

PMP Exam Study Guide

15 December 2015

3. Project Management Processes

PROJECT MANAGEMENT PROCESS					
	INITIATION	PLANNING	EXECUTION	MONITORING & CONTROLLING	CLOSING
KNOWLEDGE AREAS	4 – INTEGRATION				
		5 – SCOPE		5 – SCOPE	
		6 – SCHEDULE (TIME)		6 – SCHEDULE (TIME)	
		7 – COST		7 – COST	
		8 – QUALITY			
		9 – HUMAN RESOURCES			
		10 – COMMUNICATIONS			
		11 – RISK		11 – RISK	
		12 – PROCUREMENT			
		13 – STAKEHOLDER			

Product Lifecycle

- The general phases of a product's life
- Concept-Growth-Maturity-Decline-Withdrawal

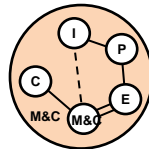
Project Lifecycle

- An organizations methodology for completing a project deliverable
- Lifecycle steps vary by industry, etc.
 - Each lifecycle step may consist of one or more Project Management Processes
 - Different Lifecycles types:
 - **Plan Driven:** predictive - clear definition
 - **Change Driven:** define in iterations
 - **Adaptive:** broad definition and refine



Project Management Process (see above)

- The process used to manage a project
 - Initiation
 - Planning
 - Execution
 - Monitoring & Control
 - Closure



Knowledge Areas (see above)

4. Integration Management
5. Scope Management
6. Schedule (Time) Management
7. Cost Management
8. Quality Management
9. Human Resources Management
10. Communications Management
11. Risk Management
12. Procurement Management
13. Stakeholder Management

Project

- Is temporary (a non-recurring activity)
- Has a beginning and an end
- Creates a unique product or service

Program

- A group of related projects

Portfolio

- A group of programs, individual projects, and other related operational work

Project Management Office

- Centralizes & standardizes project work
 - **Supporting** (low control) provides policies, methodologies & templates
 - **Controlling** (moderate) provides guidance, training, tools & oversight
 - **Directive** (high control) responsible for project results

Project Constraints

- Cost
- Time
- Scope
- Quality
- Risk
- Resources
- Customer Satisfaction



Business Organizational Structure

- **Functional:** projects occur within an single organization
- **Projectized:** project team members have no home when project is done
- **Matrixed:** combines functional and projectized – team has two bosses
 - **Strong Matrix:** Project is powerful
 - **Weak Matrix:** Function is powerful

Hold a kick-off meeting at the beginning of each project phase (i.e. for each project management process)

3. Project Management Process

INITIATION	PLANNING	EXECUTION	MONITORING & CONTROLLING	CLOSING
4.1 Develop Project Charter	4.2 Develop Project Management Plan	4.3 Direct & Manage Project Work	4.4 Monitor & Control Project Work	4.6 Close Project or Phase
<ul style="list-style-type: none"> • Select project manager • Identify & Understand <ul style="list-style-type: none"> – Organizational Process Assets – Project Statement of Work <ul style="list-style-type: none"> ▪ Business need, scope, strategy – Business Case – Enterprise Environmental Factors – Agreements • Determine initial requirements, assumptions, risks, scope, agreements • Divide large projects into phases • Assess project feasibility • Create measurable objectives • Develop the project charter • Identify stakeholders 	5.1 Plan Scope Management		4.5 Perform Integrated Change Control	<ul style="list-style-type: none"> • Confirm work is done to requirements • Gain final product acceptance • Hand-off completed product • Complete procurement closure • Complete financial closure • Complete final performance reporting • Solicit customer feedback • Solicit stakeholder lessons learned • Index & archive records
	5.2 Collect Requirements		5.5 Validate Scope	
	5.3 Define Scope		5.6 Control Scope	
	5.4 Create Work Breakdown Structure (wbs)			
	6.1 Plan Schedule Management		6.7 Control Schedule	
	6.2 Define Activities			
	6.3 Sequence Activities			
	6.4 Estimate Activity Resources			
	6.5 Estimate Activity Durations			
	6.6 Develop Schedule			
	7.1 Plan Cost Management		7.4 Control Costs	
	7.2 Estimate Costs			
	7.3 Determine Budget			
8.1 Plan Quality Management	8.2 Perform Quality Assurance		8.3 Control Quality	
9.1 Plan Human Resource Management	9.2 Acquire Project Team			
	9.3 Develop Project Team			
	9.4 Manage Project Team		10.3 Control Communications	
10.1 Plan Communications Management	10.2 Manage Communications		11.6 Control Risks	
11.1 Plan Risk Management				
11.2 Identify Risks				
11.3 Perform Qualitative Risk Analysis				
11.4 Perform Quantitative Risk Analysis				
11.5 Plan Risk Responses				
12.1 Plan Procurement Management	12.2 Conduct Procurements		12.3 Control Procurements	
13.1 Identify Stakeholders	13.2 Plan Stakeholder Management	13.3 Manage Stakeholder Engagement	13.4 Control Stakeholder Engagement	12.4 Close Procurements

- Obtain formal approval of plan
- Hold a kick-off meeting

4. Integration Management

INITIATION	PLANNING	EXECUTION	MONITORING & CONTROLLING	CLOSING
<div style="background-color: yellow; text-align: center; padding: 2px;">4.1</div> <div style="background-color: yellow; text-align: center; padding: 2px;">Develop Project Charter</div> <p style="text-align: center;"><i>Input From</i></p> <ul style="list-style-type: none"> • Project Statement of Work • Business Case • Agreements <div style="text-align: right; margin-right: 20px;"> <i>Project Initiator / Sponsor</i> } </div> <div style="text-align: right; margin-right: 20px;"> <i>Enterprise / Organization</i> } </div> <ul style="list-style-type: none"> • Enterprise Environmental Factors • Organizational Process Assets <p style="text-align: center;"><i>Tools & Techniques</i></p> <ul style="list-style-type: none"> • Expert Judgment • Facilitation Techniques <p style="text-align: center;"><i>Output To</i></p> <ul style="list-style-type: none"> • Project Charter (various) 	<div style="background-color: yellow; text-align: center; padding: 2px;">4.2</div> <div style="background-color: yellow; text-align: center; padding: 2px;">Develop Project Management Plan</div> <p style="text-align: center;"><i>Input From</i></p> <ul style="list-style-type: none"> • Project Charter (4.1) • Outputs from Other Processes (various) <ul style="list-style-type: none"> • Enterprise Environmental Factors • Organizational Process Assets <p style="text-align: center;"><i>Tools & Techniques</i></p> <ul style="list-style-type: none"> • Expert Judgment • Facilitation Techniques <p style="text-align: center;"><i>Output To</i></p> <ul style="list-style-type: none"> • Project Management Plan (various) 	<div style="background-color: yellow; text-align: center; padding: 2px;">4.3</div> <div style="background-color: yellow; text-align: center; padding: 2px;">Direct & Manage Project Work</div> <p style="text-align: center;"><i>Input From</i></p> <ul style="list-style-type: none"> • Project Management Plan (4.2) • Approved Change Requests (4.5) <ul style="list-style-type: none"> • Enterprise Environmental Factors • Organizational Process Assets <p style="text-align: center;"><i>Tools & Techniques</i></p> <ul style="list-style-type: none"> • Expert Judgment • Project Management Information System • Meetings <p style="text-align: center;"><i>Output To</i></p> <ul style="list-style-type: none"> • Deliverables (8.3) • Work Performance Data (various) • Change Requests (4.5) <ul style="list-style-type: none"> • Project Management Plan Updates (4.2) • Project Document Updates (various) 	<div style="background-color: yellow; text-align: center; padding: 2px;">4.4</div> <div style="background-color: yellow; text-align: center; padding: 2px;">Monitor & Control Project Work</div> <p style="text-align: center;"><i>Input From</i></p> <ul style="list-style-type: none"> • Project Management Plan (4.2) • Schedule Forecasts (6.7) • Cost Forecasts (7.4) • Validated Changes (8.3) • Work Performance Information (various) <ul style="list-style-type: none"> • Enterprise Environmental Factors • Organizational Process Assets <p style="text-align: center;"><i>Tools & Techniques</i></p> <ul style="list-style-type: none"> • Expert Judgment • Analytical Techniques • Project Management Info System • Meetings <p style="text-align: center;"><i>Output To</i></p> <ul style="list-style-type: none"> • Change Requests (4.5) • Work Performance Reports <ul style="list-style-type: none"> • Project Management Plan Updates (4.2) • Project Document Updates (various) 	<div style="background-color: yellow; text-align: center; padding: 2px;">4.6</div> <div style="background-color: yellow; text-align: center; padding: 2px;">Close Project or Phase</div> <p style="text-align: center;"><i>Input From</i></p> <ul style="list-style-type: none"> • Project Management Plan (4.2) • Accepted Deliverables (5.5) <ul style="list-style-type: none"> • Organizational Process Assets <p style="text-align: center;"><i>Tools & Techniques</i></p> <ul style="list-style-type: none"> • Expert Judgment • Analytical Techniques • Meetings <p style="text-align: center;"><i>Output To</i></p> <ul style="list-style-type: none"> • Final Product , Service or Result Transition → <i>To Customer</i> <ul style="list-style-type: none"> • Organizational Process Assets Updates (4.1)
<div style="background-color: yellow; text-align: center; padding: 2px;">4.5</div> <div style="background-color: yellow; text-align: center; padding: 2px;">Perform Integrated Change Control</div> <p style="text-align: center;"><i>Inputs</i></p> <ul style="list-style-type: none"> • Project Management Plan (4.2) • Work Performance Reports (4.4) • Change Requests (various) <ul style="list-style-type: none"> • Enterprise Environmental Factors (4.1) • Organizational Process Assets (4.1) <p style="text-align: center;"><i>Tools & Techniques</i></p> <ul style="list-style-type: none"> • Expert Judgment • Meetings • Change Control Tools <p style="text-align: center;"><i>Outputs</i></p> <ul style="list-style-type: none"> • Approved Change Requests (8.3, 12.3) • Change Log (13.3) <ul style="list-style-type: none"> • Project Management Plan Updates (var.) • Project Document Updates (various) 			<p>Analytical Techniques</p> <ul style="list-style-type: none"> • Examples Include <ul style="list-style-type: none"> – Regression Analysis – Grouping Methods – Causal Analysis – Root Cause Analysis – Forecasting Methods – Failure Mode & Effect Analysis (FMEA) – Fault Tree Analysis – Trend Analysis – Earned Value Management – Variance Analysis <p>Change Control Tools</p> <ul style="list-style-type: none"> • Manual/Automated tools for changes & configuration management <p>Change Log</p> <ul style="list-style-type: none"> • Log used to document project changes (including ones not approved) 	

