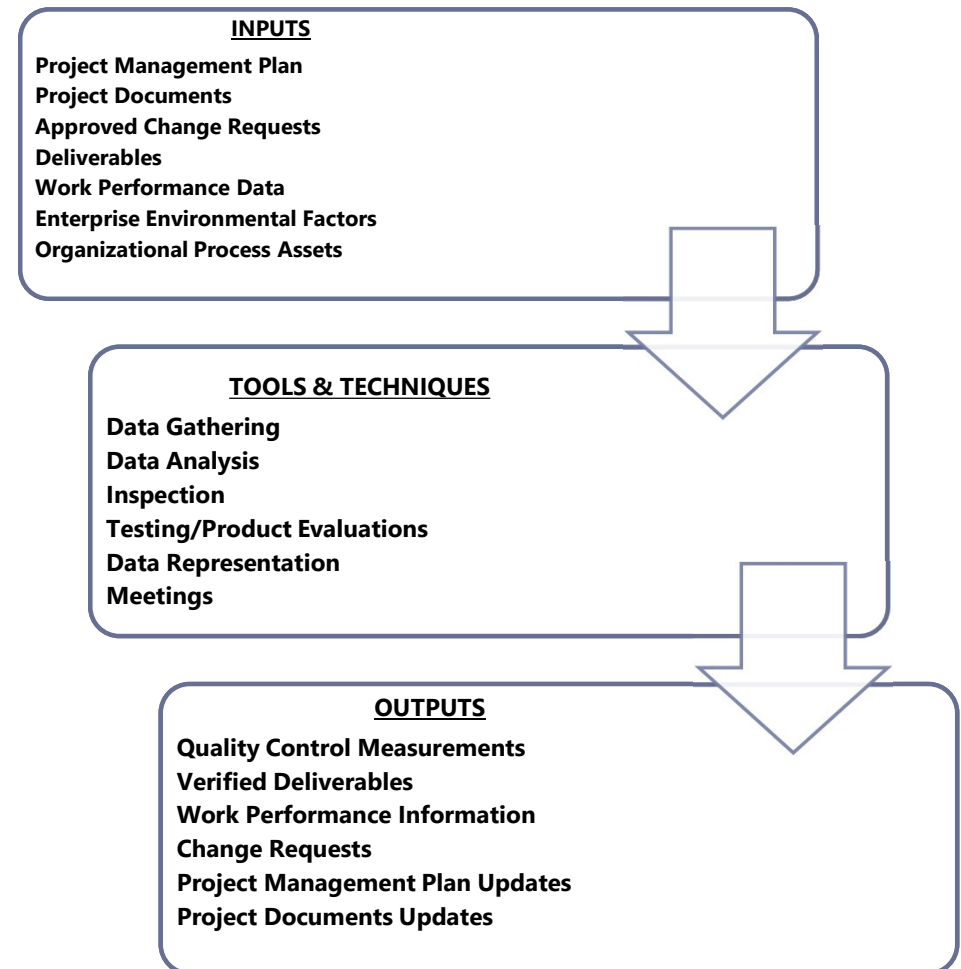
Control Costs Continue - Outputs

- Work Performance Information
- Costs Forecasts
 - ▶ Uses the EAC (Estimate at Completion) EVM formula.
- Change requests

Control Quality

- Assess performance and ensure the project outputs are complete, correct, and meet customer expectations.
- Verifying that project deliverables and work meet the requirements specified by key stakeholders for final acceptance.
- Each deliverable is inspected, measured, and tested

Control Quality - ITTO



Control Quality - Input

- Project Management Plan
 - Quality Management Plan
- Work Performance Data
- Approved Change Requests
- Deliverables
 - Output from direct and manage project work

