

# **PMP Study Notes by RAFI PELTEKIAN and RAYMOND OKIMURA**

Copyright by Rafi Peltekian, PMP.

Offered as is, with no warranty regarding the accuracy or suitability of this material. Copyright reserved. Please, however free to copy and share these documents with the following restrictions.

1. You may not charge for use or distribution of this material.
2. Your usage of this material is conditioned upon your compliance with the [PMI Code of Ethics](#).
3. All distributions must be made with the intent to further the collected wisdom of humanity.
4. You may not remove my name or my copyright notices from these documents.

---

## **Key Areas for Memorization**

[Notes on Earned Value](#)

[PMP Brain Dump](#)

[Wall Chart of the PMBOK Processes](#)

---

## **Descriptions of the Knowledge Areas**

[Cost Management](#)

[Human Resource Management](#)

[Integration Management](#)

[Communication Management](#)

[Time Management](#)

[Scope Management](#)

[Procurement Management](#)

[Quality Management](#)

[Risk Management](#)

---

## **Other useful references**

[Example PMP Hours Form](#)

[Scores on Practice Tests](#)

---

---

**EARNED VALUE study notes by RAFI PELTEKIAN and RAYMOND OKIMURA**

Earned Value (EV)	What is the estimated value of the work actually accomplished?	
Budget Cost of Work Performed (BCWP)		
Plan Value (PV)	What is the estimated value of the work planned to be done?	
Budget Cost of Work Scheduled (BCWS)		
Actual Cost (AC)	What is the actual cost incurred?	
Actual Cost of Work Performed (ACWP)		
1	<p><b>Schedule Variance (SV)</b> (NEGATIVE is behind schedule, POSITIVE is ahead of schedule)</p>	$SV = EV - PV$ $= BCWP - BCWS$
2	<p><b>Cost Variance (CV)</b> (NEGATIVE is over budget, POSITIVE is under budget)</p>	$CV = EV - AC$ $= BCWP - ACWP$
3	<p><b>Schedule Performance Index (SPI)</b></p>	$SPI = EV/PV$ $= BCWP/BCWS$
4	<p><b>Cost Performance Index (CPI)</b></p>	$CPI = EV/AC$ $= BCWP/ACWP$
5	<p><b>Estimate At Completion (EAC)</b> <b>Budget At Completion (BAC)</b></p>	$EAC = AC + (BAC - EV)$ $EAC = BAC/CPI$ $EAC = AC + ETC$ $EAC = AC + (BAC - EV)/CPI$
6	<p><b>Estimate To Complete (ETC)</b></p>	$ETC = EAC - AC$
7	<p><b>Variance At Completion (VAC)</b></p>	$VAC = BAC - EAC$
8	<p><b>Communication channels (paths)</b></p>	$N^2 - N/2$
9	<p><b>PV</b> - Present Value <b>FV</b> - Future Value <b>R</b> - interest rate <b>n</b> - number</p>	$PV = FV/(1+r)^n$
10	<p><b>Mathematical Analysis (PERT)</b> <b>T<sub>e</sub></b> - Expected Time <b>TO</b> - Optimistic <b>TM</b> - Most Likely <b>TP</b> - Pessimistic</p>	$T_e = (TO + 4TM + TP)/6$ <p style="text-align: right;">Or</p> $(P + 4M + O)/6$
11	<p><b>Standard Deviation (PERT)</b></p>	$(P - O)/6$
12	<p><b>Variance (PERT)</b></p>	$(P-O/6)^2$
13	<p><b>Procurement</b> <i>What is the final fee and price or profit?</i> Target Cost (TC) Target Fee (TF) Target Price (TP) Sharing Ratio (80/20 % or 70/30%) Actual Cost (AC) normally seller</p>	$TC - AC = \text{cost}_{\text{seller}}$ $(\text{cost}_{\text{seller}}) \text{ multiply } \% = X$ $TF + X = FEE$ $AC + FEE = \text{Final price}$

# PMP STUDY NOTES by RAFI PELTEKIAN and RAYMOND OKIMURA

PDM	ADM
AON	AOA
F-S	F-S
F-F	
S-S	
S-F	
No Dummies	Dummies
	PERT-ok
	CPM-ok

PERT	CPM
Three Estimates	One Estimate
- Optimistic	
- Pesimistic	
- Most Likely	- Most Likely
Flexible w/COST	Flexible - Schedule
Control-Schedule	Control - COST
AOA	AOA
Dummies	Dummies

<b>+/- 1 sigma</b>	68.26%
<b>+/- 2 sigma</b>	95.46%
<b>+/- 3 sigma</b>	99.73%
<b>+/- 6 sigma</b>	99.99%

<b>Formal/Written</b>	complex prob-pp-contract-long dist
<b>Formal/Verbal</b>	presentation-speech
<b>Informal/Written</b>	memos-email-note
<b>Informal/Verbal</b>	meeting-conversation

Estimates	
Order of Magnitude	-25% + 75%
Budget Estimate	-10% + 25%
Definition Estimate	-5% + 10%

SLACK	
<b>Free</b>	w/o delaying early start date of sec
<b>Total</b>	w/o delaying project completion da
<b>Project</b>	w/o delaying customer project com

<b>Formal/written</b>	complex problem, proj plan, long di
<b>Formal/Verbal</b>	presentation, speech
<b>Informal/written</b>	memos, emails, notes
<b>Informal/verbal</b>	meeting, conversation

Seller RISK				
<b>LOW</b>				<b>HIGH</b>
<b>Buyer Risk</b>				
<b>HIGH</b>				<b>LOW</b>
Cost Plus Percentage	Cost Plus Fixed Fee	Cost Plus Incentive fee	Fixed Price Incentive	Firm Fixed Price
<b>CPPC</b>	<b>CPFF</b>	<b>CPIF</b>	<b>FPI</b>	<b>FFP</b>
supplier not motivated to control \$\$	helps keep suppliers cost inline	bonus	bonus	

## Time & Material

small \$\$ amount  
 priced per hour  
 buyer medium amount of cost risk (small \$\$ amount & short length)  
 buyer wants more control  
 scope is not known or incomplete  
 short term service  
 used in emergency

Sources of Conflict	
1	Schedule
2	Project Priorities
3	Resources
4	Tech Options

Conflict Resoution Techniques	
1	Problem Solving (confronting)
2	Compromise
3	Withdrawal (avoidence)
4	Smoothing
5	Forcing

90%	PM's time communicating
55%	Non-verbal

Parametric Estimates
1. Regression Analysis
2. Learning Curve

Depreciation
1. Straight Line
2. Acceleration
a. Double declining Balance
b. Sum of years digit

# COST MANAGEMENT notes by RAFI PELTEKIAN and RAYMOND OKIMURA

- Project is completed within the approved budget
- PRIMARY concerned with the cost of the resources needed to complete project activities
- Life cycle costing together with value engineering are used to reduce cost and time, improve quality and performance, and optimize the decision-making
- Consider the information needs of the project stakeholders
- When used as a component of a reward/recognition system, controllable and uncontrollable costs should be estimated and budgeted separately to ensure that rewards reflect actual performance
- Ability to influence cost is greatest at the early stages of the project – Scope definition is critical (as well as requirement identification and execution)

## RESOURCE PLANNING

- Determines WHAT physical resources and WHAT quantities of each should be used and WHEN they would be needed to perform project activities.
  - Closely coordinated with cost estimating
1. **Inputs**
    - a. **WBS** ←
      - i. Identifies project deliverables and processes that will need resources
      - ii. PRIMARY INPUT to Resource planning
    - b. **Historical information**
    - c. **Scope statement**
      - i. Contains project justification and objectives
    - d. **Resource pool description**
    - e. **Organizational policies**
    - f. **Activity duration estimates**
  2. **Tools & Techniques**
    - a. **Expert judgment** ←
      - i. Other units within the organization
      - ii. Consultants
      - iii. Professional & technical associations
      - iv. Industry groups
    - b. **Alternatives identification**
    - c. **Project mgmt software**
  3. **Output**
    - a. **Resource Requirements** ←
      - i. Is a description of WHAT types of resources are required and in WHAT quantities for each element at the lowest level of the WBS
-