- Project Statement of Work**
- A description of the product, services, results to be delivered by the project
 - References 3 elements: Business Need, Product Scope, Strategic Plan
 - Internal projects are based on business needs, products, or service requirements
 - External projects are based on a bid document or a contract.
- Business Case**
- Business information that explains why a project is worth the investment
 - Typically includes the business need and financial analysis
- Project Selection Criteria**
- **Benefit Measure** are comparative approaches to project selection
 - Murder Boards: shoot ideas down
 - Peer Review
 - Scoring Models
 - *Economic Models* (see last page)
 - o Net Present Value (NPV)
 - o Payback Period
 - o Benefit Cost Ratio
 - o Internal Rate of Return (IRR)
 - o Return on Investment (ROI)
 - **Constrained Optimization** uses a math approach for selection to optimize
 - Linear, integer, dynamic, or multi-objective programming
- Agreements**
- Contract or other formal agreements

- Enterprise Environmental Factors**
- Conditions not under the control of a project team that affect the project
 - Includes organizational culture/structure
 - Includes work authorization system & PMIS →
 - Includes gov't, industry, market conditions
- Organizational Process Assets**
- Existing processes, policies, corporate knowledge and historical information
 - Includes the company knowledge base
 - **Lessons learned are the most important**
- Project Charter**
- Establishes a partnership between the performing & requesting organizations.
 - Approved charter formally initiates project
 - The charter is authored by sponsoring organization (but the project manager should participate)
- Project Management Plan**
- Describes how the project will be executed, monitored and controlled
 - Integrates all of the other plans into a cohesive whole
 - Includes the Scope, Schedule and Cost Baselines
 - Includes subsidiary plans for all knowledge areas, as well as:
 - *Change Management Plan*
 - *Configuration Management Plan*: for managing changes to project docs
 - *Requirements Management Plan*
 - *Process Improvement Plan*

- Project Management Information System**
- Part of enterprise environmental factors
 - Automated tools for scheduling, cost, resourcing, work authorization, data collection, configuration mgmt. etc.
- Deliverables**
- Tangible components completed to meet the project objectives.
- Work Performance Data**
- Raw observations and measurements identified during activities
- Work Performance Information**
- Transformed data into information for decisions and communication
- Work Performance Reports**
- Compiled information to generate decisions, actions, or awareness
- Change Requests**
- A formal proposal to modify a document, deliverable, or baseline, including:
 - **Defect Repair**: reworking defects
 - **Updates**: changes plans or documents
 - **Corrective Action**: analyze, identify & correct existing issues to meet plan
 - **Preventive Action**: analyze, identify & prevent possible issues to meet plan

4.5
Perform Integrated Change Control
<i>Inputs</i>
<ul style="list-style-type: none"> • Project Management Plan (4.2) • Work Performance Reports (4.4) • Change Requests (various)
<ul style="list-style-type: none"> • Enterprise Environmental Factors (4.1) • Organizational Process Assets (4.1)
<i>Tools & Techniques</i>
<ul style="list-style-type: none"> • Expert Judgment • Meetings • Change Control Tools
<i>Outputs</i>
<ul style="list-style-type: none"> • Approved Change Requests (8.3, 12.3) • Change Log (13.3)
<ul style="list-style-type: none"> • Project Management Plan Updates (var.) • Project Document Updates (various)

- Process for Making Changes**
- Prevent the root cause of changes
 - Identify the change
 - Assess the impact of the change
 - Create a change request
 - Perform **Integrated Change Control**
 - Assess change
 - ID options
 - Get: 1) internal, 2) customer approval
 - Update documents, plans, baselines

- Analytical Techniques**
- Examples Include
 - Regression Analysis
 - Grouping Methods
 - Causal Analysis
 - Root Cause Analysis
 - Forecasting Methods
 - Failure Mode & Effect Analysis (FMEA)
 - Fault Tree Analysis
 - Trend Analysis
 - Earned Value Management
 - Variance Analysis
- Change Control Tools**
- Manual/Automated tools for changes & configuration management
- Change Log**
- Log used to document project changes (including ones not approved)
- Lessons learned are best completed by the stakeholders
- Depreciation**
- Straight-line Depreciation
 - Depreciation Rate = 100% / Useful Life
 - Accelerated Depreciation: the rate of depreciation is faster than straight line
 - Double Declining Balance Method
 - Sum-of-Years' Digits Method

5. Scope Management

INITIATION	PLANNING	EXECUTION	MONITORING & CONTROLLING	CLOSING		
<p>Scope Management Process</p> <ul style="list-style-type: none"> Plan to establish, manage, control scope Determine requirements Sort & balance requirements to ID scope Create WBS dictionary Validate Scope Measure Performance Balance competing requirements <p>Product Scope</p> <ul style="list-style-type: none"> (WHAT) The features of functions of the product, service or deliverable Requirements that related to the product <p>Project Scope</p> <ul style="list-style-type: none"> (HOW) The work required to deliver the project deliverable <p>Scope Management Plan</p> <ul style="list-style-type: none"> How the project scope will be planned, managed and controlled <p>Requirements Management Plan</p> <ul style="list-style-type: none"> How requirements will be identified, analyzed, prioritized, managed and controlled (track changes) <p style="text-align: center;">-----</p> <p>Collect Requirements</p> <ul style="list-style-type: none"> Interviews Focus Groups: soliciting customer ideas Prototypes: creating a working model Context Diagrams: visually depict scope; show relationship to other process Observation: observing the process Benchmarking: survey similar processes Document Analysis: study existing docs Facilitated Workshops: stakeholders meet together to identify requirements Questionnaires & Surveys Group Creativity Techniques <ul style="list-style-type: none"> <i>Brainstorm:</i> generate & collect ideas <i>Nominal Group Technique:</i> brainstorm with a voting process to rank <i>Mind Maps:</i> brainstorm & map linkages <i>Affinity Diagrams:</i> brainstorm & group <i>Multi-Criteria Decision Making:</i> brainstorm and assess via criteria <i>Delphi Technique:</i> brainstorm individually & review with group Group Decision-Making Techniques <ul style="list-style-type: none"> <i>Unanimity:</i> based on 100% agreement <i>Majority:</i> based on 51% of votes <i>Plurality:</i> based on highest # of votes <i>Dictatorship:</i> based on 1 vote 	<div style="background-color: orange; text-align: center; padding: 2px;">5.1 Plan Scope Management</div> <p style="text-align: center;"><i>Inputs From</i></p> <ul style="list-style-type: none"> Project Management Plan (4.2) Project Charter (4.1) Enterprise Environmental Factors Organizational Process Assets <p style="text-align: center;"><i>Tools & Techniques</i></p> <ul style="list-style-type: none"> Expert Judgment Meetings <p style="text-align: center;"><i>Outputs To</i></p> <ul style="list-style-type: none"> Scope Management Plan (various) Requirements Management Plan (5.2) <div style="background-color: orange; text-align: center; padding: 2px;">5.2 Collect Requirements</div> <p style="text-align: center;"><i>Inputs From</i></p> <ul style="list-style-type: none"> Scope Management Plan (5.1) Requirements Management Plan (5.1) Stakeholder Management Plan (13.1) Project Charter (4.1) Stakeholder Register (13.2) <table style="width: 100%; border: none;"> <tr> <td style="border: none; vertical-align: top;"> <ul style="list-style-type: none"> Interviews Focus Groups Prototypes Context Diagrams Observations Benchmarking </td> <td style="border: none; vertical-align: top;"> <ul style="list-style-type: none"> Document Analysis Facilitated Workshops Questionnaires & Surveys Group Creativity Techniques Group Decision-Making Tech. </td> </tr> </table> <p style="text-align: center;"><i>Outputs To</i></p> <ul style="list-style-type: none"> Requirements Documentation Requirements Traceability Matrix <div style="background-color: orange; text-align: center; padding: 2px;">5.3 Define Scope</div> <p style="text-align: center;"><i>Inputs From</i></p> <ul style="list-style-type: none"> Scope Management Plan (5.1) Project Charter (4.1) Requirements Documentation (5.2) Organizational Process Assets (4.1) <p style="text-align: center;"><i>Tools & Techniques</i></p> <ul style="list-style-type: none"> Expert Judgment Product Analysis Alternatives Generation Facilitated Workshops <p style="text-align: center;"><i>Outputs To</i></p> <ul style="list-style-type: none"> Project Scope Statement (5.4) Project Documents Updates <div style="background-color: orange; text-align: center; padding: 2px;">5.4 Create Work Breakdown Structure (WBS)</div> <p style="text-align: center;"><i>Inputs From</i></p> <ul style="list-style-type: none"> Scope Management Plan (5.1) Project Scope Statement (5.3) Requirements Documentation (5.2) Enterprise Environmental Factors (4.1) Organizational Process Assets (4.1) <p style="text-align: center;"><i>Tools & Techniques</i></p> <ul style="list-style-type: none"> Decomposition Expert Judgment <p style="text-align: center;"><i>Outputs To</i></p> <ul style="list-style-type: none"> Scope Baseline (Various) Project Documents Updates 	<ul style="list-style-type: none"> Interviews Focus Groups Prototypes Context Diagrams Observations Benchmarking 	<ul style="list-style-type: none"> Document Analysis Facilitated Workshops Questionnaires & Surveys Group Creativity Techniques Group Decision-Making Tech. 	<p>Resolving Competing Requirements</p> <ul style="list-style-type: none"> Pick requirements that best comply with: <ul style="list-style-type: none"> <i>Business Case</i> <i>Project Charter</i> <i>Project Scope Statement</i> <i>Project Constraints</i> <p>Requirements Documentation</p> <ul style="list-style-type: none"> Include requirement & acceptance criteria Includes the following requirements <ul style="list-style-type: none"> <i>Business</i> <i>Stakeholder</i> <i>Solution</i> <i>Project</i> <i>Transition</i> <i>Assumptions/Dependency/Constraints</i> <p>Requirements Traceability Matrix</p> <ul style="list-style-type: none"> Traces requirements to how they are fulfilled by the project deliverables <p style="text-align: center;">-----</p> <p>Project Scope Statement</p> <ul style="list-style-type: none"> Product Scope Project Scope Acceptance Criteria Deliverables Out-of-Scope Constraints Assumptions <p style="text-align: center;">-----</p> <p>Scope Baseline</p> <ul style="list-style-type: none"> Project Scope Statement WBS WBS Dictionary <p>Work Breakdown Structure (WBS)</p> <ul style="list-style-type: none"> Hierarchical diagram of total work scope Focused on product deliverables (nouns) vs. the activities themselves <u>Does not</u> show dependencies Decomposition breaks work down into work packages. Work Packages are the lowest level of the WBS and can be: <ul style="list-style-type: none"> <i>Estimated</i> <i>Completed quickly</i> <i>Completed without interruption</i> <i>Outsourced</i> <p>WBS Dictionary</p> <ul style="list-style-type: none"> Provides detailed deliverable, activity and scheduling information about each component of the WBS 	<div style="background-color: orange; text-align: center; padding: 2px;">5.5 Validate Scope</div> <p style="text-align: center;"><i>Inputs From</i></p> <ul style="list-style-type: none"> Project Management Plan (4.2) Requirements Documentation (5.2) Requirements Traceability Matrix (5.2) Verified Deliverables (8.3) Work Performance Data (4.3) <p style="text-align: center;"><i>Tools & Techniques</i></p> <ul style="list-style-type: none"> Inspection Group Decision Making Techniques <p style="text-align: center;"><i>Outputs To</i></p> <ul style="list-style-type: none"> Accepted Deliverables (4.6) Change Requests (4.5) Work Performance Information Project Document Updates <div style="background-color: orange; text-align: center; padding: 2px;">5.6 Control Scope</div> <p style="text-align: center;"><i>Inputs From</i></p> <ul style="list-style-type: none"> Project Management Plan (4.2) Requirements Documentation (5.2) Requirements Traceability Matrix (5.2) Work Performance Data (4.3) Organizational Process Assets <p style="text-align: center;"><i>Tools & Techniques</i></p> <ul style="list-style-type: none"> Variance Analysis <p style="text-align: center;"><i>Outputs To</i></p> <ul style="list-style-type: none"> Work Performance Information (4.4) Change Requests (4.5) <ul style="list-style-type: none"> Project Management Plan Updates (4.2) Project Document Updates Organizational Process Assets Update 	<p>Validate Scope</p> <ul style="list-style-type: none"> Gain formal acceptance for deliverables <p>Control Scope</p> <ul style="list-style-type: none"> Measuring and assessing work performance against the scope baseline Managing scope baseline changes <p>Variance Analysis</p> <ul style="list-style-type: none"> Determining the cause and degree of difference between the baseline & actual Drives corrective & preventive actions <p>Control Account</p> <ul style="list-style-type: none"> Allows the collection & analysis of work performance data for cost, time, scope
<ul style="list-style-type: none"> Interviews Focus Groups Prototypes Context Diagrams Observations Benchmarking 	<ul style="list-style-type: none"> Document Analysis Facilitated Workshops Questionnaires & Surveys Group Creativity Techniques Group Decision-Making Tech. 					