Control Quality - Tools

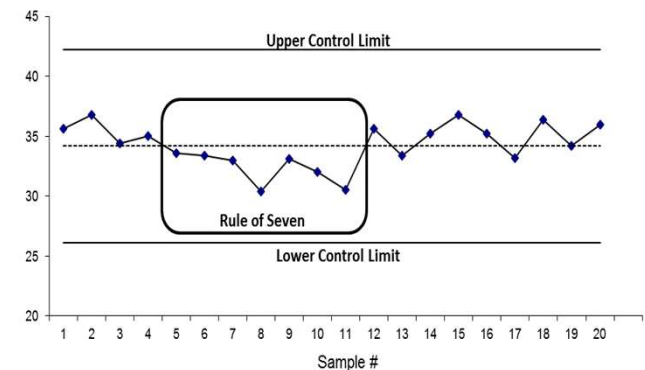
- Data Gathering
 - ▶ Checklists - ensures that all components of the deliverables are checked correctly
 - ▶ Check sheets - used to keep a running total or tally
 - ▶ Statistical Sampling
 - ▶ Questionnaires and Surveys
- Inspection
 - ▶ Inspections are often referred to as audits, walk-throughs or peer reviews. Used to validate defect repairs

Control Quality - Tools

- Testing/Product Evaluations
 - ▶ Before the project team or manager can verify that a deliverable has met all its quality requirements they would have to test these deliverables extensively. E.g. Unit testing, integration testing.
- Data Representation
 - ▶ Cause and Effect Diagrams
 - ▶ Scatter Diagrams
 - ▶ Histogram
 - Pareto Diagrams

Control Quality - Tools

- Data Representation
 - ▶ Control Chart
 - will tell if a process is in "control"
 - identify the rule of seven