## COST ESTIMATING

- Developing an approximation of the costs of the resources needed to complete project activities.
- Estimator considers the causes of variation of the final estimate for purposes of better managing the project
- Involves developing an assessment of the likely quantitative results (Pricing is a business decision)
- Includes identifying and considering various costing alternatives

### 1. Inputs

#### a. WBS ←

- i. Used to organize the cost estimates and ensure all identified work has been estimated

#### b. Resources requirements

#### c. Resources rates

#### d. Activity duration estimates

#### e. Estimating publications

#### f. Historical information ←

- i. Project files – previous project results
- ii. Commercial cost-estimating databases –
- iii. Project team knowledge

#### g. Chart of accounts

#### h. Risks ←

### 2. Tools & Techniques

#### a. Analogous estimating ←

- i. Top-down estimating – using the actual cost of a previous, similar project
- ii. Frequently used to estimate total project cost
- iii. Form of expert judgment
- iv. Generally less accurate
- v. Most accurate when:
  1. The previous projects are similar
  2. The individuals preparing the estimates have the needed expertise

#### b. Parametric modeling ←

- i. Using project characteristics (parameters) in a *mathematical model* to predict project costs
- ii. Reliable when
  1. Historical information was accurate
  2. Readily quantifiable
  3. Scalable

#### c. Bottom-up estimating ←

- i. Estimating the cost of individual activities or work packages, rolling up the individual estimates to get a project total
- ii. Cost and accuracy of this method depends on the level of detail (smaller activities)

#### d. Computerized tools

#### e. Other cost estimates methods

### 3. Outputs

#### a. Cost estimates ←

- i. Quantitative assessments of likely costs of the resources required to complete the project
- ii. Expressed in units of currency

#### b. Supporting details ←

- i. Description of the scope of work estimated
- ii. Documentation of the basis for the estimate
- iii. Documentation of any assumptions made
- iv. An indication of the range of possible results

#### c. Cost Management Plan ←

- i. Describes HOW cost variances will be managed
-

## **COST BUDGETING**

- Allocating overall cost estimates to individual activities or work packages to establish a COST BASELINE for measuring project performance.
    1. **Inputs**
      - a. **Cost estimates**
      - b. **WBS** ←
        - i. Identifies the project elements to which costs will be allocated
      - c. **Project schedule**
        - i. Is needed to assign costs to the time period when the cost will be incurred
      - d. **Risk management plan**
    2. **Tools & Techniques**
      - a. **Cost budgeting tools & techniques**
    3. **Outputs**
      - a. **Cost Baseline** ←
        - i. Is a time-phased budget that will be used to measure and monitor cost performance on the project
        - ii. Usually displayed in the form of an “S” curve
-

## **COST CONTROL**

- MONITOR cost performance to detect & understand variances
  - Ensure all appropriate changes are RECORDED accurately in the cost baseline
  - PREVENTING incorrect, inappropriate, or unauthorized changes from being included in the cost baseline
  - INFORMING appropriate stakeholders of authorized changes
  - Acting to BRING expected costs within acceptable limits
  - Includes searching out the “whys” of both positive and negative variances
1. Inputs
    - a. **Cost baseline** ←
    - b. **Performance reports**
      - i. Provide information on project scope and cost performance ←
    - c. **Change request**
    - d. **Cost management plan**
  2. Tools & Techniques
    - a. **Cost Change Control System** ←
      - i. Defines the procedures by which the cost baseline may be changed
    - b. **Performance measurement**
      - i. Helps assess the magnitude of any variances that do occur
    - c. **Earned value management (EVM)** ←
      - i. Planned value (PV) – the physical work scheduled to be performed, including the estimated value of this work
      - ii. Earned value (EV) – physical work actually accomplished, including the estimated value of this work
      - iii. Actual costs (AC) – actual costs incurred to accomplish the Earned Value
      - iii. Scheduled Variance (SV) = EV – PV
      - iv. Cost Variance (CV) = EV - AC
    - d. **Additional planning**
    - e. **Computerized tools**
  3. Outputs
    - a. **Revised cost estimates** ←
      - i. Modifications to the cost information used to manage the project
      - ii. Appropriate stakeholders Must be notified as needed
    - b. **Budget updates** ←
      - i. Changes to the approved cost baseline
      - ii. Revised only in response to scope changes
      - iii. Cost variances may be severe that rebaselining is needed to provide realistic measure of performance
    - c. **Corrective action**
    - d. **Estimates at completion** ←
      - i. Forecast of most likely total project costs based on project performance and risk quantification.
      - ii. Estimate at Completion (EAC) = Actuals to date plus new estimate (used when past performance shows original est. flawed)  
**EAC = AC + ETC**
      - iii. EAC= Actuals to date plus remaining budget (used when current variances seen as atypical and will not occur in the future)  
**EAC = AC + BAC - EV**
      - iv. EAC+ Actuals to date plus the remaining project budget (used current variances are seen typically future variances)  
**EAC = (AC + (BAC – EV)/CPI)**
    - e. **Project closeout** ←
    - f. **Lessons learned**
      - i. Documented to become part of historical database

# HUMAN RESOURCES MANAGEMENT notes by RAFI PELTEKIAN and RAYMOND OKIMURA

- Process required making the MOST effective use of the people involved with the project
- Must be sensitive as to how this knowledge is applied:
  - Temporary nature of projects means the personnel & organizational relationships will be both temporary and new
  - Nature & number of project stakeholders will often change as the project moves from phase to phase of its life cycle
  - Human resources, though not seldom a direct responsibility of the project mgmt team, team must be sufficiently aware of administrative requirements to ensure compliance

## ORGANIZATIONAL PLANNING

- Involves:
  - a. Identifying
  - b. Documenting
  - c. Assigning project roles, responsibilities
  - d. Reporting relationships
- Majority of organizational planning is done as part of the earliest project phases
- Tightly linked with communications planning
  1. **Inputs**
    - a. **Project Interfaces** ←
      - i. Organizational interface - Reporting relationships among different organizational units
      - ii. Technical Interface - Reporting relationships among different technical disciplines
      - iii. Interpersonal Interface - Reporting relationships among different individuals
    - b. **Staffing requirements** ←
      - i. Defines WHAT KIND of competencies are required from WHAT KIND of individuals or groups and WHAT time frames
    - c. **Constraints** ←
      - i. Organizational structure of the performing organization (matrix)
      - ii. Collection bargaining agreements (union)
      - iii. Preferences of the project management team
      - iv. Expected staff assignments
        1. HOW the project is organized is often influenced by the competencies of the specific individual
  2. **Tools & Techniques**
    - a. **Templates**
    - b. **Human resources practice**
    - c. **Organizational theory**
    - d. **Stakeholder analysis**
  3. **Output**
    - a. **Roles and responsibility assignments** ←
      - i. Project roles (who does what) and responsibilities (who decides what) must be assigned
      - ii. Closely linked to the project scope definition
      - iii. Responsibility Assignment Matrix (RAM)
    - b. **Staffing Management Plan** ←
      - i. Describes WHEN and HOW human resources will be brought onto and taken off of the project team
      - ii. Often include resource histograms
      - iii. Attention to how project team members will be released when they are no longer needed on the project
      - iv. Appropriate reassignment procedures may:
        1. Reduce costs by reducing the tendency to “make work” fill the time between assignments
        2. Improve morale by reducing uncertainty about future employment possibilities
    - c. **Organization chart** ←
      - i. Any graphic display of project reporting relationships
      - ii. Organizational Breakdown Structure (OBS) - shows which organization units are responsible for which work packages
    - d. **Supporting detail**
      - i. Organizational impact
      - ii. Job descriptions
      - iii. Training needs

## STAFF ACQUISITION

- Getting the needed human resources assigned to and working on the project

### 1. Inputs

#### a. Staffing management Plan

#### b. Staffing pool description

- i. Characteristics of the potential staff:
  1. Previous experience
  2. Personal interest
  3. Personal characteristics
  4. Availability
  5. Competencies

#### c. Recruitment practices

### 2. Tools & Techniques

#### a. Negotiations ←

- i. Project mgmt team may need to negotiate:
  1. Responsible functional managers
  2. Other project mgmt teams with the performing organization to assign scarce or specialized resources

#### b. Pre-assignment ←

- i. Project is a result of a competitive proposal and specific staff was promised
- ii. Project is an internal service project and staff assignments were defined with the project charter