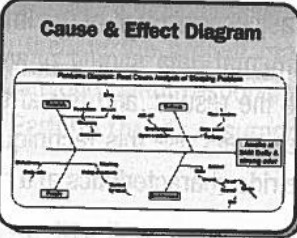
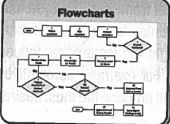
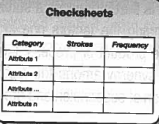
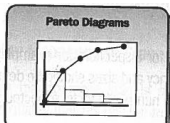
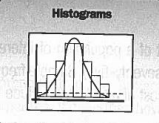
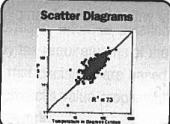
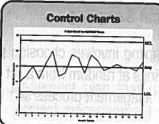
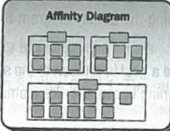
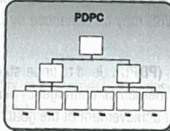
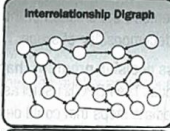
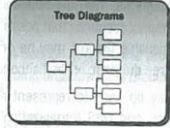
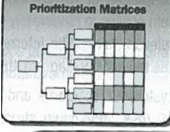
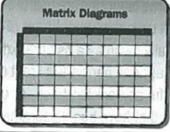
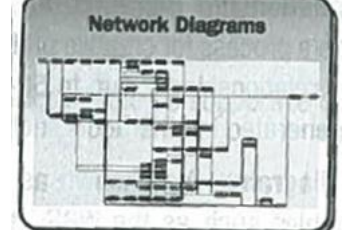
6. Schedule Management

INITIATION	PLANNING	EXECUTION	MONITORING & CONTROLLING	CLOSING
<p>Plan Schedule Management</p> <ul style="list-style-type: none"> How you will plan manage and control the project schedule <p>Schedule Management Plan</p> <ul style="list-style-type: none"> Defining the scheduling methodology & software <p style="text-align: center;">-----</p> <p>Rolling Wave Planning</p> <ul style="list-style-type: none"> Detailed planning for near term activities and a high level planning for future work As additional knowledge is gained about future work, details are added <p>Activity List</p> <ul style="list-style-type: none"> Decomposing work packages into the activities needed to produce them <p>Activity Attributes</p> <ul style="list-style-type: none"> Adds associated components (e.g. time, cost, dependence) to activity descriptions <p>Milestone List</p> <ul style="list-style-type: none"> A list of significant events in a project They are <u>not</u> work activities (no duration) <p style="text-align: center;">-----</p> <p>Precedence Diagramming Method (PDM)</p> <ul style="list-style-type: none"> Finish to Start: Predecessor must finish before successor can start Finish to Finish: Predecessor must finish before successor can finish Start to Start: Predecessor must start before successor can start Start to Finish: Predecessor must start before successor can finish (rarely used) <p>Dependency Determination</p> <ul style="list-style-type: none"> Mandatory < and > External Discretionary < and > Internal <p>Leads</p> <ul style="list-style-type: none"> Time before a predecessor has finished that a successor can start (early start) <p>Lags</p> <ul style="list-style-type: none"> Delay after predecessor has finished before a successor can start (late start) <p style="text-align: center;">-----</p> <p>Activity Resource Requirements</p> <ul style="list-style-type: none"> Identifying the types & quantities of resources needed to complete a task <p>Resource Breakdown Structure</p> <ul style="list-style-type: none"> Hierarchical diagram of resources by category (e.g. labor) & type (e.g. skills) 	<div style="background-color: orange; text-align: center; padding: 2px;">6.1 Plan Schedule Management</div> <p style="text-align: center;"><i>Inputs From</i></p> <ul style="list-style-type: none"> Project Management Plan (4.2) Project Charter (4.1) EEF & OPA (4.1) <p style="text-align: center;"><i>Tools & Techniques</i></p> <ul style="list-style-type: none"> Expert Judgment Analytical Techniques Meetings <p style="text-align: center;"><i>Outputs To</i></p> <ul style="list-style-type: none"> Schedule Management Plan (6.2) <div style="background-color: orange; text-align: center; padding: 2px;">6.2 Define Activities</div> <p style="text-align: center;"><i>Inputs From</i></p> <ul style="list-style-type: none"> Schedule Management Plan (6.1) Scope Baseline EEF & OPA (4.1) <p style="text-align: center;"><i>Tools & Techniques</i></p> <ul style="list-style-type: none"> Decomposition Rolling Wave Planning Expert Judgment <p style="text-align: center;"><i>Outputs To</i></p> <ul style="list-style-type: none"> Activity List (various) Activity Attributes (various) Milestone List (6.3) <div style="background-color: orange; text-align: center; padding: 2px;">6.3 Sequence Activities</div> <p style="text-align: center;"><i>Inputs From</i></p> <ul style="list-style-type: none"> Schedule Management Plan (6.1) Activity List & Activity Attributes Milestone List Project Scope Statement EEF & OPA <p style="text-align: center;"><i>Tools & Techniques</i></p> <ul style="list-style-type: none"> Precedence Diagramming Method (PDM) Dependency Determination Leads & Lags <p style="text-align: center;"><i>Outputs To</i></p> <ul style="list-style-type: none"> Project Schedule Network Diagrams Project Documents Updates <div style="background-color: orange; text-align: center; padding: 2px;">6.4 Estimate Activity Resources</div> <p style="text-align: center;"><i>Inputs From</i></p> <ul style="list-style-type: none"> Schedule Management Plan (6.1) Activity List, Attributes & Resource Reqmt Resource Calendars & Breakdown Project Scope Statement Risk Register Enterprise Environmental Factors Organizational Process Assets <p style="text-align: center;"><i>Tools & Techniques</i></p> <ul style="list-style-type: none"> Expert Judgment Alternative Analysis Published Estimating Data Bottom-up Estimating Project Management Software <p style="text-align: center;"><i>Outputs To</i></p> <ul style="list-style-type: none"> Activity Resource Requirements Resource Breakdown Structure Project Document Updates 	<div style="background-color: orange; text-align: center; padding: 2px;">6.5 Estimate Activity Durations</div> <p style="text-align: center;"><i>Inputs</i></p> <ul style="list-style-type: none"> Schedule Management Plan (6.1) Activity List - Attributes - Resource Reqmt Resource Calendars & Breakdown Project Scope Statement Risk Register EEF & OPA <p style="text-align: center;"><i>Tools & Techniques</i></p> <ul style="list-style-type: none"> Expert Judgment Analogous, Parametric & 3 Point Estimate Group Decision Making Reserve Analysis <p style="text-align: center;"><i>Outputs</i></p> <ul style="list-style-type: none"> Activity Duration Estimates Project Document Updates <div style="background-color: orange; text-align: center; padding: 2px;">6.6 Develop Schedule</div> <p style="text-align: center;"><i>Inputs</i></p> <ul style="list-style-type: none"> Schedule Management Plan (6.1) Activity List - Attributes - Resource Reqmt Activity Duration Estimates Project Schedule Network Diagrams Resource Calendars & Breakdown Project Scope Statement Risk Register Project Staff Assignments EEF & OPA <p style="text-align: center;"><i>Tools & Techniques</i></p> <ul style="list-style-type: none"> Schedule Network Analysis Critical Path Method Critical Chain Method Resource Optimization Techniques Modeling Techniques Leads & Lags Schedule Compression Scheduling Tool <p style="text-align: center;"><i>Outputs</i></p> <ul style="list-style-type: none"> Schedule Baseline Project Schedule Schedule Data Project Calendars Project Management Plan Updates Project Documents Updates 	<div style="background-color: orange; text-align: center; padding: 2px;">6.7 Control Schedule</div> <p style="text-align: center;"><i>Inputs</i></p> <ul style="list-style-type: none"> Project Management Plan (4.2) Project Schedule (6.6) Work Performance Data Project Calendars (6.6) Schedule Data (6.6) Organizational Process Assets <p style="text-align: center;"><i>Tools & Techniques</i></p> <ul style="list-style-type: none"> Performance Reviews Project Management Software Resource Optimization Techniques Modeling Techniques Leads & Lags Schedule Compression Scheduling Tool <p style="text-align: center;"><i>Outputs</i></p> <ul style="list-style-type: none"> Schedule Forecasts Work Performance Information Change Requests Project Management Plan Updates Project Documents Updates Organizational Process Assets <p style="text-align: center;">-----</p> <p>Analogous Estimates</p> <ul style="list-style-type: none"> Using a similar activity or project to estimate a future activity/project <p>Parametric Estimates</p> <ul style="list-style-type: none"> Using a formula (e.g. you can paint 10 square feet per hour) <p>Heuristic Estimates</p> <ul style="list-style-type: none"> Using a generally accepted rule (e.g. design work is 15% of the project length) <p>Three Point Estimates</p> <ul style="list-style-type: none"> Estimates based on a pessimistic (P), most likely (M) & optimistic (O) estimate <p style="text-align: center;">- Triangular Distribution $\frac{P + M + O}{3}$</p> <p style="text-align: center;">- Beta Distribution $\frac{P + 4M + O}{6}$ (PERT)</p> <p style="text-align: center;">- Standard Deviation $\frac{P - O}{6}$</p> <p>Reserve (Buffer) Analysis</p> <ul style="list-style-type: none"> Time estimates may include reserves (buffers) to account for uncertainty; also see critical chain method → Contingency Time Reserves: PM controlled for known project risks Management Time Reserves: Management unknown project risks 	<p style="text-align: center;">-----</p> <p>Schedule Network Analysis</p> <ul style="list-style-type: none"> Critical Path: the longest path in the network diagram – the shortest time to complete the project (has no slack) Near Critical Path: a path duration close to critical path (monitor high risk) Critical Chain Method: Allows project to add a "buffer" to any network path <ul style="list-style-type: none"> – Project Buffer: on critical path – Feeding Buffer: on non-critical path – Resource Buffer: for resources Total Float (slack): the time an ES can flex without affecting a successor <ul style="list-style-type: none"> – Float = LF – EF or LS – ES Free Float: the time an EF can flex without affecting a successor <ul style="list-style-type: none"> – ES(Successor) – EF(Predecessor) Project Float: time a project can be delayed w/out affecting external dates <p>Schedule Compression</p> <ul style="list-style-type: none"> Fast Tracking: doing tasks in parallel that were planned in sequence Crashing: Adding resources (crash least expensive tasks on critical path) Reduce Scope Reduce Quality <p>Schedule Baseline</p> <ul style="list-style-type: none"> An approved schedule that can only be altered with a change request <p>Project Schedule</p> <ul style="list-style-type: none"> A graphic representation of the project Bar Chart (Gantt): to track progress Milestone Chart: for management Network Diagram: to identify dependencies <p>Schedule Data</p> <ul style="list-style-type: none"> Data associated with the schedule <p>Project Calendars</p> <ul style="list-style-type: none"> Outlines the schedule in working days <p style="text-align: center;">-----</p> <p>Performance Reviews</p> <ul style="list-style-type: none"> Trends: assess progress over time Critical Path: assess critical path Critical Chain: assess buffer Earned Value: assess SV & SPI <p>Schedule Forecasts</p> <ul style="list-style-type: none"> Estimates of the future based on information known at the time <p>Schedule Variance</p> <ul style="list-style-type: none"> SV = EV – PV <p>Schedule Performance Index</p> <ul style="list-style-type: none"> SPI = EV / PV