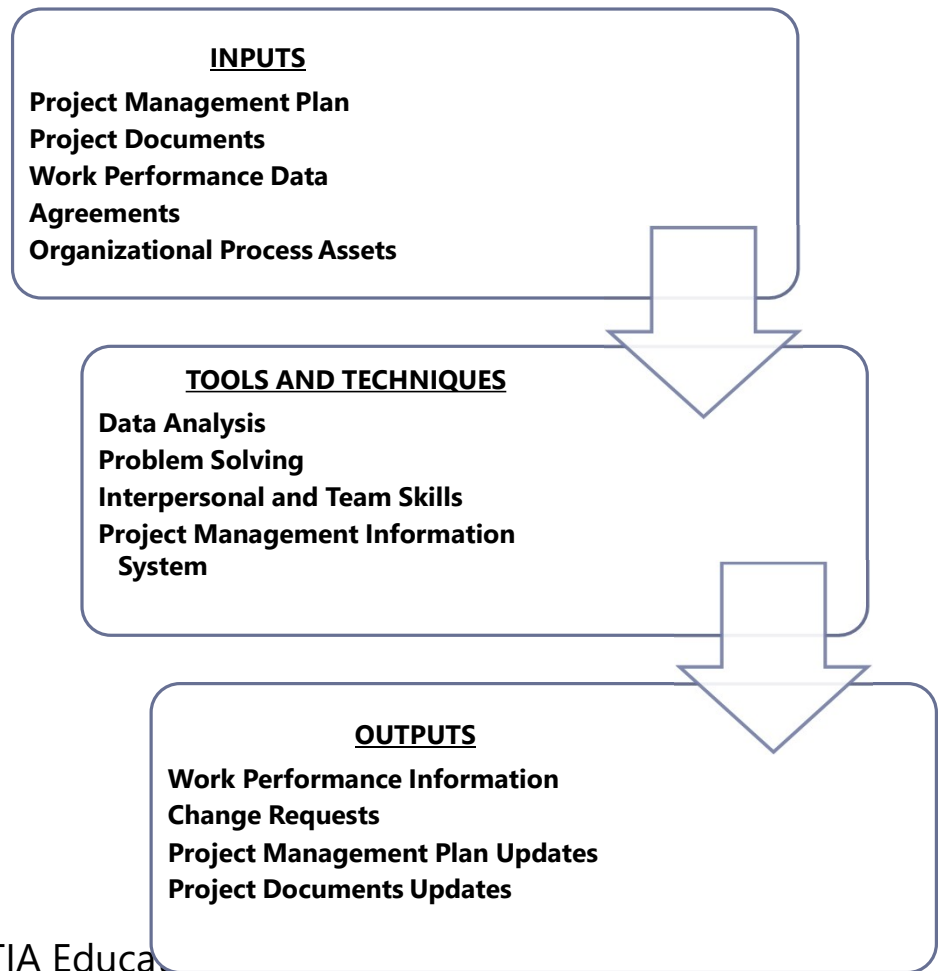
Control Quality - Output

- Quality Control Measurements
 - The results of the activities done in the control quality processes to determine if the quality standards or policies were met
- Verified Deliverables
 - An input to Validate Scope
 - Needed for formal acceptance
- Work Performance Information
- Change Requests

Control Resources

- How to correctly manage the physical resources on the project as the project is progressing
- This process does not look at the HR resources which was covered in the previous process (manage team).
- project manager will have to ensure that the physical resources are being used correctly and efficiently

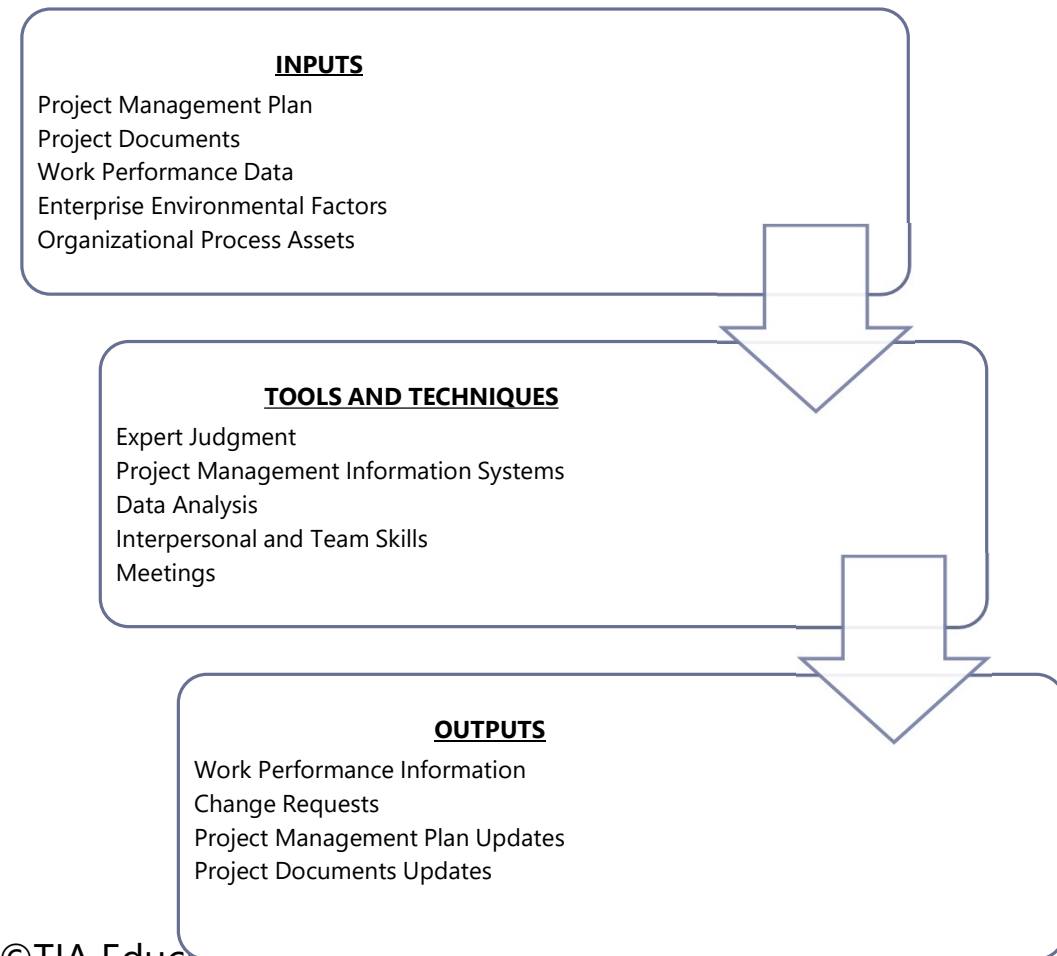
Control Resources



Monitor Communication

- Ensuring the communications requirements of the project and its stakeholders are met.
- Ensures that the communications management plan is being followed