#### c. Procurement

### 3. Outputs

#### a. Project staff assigned ←

#### b. Project team directory ←

---

## TEAM DEVELOPMENT

- Enhancing the ability of stakeholders to contribute as individuals as well as enhancing the ability of the team to function as a team
- Individual development (managerial & technical) is the foundation necessary to develop the team
- Development as a team is CRITICAL to the project's ability to meet its objective
- Team development is often complicated when individual team members are accountable to both functional and project managers
- Effective mgmt of this dual reporting relationship is often a critical success factor for the project and the responsibility of the project manager

### 1. Inputs

- Project staff**
  - Define the individual /team competencies
- Project plan**
  - Describes the technical context within which the team operates
- Staffing mgmt plan**
- Performance reports**
- External feedback**

### 2. Tool & techniques

- Team-building activities** ←
  - Include mgmt and individual actions taken specifically and PRIMARY to improve TEAM PERFORMANCE
  - Enhance team performance as a secondary effect:
    - Involving non-management-level team members in the planning process
    - Establishing ground rules for surfacing and dealing with conflict
- General mgmt skills**
- Reward and recognition systems** ←
  - FORMAL mgmt actions that promote or reinforce desired behavior
  - To be effective, MUST make the link between project performance and reward clear, explicit, and achievable
- Collocation** ←
  - Involves placing all, or almost ALL, of the most active project team members in the same physical location to enhance their ability to perform as a team.
- Training** ←
  - Designed to enhance the competencies of the project team
  - Direct and indirect costs for training are generally paid by the performing organization

### 3. Outputs

- Performance improvements** ←
    - Improvement in individual skills
    - Improvement in team behaviors
    - Improvement in either individual or team competencies
  - Input to performance appraisals**
- 
-

# INTEGRATION MANAGEMENT notes by RAFI PELTEKIAN and RAYMOND OKIMURA

Processes required ensuring that the various elements of the project are properly coordinated

## PROJECT PLAN DEVELOPMENT

- Uses the outputs of the other planning processes including strategic planning, to create a consistent, coherent document that can be used to guide project execution and project control.
- All defined work must be planned, estimated & scheduled, and authorized with the use of detailed integrated mgmt control plan *sometimes called Control Account Plans or CAPs*
- The sum of all the integrated mgmt control plans will constitute the total project scope

### 1. Inputs

- Other planning outputs**
- Historical information** ←
- Organizational policies** ←
  - Quality management* – Process audits, continuous improvement targets
  - Personnel administration* – hire/fire guidelines & performance reviews
  - Financial controls* – time reporting, required expenditures & disbursements
- Constraints**
  - An applicable restriction that will affect the performance of the project
- Assumptions**
  - Factors considered to be true, real, or certain
  - Part of the *progressive elaboration* of the project

### 2. Tools & Techniques

- Project planning methodology** ←
  - Structured approach used to guide the project team during development of the project plan
- Stakeholder skills & knowledge** ←
  - Every stakeholder has skills and knowledge that may be useful
  - Create environment in which the stakeholder can contribute
- Project management information system (PMIS)** ←
  - Used to gather, integrate, & disseminate the outputs of project mgmt processes
- Earned value management (EVM)** ←
  - Used to integrate the project's scope, schedule, and resources
  - Measure project performance from initiation to closeout

### 3. Outputs

- Project Plan** ←←
  - Is a *formal, approved document* used to manage project execution
  - Is a document that should be expected to change over time as more information becomes available
  - Used to:
    - Guide project execution
    - Document Project planning assumptions
    - Document project planning decisions
    - Facilitate communications
    - Define key management reviews
    - Provide baseline for progress measurement & project control
  - Includes the following:
    - Project Charter
    - Project mgmt approach
    - Scope statement
    - WBS to the level at which control will be exercised
    - Cost estimates
    - Performance measurement baselines
    - Major milestones and target dates
    - Key or required staff
    - Risk management plan
    - Subsidiary management plans open issues and pending decisions
      - Description of the project mgmt approach or strategy is a summary of these individual mgmt plans.
- Supporting details**

## PROJECT PLAN EXECUTION

- Is the PRIMARY process for carrying out the project plan
- Vast majority of the project budget will be expended
- Project manager & project mgmt team must coordinate & direct the various technical & organizational interfaces that exist in the project.
- Performance against the project baseline must be continuously monitored so that corrective actions can be taken based on actual performance against the project plan

### 1. Inputs

#### a. **Project Plan** ←

- i. The subsidiary mgmt plans and the performance measurement baselines are KEY inputs to project plan execution

#### b. **Supporting details**

#### c. **Organizational policies**

#### d. **Prevention action**

- i. Is anything that reduces the probability of potential consequences of project risks

#### e. **Corrective action**

- i. Is anything done to bring expected future project performance in line with the project plan

### 2. Tools & Techniques

#### a. **General management skills**

#### b. **Product skills & knowledge**

#### c. **Work authorization system** ←

- i. FORMAL procedure for sanctioning work to ensure that work is done at the right time and in the proper sequence
- ii. The PRIMARY MECHANISM is a written authorization to begin work on a specific activity or work pkg.

#### d. **Status review meetings** ←

- i. Regular scheduled meetings held to exchange information about the project

#### e. **Project management information system (PMIS)**

#### f. **Organizational procedures**

### 3. Outputs

#### a. **Work results** ←

- i. Are outcome of the activities performed to accomplish the project
- ii. Is collected as part of project plan execution and fed into the performance reporting process

#### b. **Change Requests** ←

---

## **INTEGRATED CHANGE CONTROL**

- The original defined project scope and the integrated performance baseline must be maintained by continuously managing changes to the baseline, either by rejecting new changes or by approving changes and incorporating them into a revised project baseline.
- Integrated change control required:
  - a. Maintaining the integrity of the performance measurement baselines
  - b. Ensuring that changes to the product scope are reflected in the definition project scope
  - c. Coordinating changes across knowledge areas

### **1. Inputs**

- a. **Project plan** ←
  - i. Provides BASELINE against which changes will be controlled
- b. **Performance reports**
  - i. Provide information on project performance
- c. **Change request**
  - i. Oral or written
  - ii. Direct or indirect
  - iii. Externally or internally initiated
  - iv. Legally or optional

### **2. Tools & Techniques**

- a. **Change Control System** ←
  - i. Is a *formal, documented* procedure that defines:
    1. HOW project performance will be monitored and evaluated
    2. Steps by which official documents may be changed
  - ii. Include a group responsible for approving or rejecting changes
  - iii. Must also include procedures to handle changes that may be approved without prior review (emergencies)
- b. **Configuration management** ←
  - i. Is any documented procedure used to apply technical and administrative direction and surveillance to:
    1. Identify & doc functional & physical characteristics of an item or system
    2. Control any changes
    3. Record and report the changes and its implementation status
    4. Audit to verify conformance to requirements
- c. **Performance measurement**
  - i. Help to assess whether variances from the plan require corrective action
- d. **Additional planning**
- e. **Project management information systems (PMIS)**

### **3. Outputs**

- a. **Project plan updates** ←
  - b. **Corrective action**
  - c. **Lessons learned**
    - i. Should be documented so that they become part of historical database for this project and other projects
    - ii. The database is also the basis for knowledge management
    - iii. Project Manager & Team CREATE
    - iv. Stakeholders INVOLVE
- 
-

# COMMUNICATION MANAGEMENT notes by RAFI PELTEKIAN and RAYMOND OKIMURA

Processes required ensuring timely and appropriate generation, collection, dissemination, storage, and ultimately disposition of project information.