7. Cost Management

INITIATION	PLANNING	EXECUTION	MONITORING & CONTROLLING	CLOSING
<p>Plan Schedule Management</p> <ul style="list-style-type: none"> How you will plan manage and control the project schedule <p>Cost Management Plan</p> <ul style="list-style-type: none"> Defines the methodology to estimate, manage, expend & control project costs <p>-----</p> <p>Estimate Costs</p> <ul style="list-style-type: none"> Coming-up with costs estimates Types of costs: <ul style="list-style-type: none"> Fixed Costs: don't change w/activity Variable Costs: change with activity Direct Costs: attributable to product Indirect Costs: overhead <p>Analogous Estimates</p> <ul style="list-style-type: none"> Using a similar activity or project to estimate a future activity/project <p>Parametric Estimates</p> <ul style="list-style-type: none"> Using a formula (e.g. you can paint 10 square feet per hour) <p>Heuristic Estimates</p> <ul style="list-style-type: none"> Using a generally accepted rule (e.g. design work is 15% of the project length) <p>Three Point Estimates</p> <ul style="list-style-type: none"> Estimates based on a pessimistic (P), most likely (M) & optimistic (O) estimate <p>– Triangular Distribution $\frac{P + M + O}{3}$</p> <p>– Beta Distribution $\frac{P + 4M + O}{6}$ (PERT)</p> <p>– Standard Deviation $\frac{P - O}{6}$</p> <p>Reserve (Buffer) Analysis</p> <ul style="list-style-type: none"> Cost estimates may include reserves to account for uncertainty; also see risk Contingency Time Reserves: PM controlled for known project risks Management Time Reserves: Management unknown project risks <p>Activity Cost Estimates</p> <ul style="list-style-type: none"> Quantitative assessments of the total costs required to complete the activity <p>Basis of Estimates</p> <ul style="list-style-type: none"> Details that support costs estimates and explain how they were derived 	<p>7.1 Plan Cost Management</p> <p><i>Inputs</i></p> <ul style="list-style-type: none"> Project Management Plan (4.2) Project Charter (4.1) EEF & OPA (4.1) <p><i>Tools & Techniques</i></p> <ul style="list-style-type: none"> Expert Judgment Analytic Techniques Meetings <p><i>Outputs</i></p> <ul style="list-style-type: none"> Cost Management Plan <p>7.2 Estimate Costs</p> <p><i>Inputs</i></p> <ul style="list-style-type: none"> Cost Management Plan Human Resources Management Plan Scope Baseline Project Schedule Risk Register EEF & OPA (4.1) <p><i>Tools & Techniques</i></p> <ul style="list-style-type: none"> Expert Judgment Analogous, Parametric, Bottoms-Up & 3-Point Estimating Reserve Analysis Cost of Quality Project Management Software Vendor Bid Analysis Group Decision Making Techniques <p><i>Outputs</i></p> <ul style="list-style-type: none"> Activity Cost Estimates Basis of Estimates Project Document Updates <p>7.3 Determine Budget</p> <p><i>Inputs</i></p> <ul style="list-style-type: none"> Cost Management Plan Scope Baseline Activity Cost Estimates Basis of Estimates Project Schedule Resource Calendars Risk Register Agreements Organizational Process Assets (4.1) <p><i>Tools & Techniques</i></p> <ul style="list-style-type: none"> Cost Aggregation Reserve Analysis Expert Judgment Historical Relationships Funding Limit Reconciliation <p><i>Outputs</i></p> <ul style="list-style-type: none"> Cost Baseline Project Funding Requirements Project Documents Updates 	<p>-----</p> <p>Historical Relationships</p> <ul style="list-style-type: none"> Using parametric and analogous estimates that are based on past history <p>Funding Limit Reconciliation</p> <ul style="list-style-type: none"> Reconciling the costs needed with the actual funding available <p>Cost Baseline (Budget at Completion or BAC)</p> <ul style="list-style-type: none"> Cost Estimates + Contingency Reserves <p>Cost Budget (Project Budget)</p> <ul style="list-style-type: none"> Cost Baseline + Management Reserves <p>Project Funding Requirements</p> <ul style="list-style-type: none"> Periodic funding needs (e.g. quarterly, annually) based on the costs baseline 	<p>7.4 Control Costs</p> <p><i>Inputs</i></p> <ul style="list-style-type: none"> Project Management Plan (4.2) Project Funding Requirements Work Performance Data Organizational Process Assets <p><i>Tools & Techniques</i></p> <ul style="list-style-type: none"> Earned Value Management Forecasting To-Complete Performance Index (TCPI) Performance Reviews Project Management Software Reserve Analysis <p><i>Outputs</i></p> <ul style="list-style-type: none"> Cost Forecasts Work Performance Information Change Requests Project Management Plan Updates Project Documents Updates Organizational Process Assets 	<p>-----</p> <p>Earned Value Management</p> <ul style="list-style-type: none"> Combines scope, schedule & resource measurements to assess performance <p>Earned Value</p> <ul style="list-style-type: none"> EV = value of work actually done <p>Planned Value</p> <ul style="list-style-type: none"> PV = value of work planned to be done <p>Actual Cost</p> <ul style="list-style-type: none"> AC = cost of work actually done <p>Budget at Completion</p> <ul style="list-style-type: none"> BAC = total budget for the project <p>Cost Variance / Performance Index,</p> <ul style="list-style-type: none"> CV = EV – AC CPI = EV / AC <p>To Complete Performance Index</p> <ul style="list-style-type: none"> TCPI = (BAC – EV) / (BAC – AC) Note: TCPI is the cost performance needed to finish the project on budget <p>Forecasting and Cost Forecasts</p> <ul style="list-style-type: none"> Forecasting the Estimate at Completion <p>Estimate at Completion</p> <ul style="list-style-type: none"> EAC "no variances" = BAC / CPI EAC "atypical" = AC + BAC – EV EAC "typical" = AC + ((BAC – EV) / (CPI * SPI)) EAC "flawed" = AC + Re-estimated ETC <p>Estimate to Completion</p> <ul style="list-style-type: none"> ETC = EAC – AC (or re-estimate) <p>Variance at Completion</p> <ul style="list-style-type: none"> VAC = BAC – EAC
			<p>Project Budget Component</p>	<p>Cumulative Values</p>