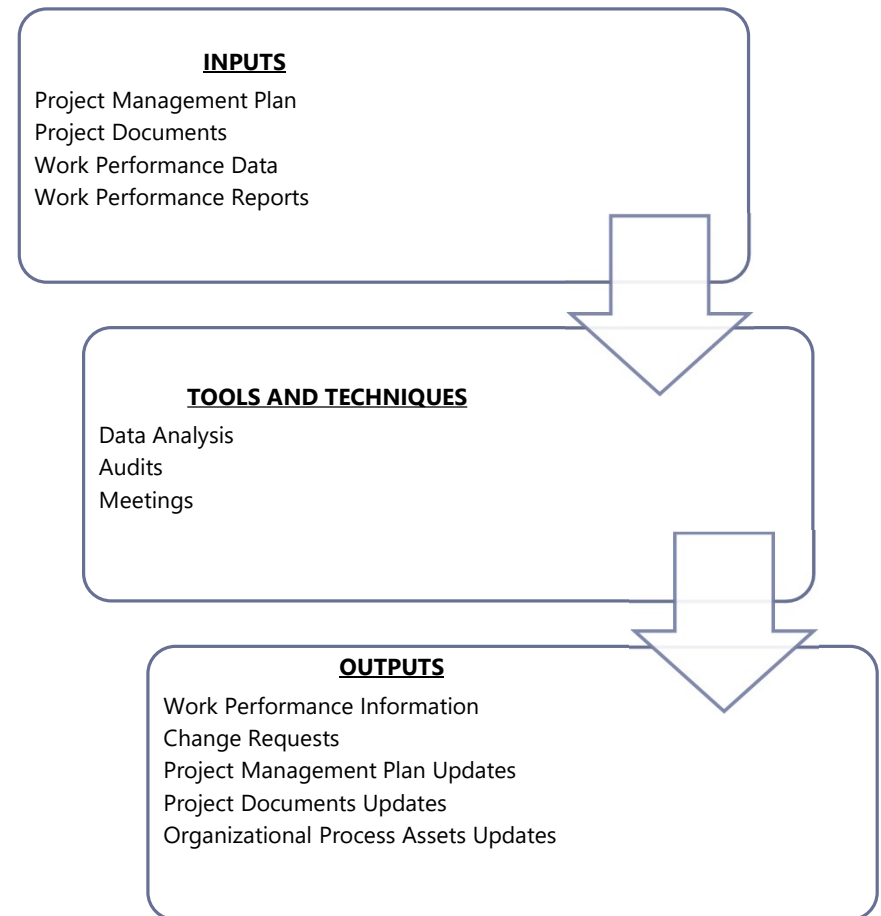
Monitor Communication - ITTO



Monitor Risks

- Monitoring the implementation risk response plans
- Tracking identified risks to see if they change
- Identifying and analyzing new risks
- Evaluating risk process effectiveness throughout the project.
- 24/7/365