## COMMUNICATIONS PLANNING

- Majority of communication planning done part of earliest project phases
- Communication planning is often tightly linked w/organization planning

### 1. Inputs

#### a. Communication Requirements

- i. Sum of the information requirements of the project stakeholders
- ii. Defined by combining the type and format of information required with an analysis of the value of that information
- iii. Information required to determine project communications requirements include:
  - Project org & stakeholders responsibility relationships
  - Disciplines, departments, & specialties
  - Logistics of how many individuals
  - External information needs

#### b. Communication Technology

- i. Immediacy of the need of information
- ii. Availability of technology
- iii. Expected project staffing
- iv. Length of the project

#### c. Constraints

#### d. Assumptions

### 2. Tools & Techniques

#### a. Stakeholder Analysis

- i. Should consider methods and technologies suited to the project that will provide the information needed

### 3. Outputs

#### a. Communication Plan

- i. WHAT methods will be used to gather and store information
  - ii. WHOM information will flow to
  - iii. WHAT methods will be used to distribute
  - iv. Description of information
  - v. Methods for ACCESSING information between schedule communications
-

## **INFORMATION DISTRIBUTION**

- Making needed information AVAILABLE to project stakeholders in a timely manner
    1. **Inputs**
      - a. **Work results**
      - b. **Communication management plan**
      - c. **Project plan**
    2. **Tools & Techniques**
      - a. **Communication skills**
        - i. Used to exchange information
        - ii. Sender responsible for making info clear, unambiguous, & complete
        - iii. Receiver responsible for making info received entirely and understood correctly
        - iv. Written & oral; listening & speaking
        - v. Internal & external
        - vi. Formal & informal
        - vii. Vertical & horizontal
      - b. **Information retrieval system**
        - i. Manual filing system
        - ii. Electronic databases
        - iii. Project mgmt software
        - iv. System that allow technical documents
      - c. **Information distribution methods**
        - i. Project meeting
        - ii. Hard-copy document distribution
        - iii. Shared access network electronic databases
        - iv. Fax
        - v. E-mail
        - vi. Voice mail
        - vii. Project intranet
    3. **Outputs**
      - a. **Project records**
        - i. Correspondence
        - ii. Memos
        - iii. Documents describing the project
      - b. **Project reports**
        - i. Formal project reports status/issues
      - c. **Project presentation**
-

## PERFORMANCE REPORTING

- Collecting & disseminating PERFORMANCE information to provide stakeholders with information HOW resources are being USED to achieve project objectives.
- Provide info on scope, schedule, cost, and quality
- Status Reports: WHERE the project stands NOW
- Progress Reporting: WHAT the project team accomplished
- Forecasting: Predicting future project status and progress

### 1. Inputs

#### a. Project Plan

- i. Contains the various BASELINES used to assess project performance

#### b. Work results

- i. Reported within the framework provided by communication mgmt plan
- ii. Accurate and uniform information on work results is essential

#### c. Other project records

### 2. Tools and Techniques

#### a. Performance reviews

- i. Meetings held to assess project status and/or progress

#### b. Variance analysis

- i. Comparing actual project results to planned or expected
- ii. Cost and schedule variances are the MOST frequently analyzed, but variances from plan in the areas of scope, resource, quality, and risk are often of equal or GREATER importance

#### c. Trend analysis

- i. Examining project results over time to determine if performance is improving or deteriorating

#### d. Earned value analysis

- i. MOST COMMON used method of performance measurement
- ii. PV: approved cost estimate planned to be spent on the activity during a given time. Used for performance measurement baseline
- iii. AC: actual cost of work performed
- iv. EV: value of work actually completed

#### e. Information distribution tools & techniques

### 3. Outputs

#### a. Performance reports

- i. Organize and summarize the information gathered and present the results of any analysis
- ii. Common formats:
  1. Bar charts (Gantt)
  2. S-curves
  3. Histograms
  4. Tables

#### b. Change requests

---

## **ADMINISTRATIVE CLOSURE**

- Documenting project results to formalize acceptance of the product by the sponsor or customer
  - Includes:
    1. Collecting project records
    2. Ensuring that they reflect final specifications
    3. Analyzing project success
    4. Effectiveness
    5. Lessons learned
  - Should NOT be delayed until project completion
  - Each phase of the project should be properly closed to ensure that important and useful information is NOT lost
  - Employee skills in the staff pool database should be updated to reflect new skills and proficiency increases.
    1. **Inputs**
      - a. **Performance measurement documentation**
        - i. ALL documentation produced to record and analyze project performance, including the planning documents that established the framework for performance measurement, MUST be available for review
      - b. **Product documentation**
        - i. Documents produced to describe the product of the project MUST also be available for review
      - c. **Other project records**
    2. **Tools & Techniques**
      - a. **Performance reporting tools and techniques**
      - b. **Project reports**
      - c. **Project presentation**
    3. **Outputs**
      - a. **Project achieves**
        - i. Complete set of indexed project records should be prepared for archiving by the appropriate parties
        - ii. Any project-specific or program wide historical databases pertinent to the project should be updated
      - b. **Project closure**
        - i. Confirmation the project has met ALL customer requirements for the product of the project (the customer has FORMALLY ACCEPTED the project results and deliverables and requirements of the delivering organizations)
      - c. **Lessons learned**
- 
-

# TIME MANAGEMENT notes by RAFI PELTEKIAN and RAYMOND OKIMURA

Processes required ensuring timely completion of the project

## ACTIVITY DEFINITION

- Involves identifying and documenting the specific activities that must be performed to produce the deliverables and sub deliverables identified in the Work Breakdown Structure (WBS)
1. **Inputs**
    - a. **WBS** ←
      - i. Primary input to activity definition
    - b. **Scope statement**
    - c. **Historical information**
    - d. **Constraints**
    - e. **Assumptions**
    - f. **Expert judgment**
  2. **Tools and Techniques**
    - a. **Decomposition** ←
      - i. Involves subdividing project work packages into smaller, more manageable components to provide better mgmt control
      - ii. Final outputs here are described as ACTIVITIES
      - iii. The WBS and activity list are usually developed sequentially, with the WBS being the basis for development of the final activity list
    - b. **Templates** ←
  3. **Outputs**
    - a. **Activity List** ← ←
      - i. Must include all activities that will be performed on the project
      - ii. Organized as an extension to the WBS to help ensure that it is complete
      - iii. Does not include any activities that are NOT required as part of the project scope
    - b. **Supporting detail**
    - c. **WBS updates** ←
      - i. Refinements
        1. Most likely when the project involves new or unproven technology

## ACTIVITY SEQUENCING

- Identifying and documenting interactivity logical relationships
- Must be sequenced accurately to support later development of a realistic and achievable schedule

### 1. Inputs

- Activity list**
- Product description**
- Mandatory dependencies** ←
  - Inherent in the nature of the work being done
  - Involve physical limitations
  - Also called hard logic
- Discretionary dependencies** ←
  - Defined by the project mgmt team
  - “Best practices”
  - Specific sequence is “desired”, even though there are other acceptable sequences
- External dependencies** ←
  - Involve a relationship between project activities and non-project activities
- Milestones**

### 2. Tools & Techniques

- Precedence diagramming method (PDM)** ←
  - Uses boxes (nodes) to represent the activities and connects them with arrows to show dependencies
  - Activity-on-node (AON)
  - FOUR types of dependencies.
- Arrow diagramming method (ADM)** ←
  - Uses arrows to represent the activities and connects them at nodes to show their dependencies.
  - Activity-on-arrow (AOA)
  - Use only finish-to-start
  - May require the use of dummy activities
- Conditional diagramming method** ←
  - Graphical Evaluation and Review Technique (GERT)
    - Allows LOOPS
    - Neither PDM nor ADM allow loops or conditional branches
- Network templates** ←
  - Subnets or fragnets
    - When projects includes several identical or near identical features

### 3. Outputs

- Project network diagrams** ←←
    - Schematic displays of the project activities and the logical relationships (DEPENDENCIES) among them
    - Often referred to as a PERT chart
  - Activates list updates**
-

## ACTIVITY DURATION ESTIMATING

- Process of taking information on project scope and resources and then developing durations for input to schedules
- Inputs for the estimates of duration typically originate from the person or group on the project team who is MOST FAMILIAR with the nature of the specific activity...should make, or at least approve the estimate
- Progressively elaborated

### 1. Inputs

- Activity list**
- Constraints**
- Assumptions**
- Resource requirements**
  - Additional resources are added, projects can experience communication overload, which reduces productivity
- Resource capabilities**
  - Influenced by the capabilities of the human and material resources assigned to them
- Historical information**
  - Project files
  - Commercial duration estimates databases
  - Project team knowledge
- Identified risks** ←

### 2. Tools & Techniques

- Expert judgment**
  - Used whenever possible if guided by historic information
- Analogous estimating** ←
  - Top-down**
  - Using the actual duration of a previous, similar activity as the basis for estimating the duration of a future activity
  - Used when there is a limited amount of detailed information about the project
  - Form of expert judgment
    - Most reliable:
      - When the previous activities are similar in fact and not just in appearance
      - When the individuals preparing the estimates have the needed expertise
- Quantitatively based durations**
  - Quantities to be performed for each specific work category defined by the engineering/design effort, when multiplied by the productivity unit rate
- Reserve time (contingency)**
  - Incorporate additional time frame called reserve, contingency, or buffer