8. Quality Management

INITIATION	PLANNING	EXECUTION	MONITORING & CONTROLLING	CLOSING
<p>Seven Basic Quality Tools</p>       	<p>8.1 Plan Quality Management</p> <p><i>Inputs From</i></p> <ul style="list-style-type: none"> • Project Management Plan (4.2) • Stakeholder Register (13.1) • Risk Register (11.2) • Requirements Documentation (5.2) <p>• Enterprise Environmental Factors</p> <p>• Organizational Process Assets</p> <p><i>Tools & Techniques</i></p> <ul style="list-style-type: none"> • Cost-Benefit Analysis • Cost of Quality • Seven Basic Quality Tools • Benchmarking • Design of Experiments • Statistical Sampling • Additional Quality Planning Tools • Meetings <p><i>Outputs To</i></p> <ul style="list-style-type: none"> • Quality Management Plan (8.2, 11.2) • Process Improvement Plan (8.2) • Quality Metrics (8.3) • Quality Checklists (8.3) <p>• Project Document Updates</p>	<p>8.2 Perform Quality Assurance</p> <p><i>Inputs From</i></p> <ul style="list-style-type: none"> • Quality Management Plan (8.2) • Process Improvement Plan (8.2) • Quality Metrics (8.2) • Quality Control Measurements (8.3) • Project Documents <p><i>Tools & Techniques</i></p> <ul style="list-style-type: none"> • Quality Management & Control Tools • Quality Audits • Process Analysis <p><i>Outputs To</i></p> <ul style="list-style-type: none"> • Change Requests (4.5) <p>• Project Management Plan Updates (4.2)</p> <p>• Project Document Updates</p> <p>• Organizational Process Assets Updates</p>	<p>8.3 Control Quality</p> <p><i>Inputs From</i></p> <ul style="list-style-type: none"> • Project Management Plan (4.2) • Quality Metrics (8.2) • Quality Checklists (8.3) • Work Performance Data • Approved Change Requests • Deliverables • Project Documents • Organizational Process Assets <p><i>Tools & Techniques</i></p> <ul style="list-style-type: none"> • Seven Basic Quality Tools • Statistical Sampling • Inspection • Approved Change Requests Review <p><i>Outputs To</i></p> <ul style="list-style-type: none"> • Quality Control Measurements (8.2) • Validated Changes (4.4) • Verified Deliverables (5.5) • Work Performance Information (4.4) • Change Requests (4.5) <p>• Project Management Plan Updates (4.2)</p> <p>• Project Document Updates</p> <p>• Organizational Process Assets Updates</p>	<p>Quality Management & Control Tools</p>       

Quality

- How well the project meets requirements
- Grade ≠ Quality: low grade can be high quality, or high grade can be low quality

Cost-Benefit Analysis (Marginal Analysis)

- The point where the incremental benefits of quality are not worth the added cost.

Cost of Quality

- Understanding the cost of conformance (prevent/appraise) vs. non-conformance

Benchmarking

- Comparing actual or planned practices to comparable projects (internal or external)

Design of Experiments

- Testing multiple variables together to identify which combination to improve

Statistical Sampling

- Using a small amount of data to draw conclusions about a larger population
 - Attribute data (pass or fail)
 - Variables data (measure on a scale)

Seven Basic Quality Tools

1. **Cause & Effect Diagram (Fishbone):** shows potential causes of a problem
2. **Flowchart (Process Map):** to map steps
3. **Checksheet (Tally sheet):** to gather data
4. **Pareto:** a bar chart with the frequency of items in descending order (80/20 rule)
5. **Histogram:** a bar chart with the frequency of items per category or scale
6. **Scatter Diagram:** plots the data for two variables to understand their relationship
7. **Control Chart:** plots data vs. time to ID if data is not random (assignable cause)

Additional Quality Planning Tools

- **Run Chart:** plots data v time to ID trends
- **Brainstorming:** to generate ideas
- **Force Field Analysis:** ID for & against
- **Nominal Group Technique:** identify ideas and vote to rank
- **Quality Management & Control Tools:** see to right →

Quality Management Plan

- How quality policies will be implemented
- How quality will be assured & controlled

Quality Assurance

- **Process oriented**
- Focused on **defect prevention**

Quality Management & Control Tools

- **Affinity Diagrams:** grouping ideas
- **Process Decisions Program Charts (PDPC):** decompose goal into activities
- **Interrelationship Digraphs:** mapping interrelationships
- **Tree Diagrams:** mapping hierarchies
- **Prioritization Matrix:** prioritize solutions
- **Matrix Diagrams:** table of two items
- **Network Diagrams:** project scheduling

Quality Audits

- Assessing project conformance to policies, practices and procedures

Continuous Improvement (Kaizen)

- Focus on (small) repeated improvement

Prevention over Inspection

- Plan-in quality (keep errors out of the process) vs. Inspect-in quality (keep errors from getting to customer)

Quality Control

- **Product oriented**
- Focused on **defect identification.**

Work Performance Data

- Raw observations and measurements

Inspection

- Assessing conformance to requirements

Quality Control Measurements

- Documented results of quality control

Validated Changes

- Changes that meet the requirements of the customer

Verified Deliverables

- Deliverables that meet requirements

Work Performance Information

- Converting data into information for decisions & communication

Just-in-Time

- Deliver inventory exactly when it is needed (near zero inventory)

Quality Theorists

- **Joseph Juran:** Defined quality as "fitness for use", established 80 / 20 rule
- **W. Edward Deming:** 14 points of quality & Plan-Do-Check-Act (PDCA) cycle
- **Phillip Crosby:** Cost of poor quality, zero defects, prevention over inspection

Mutual Exclusivity

- Things are mutually exclusive if they cannot occur at the same time

Probability

- The likelihood that something will occur

Statistical Independence

- The probability of something occurring has no affect another thing occurring

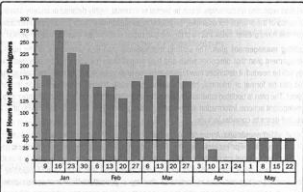


Standard Deviation (Sigma)

- The variability in a process
- The standard variability in a normal distribution

Gold Plating (note: gold plating is bad!)

- Giving the customer extras (beyond the required/agreed upon quality or scope)

9. Human Resource Management

INITIATION	PLANNING	EXECUTION	MONITORING & CONTROLLING	CLOSING																																								
	<p>9.1 Plan Human Resource Management</p> <p><i>Inputs From</i></p> <ul style="list-style-type: none"> • Project Management Plan (4.2) • Activity Resource Requirements (13.1) • Enterprise Environmental Factors • Organizational Process Assets <p><i>Tools & Techniques</i></p> <ul style="list-style-type: none"> • Org Charts & Position Descriptions • Networking • Expert Judgment • Meetings <p><i>Outputs To</i></p> <ul style="list-style-type: none"> • Human Resource Management Plan 	<p>9.2 Acquire Project Team</p> <p><i>Inputs From</i></p> <ul style="list-style-type: none"> • Human Resource Management Plan (9.1) • Enterprise Environmental Factors • Organizational Process Assets <p><i>Tools & Techniques</i></p> <ul style="list-style-type: none"> • Pre-Assignment • Negotiation • Acquisition • Virtual Teams • Multi-Criteria Decision Analysis <p><i>Outputs To</i></p> <ul style="list-style-type: none"> • Project Staff Assignments • Resource Calendars • Project Management Plan Updates 		<ul style="list-style-type: none"> • Conflict is inevitable • When feasible, team members should resolve conflicts (except threats) 																																								
<p>Org Charts & Position Descriptions</p> <ul style="list-style-type: none"> • Org Chart = hierarchical diagram of project responsibility • Position Description = description of the position responsibilities <p>Responsibility Assignment Matrix (RAM)</p> <table border="1"> <thead> <tr> <th>Task</th> <th>Pete</th> <th>Mary</th> <th>Joe</th> <th>Sally</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>P</td> <td></td> <td>S</td> <td></td> </tr> <tr> <td>B</td> <td></td> <td>S</td> <td></td> <td>P</td> </tr> <tr> <td>C</td> <td>S</td> <td>P</td> <td></td> <td></td> </tr> </tbody> </table> <p>P = Primary Responsibility, S = Secondary</p> <p>RACI Diagram</p> <table border="1"> <thead> <tr> <th>Task</th> <th>Tom</th> <th>Jane</th> <th>Dick</th> <th>Sue</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>A</td> <td>I</td> <td>R</td> <td>C</td> </tr> <tr> <td>B</td> <td></td> <td>R</td> <td>A</td> <td></td> </tr> <tr> <td>C</td> <td>A</td> <td>I</td> <td>R</td> <td>R</td> </tr> </tbody> </table> <p>R = Responsible, A = Accountable, C = Consult, I = Inform</p> <p>Resource Histogram</p> <ul style="list-style-type: none"> • X Axis = Time • Y Axis = Labor Hours or % Utilization  <p>Human Resource Management Plan</p> <ul style="list-style-type: none"> • How human resources should be defined, staffed, managed & released. • Includes the following components: <ol style="list-style-type: none"> 1. Roles & Responsibilities 2. Project Organization Charts 3. Staffing Management Plan (acquire, train, calendar, release, reward, safety) 	Task	Pete	Mary	Joe	Sally	A	P		S		B		S		P	C	S	P			Task	Tom	Jane	Dick	Sue	A	A	I	R	C	B		R	A		C	A	I	R	R	<p>Pre-assignment-Negotiation-Acquisition</p> <ul style="list-style-type: none"> • Resources may be assigned, negotiated for, or acquired (hiring, contracting, etc.) <p>Types of Teams</p> <ul style="list-style-type: none"> • Dedicated: work full-time on project • Part-Time: work part-time on project • Partnership: project shared by multiple organizations with one as the lead • Virtual: geographical differences <p>Halo Effect</p> <ul style="list-style-type: none"> • Assuming that someone who is good in one area will be good in all areas <p>Multi-Criteria Decision Making</p> <ul style="list-style-type: none"> • Selecting team based on criteria: Availability, Cost, Experience, Ability, Knowledge, Skills, Attitude, International <p>Project Staff Assignments</p> <ul style="list-style-type: none"> • Document who is assigned to the project <p>Resource Calendar</p> <ul style="list-style-type: none"> • Document when resources are available <p>Team Building</p> <ul style="list-style-type: none"> • Forming: coming together as a team • Storming: learning to work together • Norming: building relationships & trust • Performing: team works efficiently • Adjourning: team is disbanded <p>Ground Rules</p> <ul style="list-style-type: none"> • Establish team ground rules for cohesion <p>Co-location (Strong Matrix)</p> <ul style="list-style-type: none"> • Co-locate the team to improve cohesion <p>Personnel Assessment Tools</p> <ul style="list-style-type: none"> • Used to assess individual performance • Surveys, 360s, interviews, focus groups <p>Team Performance Assessments</p> <ul style="list-style-type: none"> • Assess & improve team performance 	<p>9.3 Develop Project Team</p> <p><i>Inputs From</i></p> <ul style="list-style-type: none"> • Human Resource Management Plan (9.1) • Project Staff Assignments (9.2) • Resource Calendars (9.2) <p><i>Tools & Techniques</i></p> <ul style="list-style-type: none"> • Interpersonal Skills • Training • Teambuilding Activities • Ground Rules • Co-Location • Recognition & Rewards • Personnel Assessment Tools <p><i>Outputs To</i></p> <ul style="list-style-type: none"> • Team Performance Assessments (9.4) • Enterprise Environmental Factor Update <p>9.4 Manage Project Team</p> <p><i>Inputs From</i></p> <ul style="list-style-type: none"> • Human Resource Management Plan (9.1) • Project Staff Assignments (9.2) • Team Performance Assessments (9.3) • Issue Log • Work Performance Reports • Organizational Process Assets <p><i>Tools & Techniques</i></p> <ul style="list-style-type: none"> • Observation & Conversation • Project Performance Appraisals • Conflict Management • Interpersonal Skills <p><i>Outputs To</i></p> <ul style="list-style-type: none"> • Change Requests • Project Management Plan Updates • Project Document Updates • Enterprise Environmental Factor Update • Organizational Process Assets Updates 	<p>-----</p> <p>Project Performance Appraisals</p> <ul style="list-style-type: none"> • To clarify roles, give feedback, ID issues, train, development plans, etc. <p>Conflict Management</p> <ul style="list-style-type: none"> • Withdraw/Avoid • Smooth/Accommodate • Compromise/Reconcile • Force/Direct • Collaborate/Problem Solve <i>most effective</i> <p>Sources of Conflict</p> <ol style="list-style-type: none"> 1. Schedules 2. Project Priorities 3. Resources 4. Technical Opinions 5. Administrative Procedures 6. Cost 7. Personality <p>Interpersonal Skills</p> <ul style="list-style-type: none"> • Leadership • Influencing • Decision Making <p>Leadership Styles</p> <ul style="list-style-type: none"> • Directing • Facilitating • Coaching • Supporting • Autocratic • Consultive • Consensus • Delegating • Bureaucratic • Charismatic • Democratic/Participative • Laissez-fair • Analytical • Driver • Influencing <p>Influencing Powers</p> <ul style="list-style-type: none"> • Formal: Based on position • Reward: from praise/reward • Penalty: from punishment • Expert: from being the expert • Referent: personal charisma <p>Decision Making</p> <ul style="list-style-type: none"> • Focus on goals, service, follow process 	<p>MOTIVATION THEORIES</p> <p>Expectant Theory</p> <ul style="list-style-type: none"> • People who feel efforts → performance → rewards will remain productive <p>McGregor's Theory of X & Y</p> <ul style="list-style-type: none"> • X = People have to be watched → rewards will remain productive • Y = People just have to be told – most already want to work  <p>Maslow's Hierarchy of Needs</p> <ul style="list-style-type: none"> • People are motivated by the ability to contribute their skills (v. money, etc.) • Self-Actualization = fulfillment, growth  <p>McClellan's Theory of Needs</p> <ul style="list-style-type: none"> • People are motivated by 1 of 3 needs <ol style="list-style-type: none"> 1. Achievement 2. Affiliation 3. Power <p>Hertzberg's Theory</p> <ul style="list-style-type: none"> • Poor hygiene factors inhibit morale, but do not build it. Only motivating agents do • Hygiene Factors = work conditions, salary, security, relationships • Motivating Agents = responsibility, self-actualization, growth, recognition
Task	Pete	Mary	Joe	Sally																																								
A	P		S																																									
B		S		P																																								
C	S	P																																										
Task	Tom	Jane	Dick	Sue																																								
A	A	I	R	C																																								
B		R	A																																									
C	A	I	R	R																																								