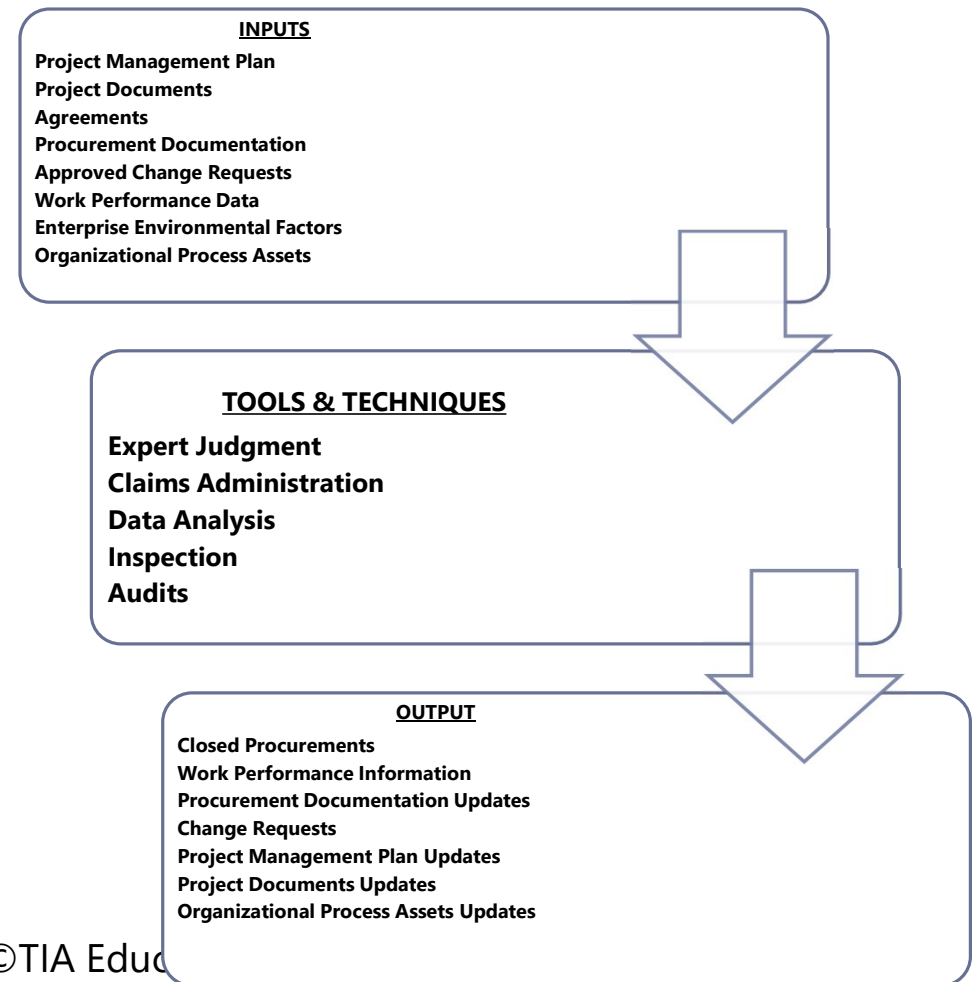
Monitor Risks - ITTO



Control Procurements

- The process of managing procurement relationships; monitoring contract performance and making changes and corrections as appropriate; and closing out contracts.

Control Procurements – ITTO's



Control Procurements –Tools

- Inspections
- Audits
- Claims Administration
 - ▶ How disputed changes can be settled when the buyer and the seller can not reach and understanding
 - ▶ Negotiation is the preferred method