### 3. Output

- Activity duration estimates** ←
    - Quantitative assessments of the likely number of work periods that will be required to complete an activity
    - Should always include some indication of the range of possible results
  - Basis of estimates**
  - Activity updates**
-

## SCHEDULE DEVELOPMENT

- Determining start and finish dates for project activities

### 1. Inputs

- a. **Project network diagrams**
- b. **Activity duration estimates**
- c. **Resource requirements**
- d. **Resource pool description**
  - i. Knowledge of WHAT resources will be available at WHAT times and in WHAT patterns
- e. **Calendars** ←
  - i. Project and resource calendars identify periods when work is allowed
  - ii. Project calendars affect ALL resources
  - iii. Resource calendars affect specific resource or category of resources
- f. **Constraints** ←
  - i. Limit team's options
  - ii. Two categories:
    1. Imposed dates
      - a. Used to restrict the start or finish to occur either no earlier than a specific date or no later than a specific date
      - b. Typical uses of date constraints:
        - i. Market window on tech project
        - ii. Weather restrictions on outdoor activities
        - iii. Government-mandated compliance with environment remediation
        - iv. Delivery of material from parties not represented in the project schedule
    2. Key events or major milestones
      - a. Completion of certain deliverables by a specific date may be REQUESTED by the project sponsor, the project customer, or stakeholder
- g. **Assumptions**
- h. **Lead & lags** ←
- i. **Risk mgmt plan** ←
- j. **Activity attributes** ←
  - i. Including responsibility, geographic or building, and activity type are very important for further selection and sorting of the planned activities in a convenient way for the users
  - ii. WBS classification is also an important attribute that allows useful activity ordering and sorting

### 2. Tools & Techniques

- a. **Mathematical analysis** ←
  - i. Calculating theoretical early and late start finish dates for all project activities without regard for any resource pool limitations
  - ii. Critical Path Method (CPM)
    1. Single, deterministic early and late start and finish date for each activity based on specific, sequential network logic and single duration estimates
    2. Calculating float to determine which activities has the least scheduling flexibility
  - iii. Graphic Evaluation and Review Technique (GERT)
    1. Allows probabilistic treatment of both network logic and activity duration estimates
  - iv. Program Evaluation and Review Techniques (PERT)
    1. Uses weighted average duration estimates to calculate activity durations
    2. Uses the distribution's mean (expected value) instead of the most likely estimate originally used in CPM
- b. **Duration compression** ←
  - i. Ways to shorten the project schedule without changing the project scope
  - ii. Crashing
    1. Obtain the greatest amount of compression for the least incremental cost
    2. Often results in increase cost
  - iii. Fast track
    1. Doing activities in parallel that normally done in sequence
    2. Often results in rework
    3. Usually increase risk
- c. **Simulation** ←
  - i. Calculating multiple project durations with different sets of activity assumptions
  - ii. MOST common technique is Monte Carlo Analysis
  - iii. In which distribution of probable results is defined for each activity and used to calculate a distribution of probable results for the total project

**d. Resource leveling heuristics** ←

- i. *Mathematical analysis* often produces a preliminary early-start schedule that required more resources during certain time periods that are available
- ii. Allocate scarce resources to critical path activities first
- iii. Often results in a project duration that is longer than the preliminary schedule
- iv. Resource-based method
  1. Resource leveling often results in a project duration that is longer than the preliminary schedule
- v. Ways to bring back schedule:
  1. Resource reallocation from non-critical to critical activities
  2. Productivity increases based on the use of different technologies and/or machinery
  3. Fast tracking
- vi. Reserve resource allocation:
  1. Project with finite and critical project resources, requiring that this resource be scheduled in reverse for the project ending date
- vii. Critical chain
  1. Technique that modifies that project schedule to account for limited resources

**e. Project mgmt software**

**f. Coding structure**

- i. Allows sorting and/or extractions based on different attributes assigned to the activities

**3. Outputs**

**a. Project schedule** ←

- i. Includes at least planned start and expected finish dates for each activity
- ii. Project network diagrams with date information added
- iii. Bar charts (GANTT)
- iv. Milestones charts

**b. Supporting detail**

- i. Includes at least documentation of all identified assumptions and constraints
- ii. Information supplied as supporting detail includes:
  1. Resource requirements by time period, often in the form of a resource histogram
  2. Alternative schedules

**c. Schedule mgmt plan** ←

- i. Defines HOW changes to the schedule will be managed

**d. Resource requirements updates**

---

## **SCHEDULE CONTROL**

### **1. Inputs**

- a. **Project Schedule** ←
  - i. Schedule baseline
  - ii. Basis for measuring and reporting schedule performance
- b. **Performance reports**
  - i. Provide information on schedule performance
- c. **Change requests**
- d. **Schedule mgmt plan**

### **2. Tools & techniques**

- a. **Schedule change control system** ←
  - i. Defines PROCEDURES by which the project schedule may be changed
  - ii. Includes paper-work, tracking systems, and approval levels necessary for authorizing changes
- b. **Performance measurement**
  - i. Help assess the magnitude of any variations that do occur
  - ii. To decide IF the schedule variation requires corrective action
- c. **Additional planning**
- d. **Project mgmt software**
- e. **Variance analysis** ←
  - i. Performance of the variance analysis during the schedule-monitoring process is a key element for time control
  - ii. Comparing target dates with actual/forecast start and finish dates provides useful info for the detection of deviations and for the implementation of corrective solutions
  - iii. Float variance
    - 1. Essential planning component to evaluate project time-performance

### **3. Outputs**

- a. **Schedule updates** ←
    - i. Any modification to the schedule information that is used to manage the project
    - ii. Appropriate stakeholders must be notified as needed
    - iii. Revisions
    - iv. Changes to the schedule start and finish dates in the approved project schedule.
    - v. In response to scope changes or changes to estimates
    - vi. Rebaselining
      - 1. To provide realistic data to measure performance
      - 2. Care must be taking, as historical data will be lost for the project schedule
      - 3. Last resort in controlling the schedule
      - 4. New target schedules should be the normal mode of schedule revisions
  - b. **Corrective action**
    - i. Anything done to bring expected future schedule performance in line with the project plan
    - ii. In the area of time mgmt, often involves expediting
    - iii. Required root-cause analysis to identify the cause of the variation, and schedule recovery can be planned
  - c. **Lessons learned**
- 
-

# SCOPE MANAGEMENT notes by RAFI PELTEKIAN and RAYMOND OKIMURA

- Processes required to ensure that the project includes ALL the work required and ONLY the work required, to complete the project successfully
- Completion of the project scope is measured against the project plan, but completion of the product scope is measured against the product requirement

## INITIATION

- Is the process of formally authorizing a new project or that an existing project should continue into the next phase.
- Projects are typically authorized:
  - a. Market demand
  - b. Business need
  - c. Customer request
  - d. Technological advance
  - e. Legal requirement
  - f. Social need

### 1. Inputs

#### a. Product description

- i. Documents the characteristics of the product or services that the project was undertaken to create
- ii. Document the relationship between the product or service being created and the business need

#### b. Strategic plan ←

#### c. Project selection criteria

- i. Defined in terms of merits of the product of the project and can cover the full range of possible mgmt concerns

#### d. Historical information

### 2. Tools & Techniques

#### a. Project selection methods ←

- i. Measuring value or attractiveness to the project owner
- ii. Include considering the decision criterion and means to calculate value under uncertainty
- iii. Choosing alternative ways of doing the project
- iv. Decision models:
  1. Benefit measurement methods
    - a. Comparable approaches, scoring models, benefit contribution, or economic
  2. Constrained optimization methods
    - a. Mathematical models using linear, non-linear, dynamic, integer, and multi-objective programming algorithms

#### b. Expert judgment

### 3. Outputs

#### a. Project Charter ←←

- i. Is a document that formally authorizes a project
- ii. Includes:
  1. Product description
  2. Business need
- iii. Provides goals & objectives
- iv. Issued by a manager EXTERNAL to the project
- v. Gives PM authority to apply organizational resources to project activities
- vi. Formally recognizes existence of the project