10. Communications Management

INITIATION	PLANNING	EXECUTION	MONITORING & CONTROLLING	CLOSING
	<p style="text-align: center;">10.1 Plan Communications Management</p> <p style="text-align: center;"><i>Inputs From</i></p> <ul style="list-style-type: none"> • Project Management Plan (4.2) • Stakeholder Register (13.1) <p style="text-align: center;"><i>Tools & Techniques</i></p> <ul style="list-style-type: none"> • Communication Requirements Analysis • Communication Technology • Communication Models • Communication Methods • Meetings <p style="text-align: center;"><i>Outputs To</i></p> <ul style="list-style-type: none"> • Communications Management Plan (13.3) <ul style="list-style-type: none"> • Project Document Updates 	<p style="text-align: center;">10.2 Manage Communications</p> <p style="text-align: center;"><i>Inputs From</i></p> <ul style="list-style-type: none"> • Communication Management Plan (10.1) • Stakeholder Register (13.1) <p style="text-align: center;"><i>Tools & Techniques</i></p> <ul style="list-style-type: none"> • Communication Technology • Communication Models • Communication Methods • Information Management Systems • Performance Reporting <p style="text-align: center;"><i>Outputs To</i></p> <ul style="list-style-type: none"> • Project Communications (13.3) <ul style="list-style-type: none"> • Project Management Plan Updates (4.2) • Project Document Updates • Organizational Process Assets Updates 	<p style="text-align: center;">10.3 Control Communications</p> <p style="text-align: center;"><i>Inputs From</i></p> <ul style="list-style-type: none"> • Project Management Plan (4.2) • Project Communications (13.3) • Issue Log (13.3) • Work Performance Data (4.3) • Organizational Process Assets <p style="text-align: center;"><i>Tools & Techniques</i></p> <ul style="list-style-type: none"> • Information Management Systems • Expert Judgment • Meetings <p style="text-align: center;"><i>Outputs To</i></p> <ul style="list-style-type: none"> • Work Performance Information (4.4) • Change Requests (4.5) <ul style="list-style-type: none"> • Project Management Plan Updates (4.2) • Project Document Updates • Organizational Process Assets Updates 	

Communications Management Plan

- How you will execute & control communications

Communication Requirements Analysis

- To analyze requirements, consider:
 - Organization Charts
 - Project Organization
 - Departments involved
 - Logistics
 - Internal Needs
 - External Needs
 - Stakeholder Needs

Communication Technology

- Choose technology based on:
 - Urgency of information
 - Available Technology
 - Ease of Use
 - Project Environment
 - Confidentiality of the Info

Communication Models

- Encode
- Transmit
- Decode
- Acknowledge
- Feedback

Communication Methods

- **Interactive:** two-way
- **Push:** PM sends (but may not know if others receive the message)
- **Pull:** PM makes available, user must get

Manage Communications

- Techniques to consider:
 - *Sender-receiver Model* (feedback loops)
 - *Choice of Media* (formal vs. informal)
 - *Writing Style* (active vs. passive voice)
 - *Meeting Management Techniques*
 - *Presentation Techniques* (non-verbal)
 - *Facilitation Techniques* (get consensus)
 - *Listening Techniques* (active listening)

Performance Reporting

- Types of Reports
 - Status Report
 - Progress Report
 - Trend Report
 - Forecasting Report
 - Variance Report
 - Earned value Report
 - Lessons Learned Documentation

Project Communications

- Sender must focus on the following:
 - **Words:** key for message, but meaning may change based on context
 - **Non-Verbal:** body language
 - **Paralingual:** pitch & tone of voice
- Receiver must focus on
 - Accurately decoding above
 - **Active Listening:** repeating back

Control Communications

- Can PM control all commo? **No**
- Should PM try to control all commo? **Yes**
- What % of PM's time is commo? **90%**

Meetings

- Have a time limit
- Have a purpose
- Have an agenda (with team input)
- Define responsibilities
- Document & publish meeting minutes

Communication Channels

- $\frac{N \cdot (N-1)}{2}$ N = the number of people

Communication Types

- **Written**
 - *Formal* = approved/signed documents
 - *Informal* = e-mail, handwritten notes, IM
- **Verbal**
 - *Formal* = presentation, speeches
 - *Informal* = meetings, conversations

Communication Blockers

- Noisy surroundings
- Distance
- Making negative statements
- Hostility
- Language
- Culture
- Encoding / Decoding problems

- **Contracts are formal, and require formal responses**
- **Communicating with the customer is formal**