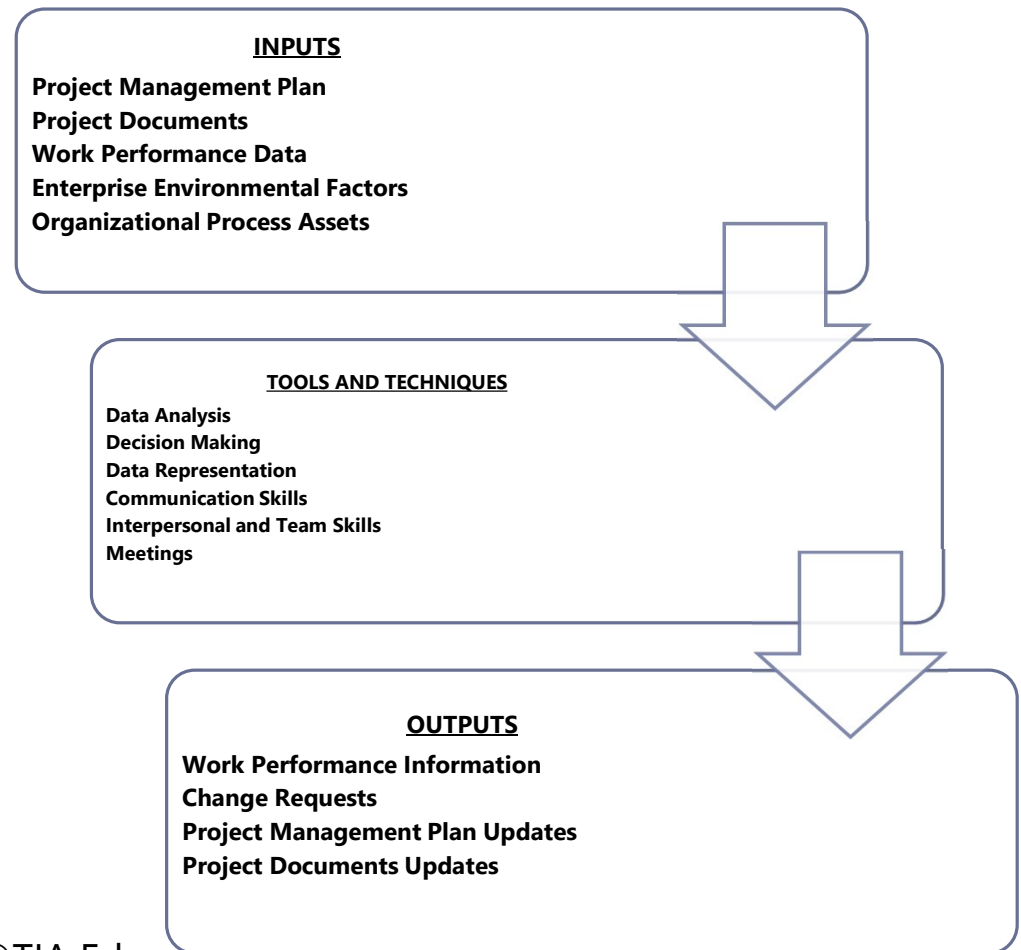
Control Procurements - Outputs

- Closed Procurements
 - ▶ The buyer, usually through its authorized procurement administrator, provides the seller with formal written notice that the contract has been completed.

Monitor Stakeholder Engagement

- Monitoring stakeholder relationships
- Engaging stakeholders through modification of engagement strategies and plans.
- Increases the efficiency and effectiveness of stakeholder engagement