#### b. Project manager identified/assigned ←←

- i. Assigned as early in the project as is feasible
- ii. PM assigned prior to the start of project plan execution and preferably before much project planning has been done

#### c. Constraints

#### d. Assumptions

---

## SCOPE PLANNING

- Is the process of progressively elaborating
  - Documenting the project work (project scope) that produces the product of the project
  - The scope statement forms the basis for an agreement the project and the project customer by IDENTIFYING BOTH the project objectives and the other project deliverables
1. **Inputs**
    - a. **Product description**
    - b. **Project charter**
    - c. Constraints
    - d. Assumptions
  2. **Tools & Techniques**
    - a. **Product analysis** ←
      - i. Developing a better understanding of the product
      - ii. Includes techniques: product breakdown analysis systems engineering, value engineering, value analysis, function analysis, and quality function deployment
    - b. **Benefit/cost analysis** ←
      - i. Estimating tangible and intangible costs and benefits of various project and product alternatives, and then using financial measures...
    - c. Alternatives identification
    - d. Expert judgment
  3. **Outputs**
    - a. **Scope Statement** ←
      - i. Provides a documented basis for making FUTURE project decisions
      - ii. Confirming or developing common understanding of project scope among the stakeholders
      - iii. Should include:
        1. Project justification
          - a. The business need
          - b. Basis for evaluating future tradeoffs
        2. Project's product
        3. Project deliverables
          - a. List of summary-level sub products whose full and satisfactory delivery marks completion of the project
        4. Project objectives
          - a. Quantifiable criteria that must be met for the project to be considered successful
          - b. Must include at least cost, schedule, and quality measures
          - c. Should have attribute, a metric, and absolute or relative value
    - b. Supporting detail
    - c. **Scope Management Plan** ←
      - i. HOW project scope will be MANAGED
      - ii. HOW scope CHANGES will be INTEGRATED into the project.
      - iii. Include an assessment of the expected stability of the project scope
      - iv. Clear description HOW scope changes will be identified and classified
-

## SCOPE DEFINITION

- Involves subdividing the major project deliverables into smaller, more manageable components to:
- Improve accuracy of cost, duration, and resource estimates
- Define clear baseline for performance measurement and control
- Facilitate clear responsibility assignments
- Critical to project success

### 1. Inputs

- a. **Scope statement**
- b. **Constraints**
- c. **Assumptions**
- d. **Other planning outputs**
- e. **Historical information**

### 2. Tools & Techniques

- a. **WBS templates** ←
  - i. A WBS from a previous project can often be used as a template for a new project
- b. **Decomposition** ←
  - i. Involves subdividing the major project deliverables or sub deliverables into smaller, more manageable components until the deliverables are defined in sufficient detail to support development of project activities
  - ii. Major Steps:
    1. Identify the major deliverables of the project
    2. Decide if adequate cost and duration estimates can be developed at this level for each deliverable
    3. Identify constituent components of the deliverables
    4. Verify the correctness of the decomposition

### 3. Outputs

- a. **Work breakdown structure** ←←←
    - i. Is a deliverable-oriented grouping of project components that organizes
    - ii. Defines the total scope of the project
    - iii. Work NOT in the WBS is outside of the scope of the project
    - iv. Develop or confirm a common understanding of project scope
    - v. Work packages
      1. Items at the lowest level of the WBS may be referred to as work packages
    - vi. WBS dictionary
      1. Work component descriptions collected in
      2. Includes:
        - a. Schedule dates
        - b. Cost budgets
        - c. Staff assignments
  - b. **Scope statement updates**
-

## SCOPE VERIFICATION

- Is process of obtaining formal acceptance of the project scope by the stakeholders
  - Required reviewing deliverables and work results to ensure that all were completed correctly and satisfactory
  - If project is terminated early, the scope verification process should establish and document the level and extent of completion
  - ACCEPTANCE of the work results (quality control is primary concern correctness of the work results)
1. **Inputs**
    - a. **Work results**
    - b. **Product documentation**
    - c. **WBS** ←
      - i. Used to verify work of the project
    - d. **Scope statement**
    - e. **Project plan**
  2. **Tools & Techniques**
    - a. **Inspection** ←
      - i. Includes activities:
        1. Measuring
        2. Examining
        3. Testing
      - ii. Also called:
        1. Reviews
        2. Product review
        3. Audits
        4. Walk-through
  3. **Outputs**
    - a. **Formal acceptance** ←
      - i. Documentations that the client or sponsor has ACCEPTED the product of the project phase or major deliverables must be prepared and distributed
-

# SCOPE CHANGE CONTROL

## 1. Inputs

- a. **WBS** ←
- b. **Performance reports**
  - i. Provide information on scope performance such as which interim deliverables have been completed and not
  - ii. Alert the project team to issues that may cause problems in the future
- c. **Change request** ←
  - i. Oral or written
  - ii. Direct or indirect
  - iii. External or internally
  - iv. Legally mandated or optional
  - v. Results of:
    - 1. External event
    - 2. Error or omission in defining the scope of the product
    - 3. Error or omission in defining the scope of the project
    - 4. Value-adding change
    - 5. Implementing a contingency plan or workaround plan to respond to risk
- d. **Scope management plan**

## 2. Tools & Techniques

- a. **Scope change control** ←
  - i. Defines PROCEDURES by which the project scope may be changed
- b. **Performance measurement**
  - i. Help assess the magnitude of any variations that do occur
- c. **Additional planning**

## 3. Outputs

- a. **Scope changes** ←
    - i. Any modifications to the agreed-upon project scope as defined by the approved WBS
    - ii. Fed back through the planning process, technical and planning documents are updated
    - iii. Stakeholders are notified as appropriate
  - b. **Corrective action**
  - c. **Lessons learned**
  - d. **Adjusted baseline**
- 
-

# PROCUREMENT MANAGEMENT notes by RAFI PELTEKIAN and RAYMOND OKIMURA

- Process required acquiring goods and services (product), to attain project scope, from OUTSIDE the performing organization
- Seller will typically manage its work as a project:
  - a. The buyer becomes the customer, and thus a key stakeholder for the seller
  - b. Seller's project mgmt team must be concerned with ALL the processes of project mgmt
  - c. Terms & conditions of the contract becomes a key INPUT to many of the seller's processes

## PROCUREMENT PLANNING

- Process of identifying which project needs can be BEST met by procuring products or services outside the project organization & should be accomplished DURING the scope definition effort
- When the project obtains products and services (project scope) from outside the performing organization, the processes from solicitation planning though contract closeout would be performed once for each product or service item
- When the project DOES NOT obtain products and services (project scope) from outside the performing organization, the processes from solicitation planning though contract closeout would NOT be performed once for each product or service item

### 1. Inputs

- a. **Scope statement**
  - i. Describes current project boundaries
  - ii. Provides important information about project needs and strategies
- b. **Product description**
  - i. Provides important info about any technical issues or concerns
  - ii. Broader than statement of work
  - iii. Describes the ultimate end product of the project
  - iv. Generally boarder than a statement of work
    1. Product description describes the ultimate end product of the project
    2. Statement of work describes the PORTION of that product to be provided by a seller to the project.
- c. **Procurement resources**
- d. **Market conditions**
- e. **Other planning outputs**
- f. **Constraints**
  - i. Factors that limits buyer's option
  - ii. Most common for many projects is funds availability
- g. **Assumption** (true, real, or certain)

### 2. Tools & Techniques

- a. **Make or buy analysis** ←
  - i. *General management technique*
  - ii. Part of initial scope definition process used to determine whether product can be produced cost effectively by the performing organization
  - iii. Include both indirect as well as direct costs
  - iv. MUST also reflect the perspective of the performing organization, as well as the immediate needs of the project
- b. **Expert judgment**
- c. **Contract type selection** ←
  - i. Fixed-price or lump-sum contract (*design*)
    1. Involves a fixed total price for a well-defined product
    2. May also include incentives for meeting/exceeding selected project objectives (schedule targets)
  - ii. Cost-reimbursable contracts (*performance*)
    1. Involves payment (reimbursement) to the seller for the actual costs, plus a fee representing seller profit
    2. Classified as **direct costs** – Incurred for the exclusive benefit of the project
    3. Classified as **indirect costs** (overhead) – Costs allocated to the project by the performing as a cost of doing business. Usually calculated as a percentage of direct costs
    4. Often include incentives for meeting or exceeding selected project objectives, such as schedule targets or total cost.
  - iii. Time & Material contracts
    1. **Hybrid of contractual arrangements containing both cost-reimbursable and fixed price-type**