11. Risk Management

INITIATION	PLANNING	EXECUTION	MONITORING & CONTROLLING	CLOSING
<p>Plan Risk Management</p> <ul style="list-style-type: none"> The goal is to decrease the probability & impact of Threats and increase the same for Opportunities <ul style="list-style-type: none"> – Threat = a negative risk – Opportunity = a positive risk Also consider the timing of risks and the quantity of risks from each source <p>Risk Management Plan</p> <ul style="list-style-type: none"> Outlines how risk management activities will be structured & performed Methodology, Timing, Budget, Roles & Responsibilities Risk Categories & Risk Breakdown Structure (e.g. external, internal, technical, process, etc.) Probability & Impact Definitions (e.g. definitions for high, med, low) <p>-----</p> <p>Information Gathering Techniques</p> <ul style="list-style-type: none"> Brainstorm: generate & collect ideas Delphi Technique: brainstorm individually & review with group Interviewing Root Cause Analysis: identify problem, determine root (key) cause(s), execute corrective & preventive actions <p>Diagramming Techniques</p> <ul style="list-style-type: none"> Cause & Effect Diagram (Fishbone): shows potential causes of a problem System/Process Flowchart: map steps to show causation Influence Diagrams: time ordering steps to show relationships & influences <p>SWOT Analysis</p> <ul style="list-style-type: none"> A technique to look at Strengths, Weaknesses, Opportunities & Threats <p>Checklist Analysis</p> <ul style="list-style-type: none"> A checklist of risks from past history <p>Risk Register</p> <ul style="list-style-type: none"> List of risks and potential responses Remember that the register is updated during the project to add new information and additional details 	<p>11.1 Plan Risk Management</p> <p><i>Inputs</i></p> <ul style="list-style-type: none"> Project Management Plan (4.2) Project Charter (4.1) Stakeholder Register (13.1) EEF & OPA <p><i>Tools & Techniques</i></p> <ul style="list-style-type: none"> Expert Judgment • Analytic Techniques • Meetings <p><i>Outputs</i></p> <ul style="list-style-type: none"> Risk Management Plan <p>11.2 Identify Risks</p> <p><i>Inputs</i></p> <ul style="list-style-type: none"> Project Management Plan (4.2) Cost, Schedule, Quality & HR Plans Scope Baseline Activity Cost & Duration Estimates Stakeholder Register Project & Project Procurement Docs EEF & OPA <p><i>Tools & Techniques</i></p> <ul style="list-style-type: none"> Information Gathering Techniques Diagramming Techniques SWOT Analysis Checklist Analysis Documentation Reviews Assumption Analysis Expert Judgment <p><i>Outputs</i></p> <ul style="list-style-type: none"> Risk Register <p>11.3 Perform Qualitative Risk Analysis</p> <p><i>Inputs</i></p> <ul style="list-style-type: none"> Project Management Plan (4.2) Project Charter (4.1) Stakeholder Register (13.1) EEF & OPA <p><i>Tools & Techniques</i></p> <ul style="list-style-type: none"> Risk Probability & Impact Assessment Probability & Impact Matrix Risk Data Quality Assessment Risk Categorization Risk Urgency Assessment Expert Judgment <p><i>Outputs</i></p> <ul style="list-style-type: none"> Project Document Updates <p>11.4 Perform Quantitative Risk Analysis</p> <p><i>Inputs</i></p> <ul style="list-style-type: none"> Project Management Plan (4.2) Project Charter (4.1) Stakeholder Register (13.1) EEF & OPA <p><i>Tools & Techniques</i></p> <ul style="list-style-type: none"> Data Gathering & Representation Quantitative Risk Analysis & Modeling Expert Judgment <p><i>Outputs</i></p> <ul style="list-style-type: none"> Project Document Updates 	<p>-----</p> <p>Perform Qualitative Risk Analysis</p> <ul style="list-style-type: none"> A subjective analysis of the risk register <p>Risk Probability & Impact Assessment</p> <ul style="list-style-type: none"> Subjective ranking (e.g. Hi, Med, Low) of risks by probability & impact of occurrence <p>Probability & Impact Matrix</p> <ul style="list-style-type: none"> Visually highlights the high probability and high impact risks Watch List: risk with low qualitative rankings that require no additional action (but watch & review during control risks) <p>Risk Data Quality Assessment</p> <ul style="list-style-type: none"> Assess and ensure the validity of the qualitative assessments <p>Risk Categorization</p> <ul style="list-style-type: none"> Group risk (e.g. by work package) to see which activities have the most <p>Risk Urgency Assessment</p> <ul style="list-style-type: none"> Understand the timing and how quickly you need to act upon each risk <p>Project Documents Updates</p> <ul style="list-style-type: none"> The risk register is updated with the information above <p>11.5 Plan Risk Responses</p> <p><i>Inputs</i></p> <ul style="list-style-type: none"> Project Management Plan (4.2) Risk Register (11.2) <p><i>Tools & Techniques</i></p> <ul style="list-style-type: none"> Strategies for Negative Risks (Threats) Strategies for Positive Risks (Opportunities) Contingent Response Strategies Expert Judgment <p><i>Outputs</i></p> <ul style="list-style-type: none"> Project Management Plan Updates Project Documents Updates 	<p>11.6 Control Risks</p> <p><i>Inputs</i></p> <ul style="list-style-type: none"> Project Management Plan Risk Register Work Performance Data Work Performance Reports <p><i>Tools & Techniques</i></p> <ul style="list-style-type: none"> Risk Reassessment Risk Audits Variance and Trend Analysis Technical Performance Measurement Reserve Analysis Meetings <p><i>Outputs</i></p> <ul style="list-style-type: none"> Project Management Plan Updates Project Document Updates <p>-----</p> <p>Perform Quantitative Risk Analysis</p> <ul style="list-style-type: none"> An objective (data based) analysis of the risk register <p>Data Gathering & Representation</p> <ul style="list-style-type: none"> Interviewing Probability Distributions: Normal, Lognormal, Beta, Triangular, etc. <p>Quantitative Risk Analysis & Modeling</p> <ul style="list-style-type: none"> Sensitivity Analysis: tornado diagram to depict the positive/negative impact Expected Monetary Value Analysis: multiply the probability x \$ impact Modeling (Monte Carlo Analysis): run multiple simulations based on inputs to create a probability graphs Decision Tree: shows how to make decisions between alternatives <div data-bbox="1249 1023 1596 1502"> <p>Tornado Chart</p> <p>Decision Tree</p> <pre> graph LR A[Design Qualification] --> B((Prototype \$200,000)) A --> C((No Prototype \$0)) B --> B1[Pass 35%] B --> B2[Fail 65%, \$150K] C --> C1[Pass 30%] C --> C2[Fail 70%, \$400K] </pre> <p>Decision: Design Qualification Chance: Prototype/No Prototype</p> </div>	<p>-----</p> <p>Strategies for Negative Risks</p> <ul style="list-style-type: none"> Avoid: alter the scope to avoid Mitigate: reduce probability or impact Transfer: outsource Accept <p>Strategies for Positive Risks</p> <ul style="list-style-type: none"> Exploit: alter the scope to obtain Enhance: increase probability or impact Share: partner with an organization who can better capitalize on the benefit Accept <p>Contingent Response Strategies</p> <ul style="list-style-type: none"> Contingency Time Reserves: PM controlled for known project risks Management Time Reserves: Management unknown project risks <p>Project Documents Updates</p> <ul style="list-style-type: none"> The risk register is updated with additional information Residual Risks: risks that remain after risk planning and are passively accepted Secondary Risks: new risks that are caused by risk response planning Risk Trigger: events that trigger a contingency response Contingency Plans: outlines the actions taken to respond to a risk trigger Fallback Plans: outlines the actions taken if a contingency plan fails Risk Owner: risk owners are needed so project managers don't own all the risks Contracts: project manager should ensure risks are included in contracts <p>-----</p> <p>Variance & Trend Analysis</p> <ul style="list-style-type: none"> Comparing actual to planned results to assess project performance <p>Risk Reassessment</p> <ul style="list-style-type: none"> The Risk Register should be reviewed & updated throughout the project <p>Risk Audits</p> <ul style="list-style-type: none"> Should assess the risk process and effectiveness of risk responses <p>Workarounds</p> <ul style="list-style-type: none"> Unplanned responses to unanticipated events or risks previously accepted

12. Procurement Management

INITIATION	PLANNING	EXECUTION	MONITORING & CONTROLLING	CLOSING
	12.1 Plan Procurement Management	12.2 Conduct Procurements	12.3 Control Procurements	12.4 Close Procurements
	<p style="text-align: center;"><i>Inputs From</i></p> <ul style="list-style-type: none"> • Procurement Management Plan • Requirements Documentation • Risk Register • Activity Resource Requirements • Project Schedule • Activity Cost Estimates • Stakeholder Register • Enterprise Environmental Factors • Organizational Process Assets <p style="text-align: center;"><i>Tools & Techniques</i></p> <ul style="list-style-type: none"> • Make-or-Buy Analysis • Expert Judgment • Market Research • Meetings <p style="text-align: center;"><i>Outputs To</i></p> <ul style="list-style-type: none"> • Procurement Management Plan (various) • Procurement Statement of Work (12.2) • Procurement Documents (various) • Source Selection Criteria (12.2) • Make-or-Buy Decisions (12.2) • Change Requests (4.5) • Project Document Updates 	<p style="text-align: center;"><i>Inputs From</i></p> <ul style="list-style-type: none"> • Procurement Management Plan (12.1) • Procurement Documents (12.1) • Source Selection Criteria (12.1) • Seller Proposals • Project Documents • Make-or-Buy Decisions (12.1) • Procurement Statement of Work (12.1) • Organizational Process Assets <p style="text-align: center;"><i>Tools & Techniques</i></p> <ul style="list-style-type: none"> • Bidder Conference • Proposal Evaluation Techniques • Independent Estimates • Expert Judgment • Analytical Techniques • Procurement Negotiations <p style="text-align: center;"><i>Outputs To</i></p> <ul style="list-style-type: none"> • Selected Sellers • Agreements • Resource Calendars • Change Requests (4.5) • Project Management Plan Updates • Project Document Updates 	<p style="text-align: center;"><i>Inputs From</i></p> <ul style="list-style-type: none"> • Project Management Plan (12.1) • Procurement Documents (12.1) • Agreements (12.2) • Approved Change Requests • Work Performance Reports • Work Performance Data <p style="text-align: center;"><i>Tools & Techniques</i></p> <ul style="list-style-type: none"> • Contract Change Control System • Procurement Performance Reviews • Inspections & Audits • Performance Reporting • Payment Systems • Claims Administration • Records Management System <p style="text-align: center;"><i>Outputs To</i></p> <ul style="list-style-type: none"> • Work Performance Information • Change Requests • Project Management Plan Updates • Project Document Updates • Organizational Process Assets Updates 	<p style="text-align: center;"><i>Inputs From</i></p> <ul style="list-style-type: none"> • Project Management Plan (12.1) • Procurement Documents (12.1) <p style="text-align: center;"><i>Tools & Techniques</i></p> <ul style="list-style-type: none"> • Procurement Audits • Procurement Negotiations • Records Management System <p style="text-align: center;"><i>Outputs To</i></p> <ul style="list-style-type: none"> • Closed Procurements <p style="text-align: center;"><i>Organizational Process Assets Updates</i></p> <ul style="list-style-type: none"> • Organizational Process Assets Updates

Make-Buy Analysis & Decisions

- Make = do work, Buy = outsource work
 - Why Make: to retain control, protect proprietary info, or utilize idle resources
 - Why Buy: to transfer risk to a supplier

Procurement Management Plan

- Plan to, execute, control & close.

Procurement Statement of Work (SoW)

- Outlines the work for each procurement
 - **Performance SoW** – *What* must be done (must go 100 miles per hour)
 - **Functional SoW** – *How* the work is done (must be an electric car)
 - **Design SoW** – *What* & *How* (must be an electric car that goes 100 mph)

Procurement Documents

- **Invitation for Bid** (IFB RFB): requests a price (i.e. no need to know costs)
 - Fixed Price Contracts & Design SoW
- **Request for Proposal** (RFP): request a detailed proposal (i.e. to know costs)
 - Cost Reimbursable Contracts & Performance or Functional SoW
- **Request for Quote** (RFQ): requests a quoted rate (e.g. cost per hour, etc.)
 - Time & Material Contracts & any SoW

Source Selection Criteria

- Objective and Subjective criteria used to rate supplier proposals
- Some criteria are:
 - Need
 - Overall or Life-cycle Cost
 - Risk
 - Business size & type
 - Management Approach
 - Technical Approach
 - Past Performance & References
 - Warranty

Bidder Conferences

- Meetings between buyer & all sellers to ensure clarity in what is required prior to the submission of a bid or proposal

Proposal Evaluation Techniques

- The approach for formal evaluation of procurement documents

Independent Estimates

- An internal or external estimate of what the project should cost

Selected Sellers

- Recommended sellers selected by the proposal evaluation techniques

Agreements - Contracts

- Formal document (need formal response)
- Define roles & responsibilities
- Make items legally binding
- Mitigate or allocate risk