Monitor Stakeholder Engagement - ITTO



Close Project or Phase

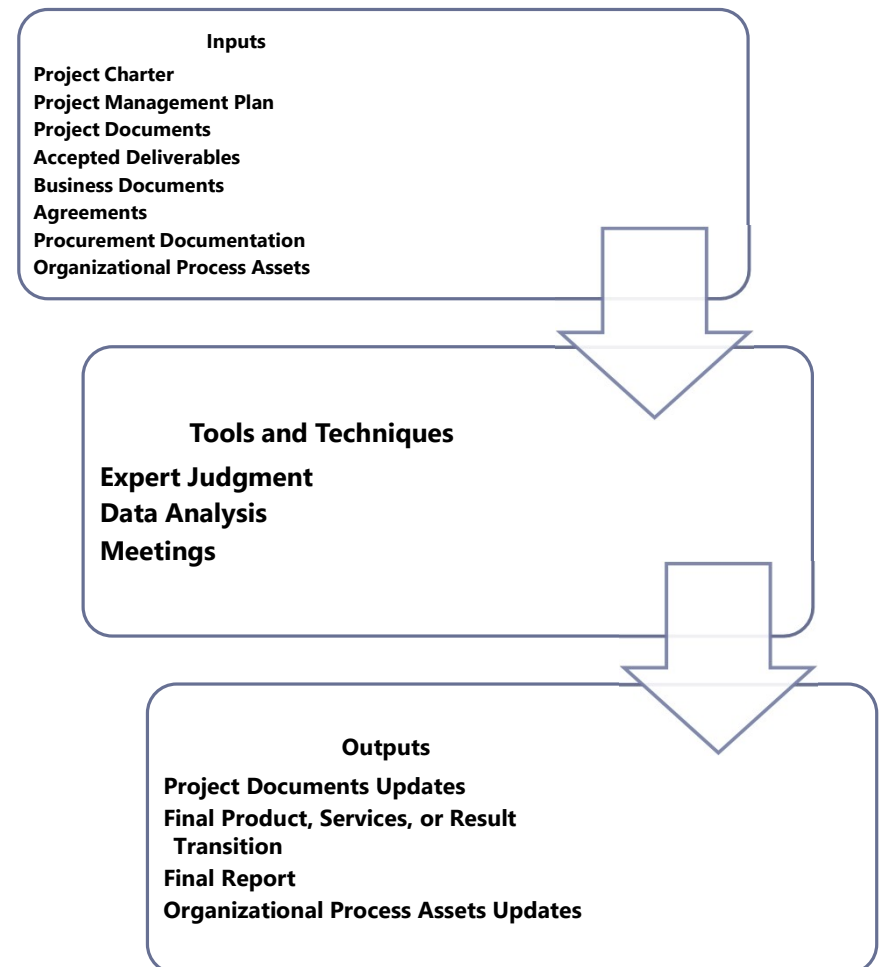
PROCESS GROUPS & KNOWLEDGE AREAS TABLE

Project Management Process Groups				
Initiating	Planning	Executing	Monitoring & Controlling	Closing
Develop Project Charter	Develop Project Management Plan	Direct and Manage Project Work	Monitor and Control Project Work	Close Project or Phase
Identify Stakeholders	Plan Scope Management	Manage Project Knowledge	Perform Integrated Change Control	
	Collect Requirements	Manage Quality	Validate Scope	
	Define Scope	Acquire Resources	Control Scope	
	Create WBS	Develop Team	Control Schedule	
	Plan Schedule Management	Manage Team	Control Costs	
	Define Activities	Manage Communications	Control Quality	
	Sequence Activities	Implement Risk Responses	Control Resources	
	Estimate Activity Durations	Conduct Procurements	Monitor Communications	
	Develop Schedule	Manage Stakeholder Engagement	Monitor Risks	
	Plan Cost Management		Control Procurements	
	Estimate Costs		Monitor Stakeholder Engagement	
	Determine Budget			
	Plan Quality Management			
	Plan Resource Management			
	Estimate Activity Resources			
	Plan Communications Management			
	Plan Risk Management			
	Identify Risks			
	Perform Qualitative Risk Analysis			
	Perform Quantitative Risk Analysis			
	Plan Risk Responses			
	Plan Procurement Management			
	Plan Stakeholder Engagement			

Close Project or Phase

- Finalizing all activities for the project, phase, or contract.
- Making certain that all documents and deliverables are up-to-date and that all issues are resolved
- Confirming the delivery and formal acceptance of deliverables by the customer
- Closing project accounts
- Reassigning personnel
- Confirming the formal acceptance of the seller's work and finalizing open claims
- Audit project success or failure
- Identify lessons learned, and archive project information for future use by the organization.
- Transfer the project's products, services, or results to the next phase or to production and/or operations
- Investigate and document the reasons for actions taken if the project is terminated before completion.

Close Project or Phase - ITTO



Close Project or Phase - Inputs

- Project Management Plan
- Accepted Deliverables

Close Project or Phase - Outputs

- Final Product service, or result Transition
 - The transition of the deliverable to organization.
- Final report
 - A summary of what took place in the project
 - How successful was the project?
 - Any variations in the Baselines