### 3. Outputs

- a. **Procurement management plan** ←
  - i. Describe HOW the remaining procurement processes (from solicitation planning through contract closeout) will be managed
  - ii. What types of contracts will be used?
  - iii. Who will prepare them and when (independent estimates needed as evaluation criteria)
  - iv. What actions can the project department team take on its own
  - v. Where can they be found (if standardized procurement docs are needed)
  - vi. How will multiple providers be managed?
  - vii. How will procurement be coordinated with other projects aspects?
- b. **Statement(s) of work** ←
  - i. Sufficient detail to allow prospective sellers to determine if they are capable of providing the item
  - ii. May be revised and redefined as it moves through the procurement process
  - iii. Should be clear, as complete, as concise as possible

iv. Include description of any collateral services required (performance reporting or post-project ops support)

---

## SOLICITATION PLANNING

- Involves preparing the documents needed to support solicitation
    1. **Inputs**
      - a. **Procurement management plan**
      - b. **Statement of work**
      - c. **Other planning outputs**
    2. **Tools & Techniques**
      - a. **Standard forms**
      - b. **Expert judgment**
    3. **Outputs**
      - a. **Procurement documents** ←
        - i. Used to solicit proposals from prospective sellers
        - ii. Bid and quotations based on price
        - iii. Proposal used when other considerations, such as technical skills or tech approach are paramount
        - iv. Structured to facilitate accurate and complete responses from the perspective seller
        - v. Common names for different types of procurement documents:
          1. Invitation for Bid (IFB)
          2. Request for Proposal (RFP)
          3. Request for quotation (RFQ)
          4. Invitation for Negotiation
          5. Contract Initial Response
        - vi. Should always include:
          1. SOW
          2. Description of the desired form of the response
          3. Any required contractual provisions
      - b. **Evaluation criteria** ←
        - i. Used to rate or score proposals
        - ii. May be objective or subjective
        - iii. Included as part of the procurement documents
        - iv. Other selection criteria must be identified and documented to support an assessment:
          1. Understanding of need
          2. Overall or life-cycle cost
          3. Technical capability
          4. Management approach
          5. Financial capability
      - c. **Statement of work updates**
-

## **SOLICITATION**

- Obtaining responses (bids & proposals) from prospective sellers on HOW project needs can be met

### **1. Inputs**

#### **a. Procurement documents**

#### **b. Qualified seller list**

- i. Some organizations maintain lists or files with information on prospective sellers
- ii. General information is available through:
  1. Internet
  2. Library directories
  3. Relevant local associations
  4. Trade catalogs

### **2. Tools & Techniques**

#### **a. Bidder conferences** ← (contractor, vendor, and pre-bid conferences)

- i. Meetings with prospective sellers prior to preparation of a proposal
- ii. All will have clear, common understanding of the procurement

#### **b. Advertising** ←

- i. Existing list of potential sellers can be expanded by placing ads in general circulation
- ii. Government jurisdictions:
  1. Some require public advertising of certain type of procurement
  2. Most require public advertising of subcontractor on government contract.

### **3. Outputs**

#### **a. Proposals** ←

- i. Are seller-prepared documents that describe the seller's ability and willingness to provide the requested product
-

## SOURCE SELECTION

- Involves the receipt of bids or proposals and the application of the evaluation criteria to select a provider
- Price may be the primary determinant for an off-the-self item
- Proposal are often separated into technical (approach) and commercial (Price) sections for each evaluated separately
- Multiple sources may be required for critical products

### 1. Inputs

#### a. Proposals

#### b. Evaluation criteria

- May include samples of suppliers previously produce products/services
- Review supplier's history

#### c. Organizational policies

### 2. Tools & Techniques

#### a. Contract negotiation ←

- Involves clarification and mutual agreement on the structure and requirements of the contract prior to the signing of the contract
- Subjects covered:
  - Responsibilities and authorities
  - Applicable terms and law
  - Technical and business management approaches
  - Contract financing
  - Price
- For COMPLEX procurement items, contract negotiations may be an independent process with inputs and outputs of its own

#### b. Weighting system ←

- Method for quantifying qualitative data to minimize the effect of personal prejudice on source selection
- Most systems:
  - Assigning a numerical weight to each of the evaluation criteria
  - Rating the prospective sellers on each criteria
  - Multiplying the weight by the rating
  - Totaling the resultant products to compute an overall score

#### c. Screening system ←

- Establishing minimum requirements of performance for one or more of the evaluation criteria

#### d. Independent estimates ←

- Procuring organization may prepare its own independent estimates as a check on proposal pricing
- Often referred to as SHOULD COST estimates

### 3. Outputs

#### a. Contract ←←

- A mutual binding agreement that obligates the seller to provide the specific product and obligates the buyer to pay for it
  - A legal relationship subject to remedy in the courts
  - May be called:
    - Contract
    - Agreement
    - Subcontract
    - Purchase order
    - Memorandum of understanding
  - Subjected to more extensive approval process
  - Primary focus of the review and approval process: Ensure that the contract language describes a product or service that will satisfy the identified need
-

## CONTRACT ADMINISTRATION

- Ensuring that the seller's performance meets contractual requirements
  - The legal nature of the contractual relationship makes it imperative that the project team be acutely aware of the legal implications of actions taken when administrating the contract
  - Application of the appropriate project management processes to the contractual relationship(s) and integration of the outputs from these processes into the overall management of the project.
  - Project mgmt processes that must be applied:
    - a. Project plan execution
    - b. Performance reporting
    - c. Quality control
    - d. Change control
    - e. Also have a financial management components
1. **Inputs**
    - a. **Contracts**
    - b. **Work results**
    - c. **Change request**
    - d. **Seller invoices**
  2. **Tools & Techniques**
    - a. **Contract change control system** ←
      - i. Defines the process by which the contract may be modified
    - b. **Performance reporting** ←
      - i. Provides mgmt with information about how effectively the seller is achieving the contractual objectives
    - c. **Payment system** ←
      - i. Usually handled by the accounts payable system of the performing organization.
  3. **Outputs**
    - a. **Correspondence** ←
    - b. **Contract changes** ←
    - c. **Payment request** ←
-

## CONTRACT CLOSEOUT

- Similar to administrative closure in that it involves both product verification and administrative closeout
- Early termination of a contract is a special case of contract closeout
- The contract terms and conditions may prescribe specific procedures for contract close out

### 1. Inputs

#### a. Contract documentation ←

- i. Contract
- ii. All supporting schedules
- iii. Requested and approved contract changes
- iv. Any seller-developed technical documentation
- v. Seller performance reports
- vi. Financial documents

### 2. Tools & Techniques

#### a. Procurement audits ←

- i. Structured review of the procurement process from procurement planning through contract administration
- ii. Objective is to identify successes and failures that warrant transfer to other procurement items on this project

### 3. Outputs

#### a. Contract file ←

- i. Complete set of indexed records should be prepared for inclusion with the final project records

#### b. Formal acceptance and closure ←

- i. Provide seller with formal written notice that the contract has been completed
  - ii. Requirements for formal acceptance and closure are usually defined in the CONTRACT.
- 
-

# QUALITY MANAGEMENT notes by RAFI PELTEKIAN and RAYMOND OKIMURA

- Includes the processes required to ensure that the project will satisfy the needs for which it was undertaken
- Must address both the mgmt of the project and the product of the project
- Basic approach to quality mgmt is intended to be compatible with ISO
- Quality: **Conformance to requirements and fitness of use.**
- Grade: **A category or rank given to entities having the same functional use but different technical characteristics**
- Determining and delivering the required levels of both quality and grade are the responsibilities of the project manager and the project mgmt team
- Modern quality mgmt complements project mgmt:
  - Customer satisfaction
    - Requires a combination of conformance to requirements and fitness for use
  - Prevention over inspection
  - Management responsibility
    - Responsibility of management to provide the resources needed to succeed
  - Processes within phases

## QUALITY PLANNING

- Identifying **WHICH quality standards are relevant to the project and determining HOW to satisfy them**
- One of the KEY facilitating processes during project planning and should be performed regularly and in parallel with other project planning processes
- Quality is PLANNED IN, not inspected in

### 1. Inputs

#### A. QUALITY POLICY ←

- i. Is the overall intentions and direction of an organization with regard to quality, as formally expressed by top management
- ii. If the performing organization LACKS a formal quality policy (or involves multiple performing organizations), then the project mgmt team will need to develop a quality policy for the project
- iii. The project mgmt team is responsible for ensuring that the project stakeholders are fully aware through appropriate information distribution.