Procurement Documents

- Fixed Price Contract
- Cost-Reimbursable Contract
- Time & Material Contract

Fixed Price Contracts

- Fix a price in advanced (despite cost)
- Transfers cost risk to the seller
- Requires defined requirements & scope
- Competition works to ensure a fair price & prevent the seller from padding costs
- Types of Fixed Price contracts
 - **Firm Fixed Price**: the buyer pays a fixed amount, regardless of costs
 - **Fixed Price Incentive Fee** (FPIF): Fix price plus incentive (variable)
 - **Fixed Price Award Fee** (FPAF): Fixed price plus award (fixed)
 - **Fixed Price Economic Price Adjust** (FPEPA): Fixed price adjusted for economics (e.g. gas costs)
- **Purchase Order** – fixed price – no negotiation (e.g. a commodity item)

Cost Reimbursable Contracts

- Covers the cost of the work, which may be unknown or difficult to estimate
- Transfers cost risk to the buyer (project)
- Types of Cost Reimbursable Contracts
 - **Cost Contract**: Covers costs only (the seller makes no profit)
 - **Cost Plus Fee** (CPF) or **Cost Plus Percentage Costs** (CPPC) Covers costs & profit as a % of costs
 - **Cost Plus Fixed Fee** (CPFF) - Covers costs and provides a fixed profit
 - **Cost Plus Incentive Fee** (CPIF) – Covers costs plus an incentive, but the seller shares in costs overruns
 - **Cost Plus Award Fee** (CPAF) – Covers costs plus an award (typically subjective), but the seller does not share in costs overruns

Time & Material Contracts

- Fixed per-hour rate and cover costs
- Need is immediate & effort unknown
- Only use for short term issues
 - “Not to Exceed” clause can limit costs

Procurement Performance Reviews

- A structured review of seller’s progress to deliver project requirements

Procurement Audits

- A review of the procurement process

Constructive Change

- Requested but unresolved changes directed by buyer or acted on by seller

Procurement Negotiations

- Resolving issues, claims, disputes
- Goal: Win-Win (v. Win-Lose, Lose-Lose)
 - To obtain a fair and reasonable price
 - Develop a good relationship with seller
- Items to Negotiate
 - Primary = Scope, Schedule, Price
 - Secondary = Responsibility, Authority, Applicable Law, Processes, Payment

Negotiation Tactics

- **Attacks** (e.g. attacking your company)
- **Personal Insults** (e.g. attack you)
- **Good/Bad Guy** (e.g. 2 people; 2 roles)
- **Deadline** (e.g. must catch a flight)
- **Lying** (e.g. misrepresent the truth)
- **Missing Man** (e.g. no decision maker)
- **Fair & Reasonable** (e.g. claim deal is fair)
- **Delay** (e.g. postpone until last minute)
- **Extreme Demands** (e.g. start extreme so that high prices seem better)
- **Withdrawal** (e.g. show a lack of interest)
- **Fait Accompli** (e.g. claiming no control)

13. Stakeholder Management

INITIATION	PLANNING	EXECUTION	MONITORING & CONTROLLING	CLOSING
13.1 Identify Stakeholders	13.2 Plan Stakeholder Management	13.3 Manage Stakeholder Engagement	13.4 Control Stakeholder Engagement	
<p style="text-align: center; color: #808080;"><i>Inputs From</i></p> <ul style="list-style-type: none"> • Project Charter (4.1) • Procurement Documents (12.1) • Enterprise Environmental Factors • Organizational Process Assets <p style="text-align: center; color: #808080;"><i>Tools & Techniques</i></p> <ul style="list-style-type: none"> • Stakeholder Analysis • Expert Judgment • Meetings <p style="text-align: center; color: #808080;"><i>Outputs To</i></p> <ul style="list-style-type: none"> • Stakeholder Register (13.2) 	<p style="text-align: center; color: #808080;"><i>Inputs From</i></p> <ul style="list-style-type: none"> • Project Management Plan (4.2, various) • Stakeholder Register (13.2) • Enterprise Environmental Factors • Organizational Process Assets <p style="text-align: center; color: #808080;"><i>Tools & Techniques</i></p> <ul style="list-style-type: none"> • Expert Judgment • Meetings • Analytical Techniques <p style="text-align: center; color: #808080;"><i>Outputs To</i></p> <ul style="list-style-type: none"> • Stakeholder Management Plan (various) • Project Document Updates (various) 	<p style="text-align: center; color: #808080;"><i>Inputs From</i></p> <ul style="list-style-type: none"> • Stakeholder Management Plan (13.2) • Communication Management Plan (10.1) • Change Log (4.5) • Organizational Process Assets <p style="text-align: center; color: #808080;"><i>Tools & Techniques</i></p> <ul style="list-style-type: none"> • Communication Methods (10.1) • Interpersonal Skills • Management Skills <p style="text-align: center; color: #808080;"><i>Outputs To</i></p> <ul style="list-style-type: none"> • Issue Log (13.4, 9.4, 10.3) • Change Requests (4.5) • Project Management Plan Updates (4.2) • Project Document Updates (various) • Organizational Process Assets Updates 	<p style="text-align: center; color: #808080;"><i>Inputs From</i></p> <ul style="list-style-type: none"> • Project Management Plan (4.2) • Issue Log • Work Performance Data (4.3) • Project Documents <p style="text-align: center; color: #808080;"><i>Tools & Techniques</i></p> <ul style="list-style-type: none"> • Information Management Systems • Expert Judgment • Meetings <p style="text-align: center; color: #808080;"><i>Outputs To</i></p> <ul style="list-style-type: none"> • Work Performance Information (4.4) • Change Requests (4.5) • Project Management Plan Updates (4.2) • Project Document Updates (various) • Organizational Process Assets Updates 	

What to do with Stakeholders

- Identify all of them
- Determine their requirements
- Determine their expectations
- Determine their level of influence
- Plan how to manage them
- Plan how to communicate with them
- Manage their expectations, influence and engagement
- Communicate with them
- Control communication and stakeholder engagement

Stakeholder Analysis

- Gathering & analyzing qualitative and quantitative stakeholder information
 - Power / Interest grid
 - Power / Influence grid
 - Influence / Impact grid
 - Salience Model – describes classes of stakeholders

Stakeholder Register

- Contains details about stakeholders, including (but not limited to):
 - Identification Information
 - Assessment information
 - Stakeholder classification

Stakeholder Management Plan

- Describes how stakeholder management will be executed & controlled
- May be formal or informal
- May be detailed or general

Communication Methods

- **Interactive** – two way mutual exchange
- **Push** – information sent to recipients
- **Pull** – recipients must pull information

Interpersonal Skills

- Building Trust
- Resolving Conflict
- Active Listening
- Overcoming Resistance to Change

Management Skills

- Facilitate consensus to project objectives
- Influence people to support project
- Negotiate agreements to support project
- Modify organizational behavior to accept project outcomes

Change Requests

- A formal proposal to modify a document, deliverable, or baseline, including:
 - **Defect Repair**: reworking defects
 - **Updates**: changes plans or documents
 - **Corrective Action**: analyze, identify & correct existing issues to meet plan
 - **Preventive Action**: analyze, identify & prevent possible issues to meet plan

Work Performance Data

- Raw observations and measurements identified during activities

Work Performance Information

- Transformed data into information for decisions and communication

FORMULAS

Estimate Accuracy (for cost & schedule)

- Order of Magnitude estimate = -25% / +75% (Initiation) +/- 50%
- Budget estimate = -10% / +25% (Planning) +/- 25%
- Definitive estimate = -5% / +10% (Execution) +/- 10%

3-Point Estimates (for schedule & cost)

- Triangular Distribution $(P + M + O) / 3$
- Beta (PERT) Distribution $(P + 4M + O) / 6$
- Standard Deviation $(P - O) / 6$
- Variance $(P - O) / 6)^2$
- PERT Variance All $\text{sum of } (P - O) / 6)^2$

Network Diagram (Schedule)

- Float on Critical Path 0 days
- Forward Pass $EF = ES + \text{Duration}$
- Backward Pass $LS = LF - \text{Duration}$
- Float (Slack) $LF - EF = LS - ES$
- Free Float $ES(\text{Successor}) - EF(\text{Predecessor})$

Earned Value

- EV The value of work done

Planned Value

- PV The value of work planned

Actual Cost

- AC The actual cost of work done

Budget at Completion

- BAC The budget for the project

Schedule Variance/Performance Index

- SV $EV - PV$
- SPI EV / PV

Cost Variance / Performance Index, To Complete Performance Index

- CV $EV - AC$
- CPI EV / AC
- TCPI $(BAC - EV) / (BAC - AC)$

Note: TCPI is the cost performance need to finish the project within budget

Estimate at Completion (Cost)

- EAC 'no variances from past CPI' BAC / CPI
- EAC 'past CPI variances atypical' $AC + BAC - EV$
- EAC 'past CPI variances typical' $AC + ((BAC - EV) / (CPI * SPI))$
- EAC '1st estimate deeply flawed' $AC + \text{Re-estimated ETC}$

Estimate to Completion - Variance at Completion (Cost)

- ETC $EAC - AC$ (or re-estimate)
- VAC $BAC - EAC$

Project Selection Criteria

- Present Value = $PV = FV / (1+r)^n$
- Future Value = $FV = PV * (1+r)^n$
- Net Present Value NPV = Select biggest number.
- Return on Investment ROI = Select biggest number.
- Individual Rate of Return IRR = Select biggest number.
- Payback Period = Time until the project cost is recouped
- BCR = Benefit / Cost
- CBR = Cost / Benefit
- Opportunity Cost = the value of the project not chosen.
- Expected Value = Probability % x Consequence \$

Straight-line Depreciation

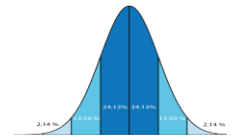
- Depreciation Rate 100% / Useful Life

Accelerated Depreciation

- Rate faster than straight line Double Declining Balance Method
Sum-of-Years' Digits Method

Normal Distributions

- 1 sigma (standard deviation) 68.26%
- 2 sigma (standard deviations) 95.46%
- 3 sigma (standard deviations) 99.73%
- 6 sigma (standard deviations) 99.99%



Control Charts

- Control Limits +/- 3 sigma (standard deviations) from mean
- Control Specifications Defined by customer; less than control limits
- Pareto Diagram 80/20
- PM communicates 90% of the time
- Crashing a project Crash least expensive tasks on critical path.
- JIT inventory 0% (or very close to 0%).

Communications

- Communication Channels = $n * (n-1) / 2$

Expected Monetary Value

- EMV = Probability * Impact (in \$\$)

Procurement - Point of Total Assumption

- PTA = $\frac{(\text{Ceiling Price} - \text{Target Price})}{\text{Buyer's Share Ratio}} + \text{Target Cost}$