#### b. Statement of work

- i. Key input to quality planning since it documents major project deliverables

#### c. Product description

#### D. STANDARDS AND REGULATIONS ←

#### e. Other process outputs

### 2. Tool & Techniques **BBC-FD**

#### A. BENEFIT/COST ANALYSIS ←

- i. The PRIMARY benefit of meeting quality requirements is LESS REWORK, which means HIGHER productivity, LOWER costs, and INCREASED stakeholder satisfaction.

#### B. BENCHMARKING ←

- i. Comparing actual or planned project practices to those of other projects to generate ideas for improvement
- ii. Provide a standard by which to measure performance.

#### C. FLOWCHARTING ←

- i. Can help anticipate WHAT and WHERE quality problems might occur, and thus can help develop approaches for dealing with them.
- ii. Common flow charting techniques:
  1. Cause-and-effect: Show how various factors might be linked to potential problems
  2. System or Process flow charts: Show how various elements of a system interrelate

#### D. DESIGN EXPERIMENTS ←

- i. A statistical method that HELPS IDENTIFY which factors might influence specific variables
- ii. Applied to project mgmt issues, such as cost and schedule tradeoffs
- iii. Applied most frequently to the product of the project

#### E. COST OF QUALITY ←

- i. Total cost of all efforts to achieve product/service quality, and includes all work to ensure conformance to requirements
- ii. Five types of cost:
  1. Prevention cost
    - a. Error free performance
  2. Appraisal costs

- a. Evaluation of processes & outputs to ensure product/service is error free, inspection, testing, reporting costs, design reviews, etc.
3. Failure cost
4. Internal – scrap and rework
5. External – after customer receives

### 3. Outputs

#### A. **QUALITY MANAGEMENT PLAN** ←

- i. Describe HOW the project mgmt team will implement its quality policy
- ii. Provided input to the overall project plan
- iii. Must address quality control, assurance, and quality improvement for the project

#### b. **Operational definitions**

- i. WHAT something IS
- ii. HOW the quality control process measures it
- iii. Also called METRICS

#### C. **CHECKLIST** ←

- i. Structured tool
- ii. Used to VERIFY that a set of required steps has been performed

#### d. **Inputs to other processes**

---

## QUALITY ASSURANCE

- Is all the planned and systematic activities implemented within the quality system to **PROVIDE CONFIDENCE** that the project will satisfy the relevant quality standards.
  - Often provided by a Quality Assurance Department
1. **Inputs**
    - a. Quality mgmt plan
    - B. **RESULTS OF QUALITY CONTROL MEASUREMENTS** ←
    - c. Operational definitions
  2. **Tools & Techniques**
    - a. Quality planning tools and techniques
    - B. **QUALITY AUDITS** ←
      - i. A structured review of other quality management activities
      - ii. Objective is to identify lessons learned that could improve performance
  3. **Outputs**
    - A. **QUALITY IMPROVEMENT** ←
      - i. Taking action to increase the effectiveness and efficiency of the project to provide added benefits to the project stakeholders
      - ii. Will require preparation of change requests or taking of corrective action
-

## QUALITY CONTROL

- Monitoring specific project results to determine if they comply with relevant quality standards
- Identifying ways to eliminate causes of unsatisfactory results
- Performed through the project
  - a. Product results – Deliverables
  - b. Project management results – Cost and schedule performance
- Project team should have a working knowledge of statically quality control (sampling & probability)
- Often performed by a Quality Control Department
- Should know:
  - a. **Prevention** – keeping errors out of the process
  - b. **Inspection** - keeping errors out of hand of customer
    - i. **Attribute sampling** – result conforms, or does not
    - ii. **Variable sampling** – result measures *degree* of conformity
      1. **Special causes** – unusual events (*Project team should know*)
      2. **Random causes** – *normal* process variation (*Project team should know*)
        - a. **Tolerances** – result is acceptable within the specific range
        - b. **Control limits** - process in control IF it falls within the control limits

### 1. Inputs

- a. **Work results** ←
  - i. Include both process results and product results
- b. **Quality mgmt plan**
- c. **Operational definition**
- d. **Checklist**

### 2. Tools & Techniques **FIC-STP**

- A. **INSPECTION** ←
  - i. Measuring, examining, and testing undertaken to determine whether results conform to requirements
  - ii. Also called: reviews, product reviews, audits and walk-through
- B. **CONTROL CHARTS** ←
  - i. A *graphic display* of the results, over time, of a process
  - ii. Used to determine if the process is IN CONTROL
  - iii. When a process IS IN CONTROL, the process should NOT be adjusted
  - iv. Used to track repetitive activities (manufacturing lots)
  - v. Used to monitor cost & schedule variances, volume and frequency of scope changes, errors in project documents or other mgmt results
- C. **PARETO DIAGRAMS** ←
  - i. *Histogram*, ordered by frequency of occurrence, that show HOW MANY results were generated by type or category of identified cause
  - ii. Rank order is used to guide corrective action
  - iii. Project team should take action to fix the problems that are causing the greatest number of defects first
  - iv. 80/20 – 80% of the problems caused by 20% of the causes
- D. **STATISTICAL SAMPLING** ←
  - i. Involves choosing part of a population of interest for inspection
  - ii. Can often reduce cost of quality control
- E. **FLOWCHARTING** ←
  - i. Help analyze HOW problems occur
- F. **TREND ANALYSIS** ←
  - i. *Mathematical* techniques to forecast future outcomes based on historical results
  - ii. Used to monitor: Technical Performance & Cost & Schedule Performance

### 3. Outputs

- A. **QUALITY IMPROVEMENTS** ←
- B. **ACCEPTANCE DECISIONS** ←
- C. **REWORK** ←
  - i. Action taken to bring a defective or nonconforming item into compliance with requirements or specifications
  - ii. Is frequent cause of project overruns
- d. **Completed checklist**
- e. **Process adjustments**
  - i. Involve IMMEDIATE corrective or preventive action as a result of quality control measurements
  - ii. May need to be handled according to procedures for INTEGRATED CHANGE CONTROL.



# RISK MANAGEMENT notes by RAFI PELTEKIAN and RAYMOND OKIMURA

- The systematic process of identifying, analyzing and responding to project risk
- Includes maximizing the probability and consequences of positive events and minimizing the probability and consequences of adverse events to project objectives
- Project risk is an uncertain event or condition that, if occurs, has a positive or negative effect on a project objective
- A risk has a cause and, if it occurs, a consequence
- Project risk includes BOTH threats to the project's objectives and opportunities to improve on those objectives
- Known risks are those that have been identified and analyzed, and it may be possible to plan for them
- Unknown risks cannot be managed, although may be addressed by applying a general contingency based on past experience with similar projects
- To be successful, the organization MUST be committed to addressing risk management throughout the project. One measure is its dedication to gather high-quality data on project risks and their characteristics

## RISK MANAGEMENT PLANNING

- Process of deciding HOW to approach and PLAN the risk management activities for a project
1. **Inputs**
    - a. **Project charter**
    - b. **Organization's risk mgmt policies** (predefined approach)
    - c. **Defined role & responsibilities** (predefined roles & responsibilities)
    - d. **Stakeholder risk tolerances** (different tolerances to risks)
    - e. **Template for the organization's risk mgmt plan**
    - f. **WBS**
  2. **Tools & Techniques**
    - a. **Planning meetings** (meeting to develop risk mgmt plan)
  3. **Outputs**
    - a. **Risk management plan** ←
      - i. Describes HOW the risk processes (risk identification, qualitative & quantitative analysis, response planning & monitoring, and control) will be STRUCTURED and PERFORMED during the project life cycle
      - ii. Plan may include the following
        1. Methodology
          - a. Defines the approaches, tools, and data sources that may be used to perform risk mgmt
        2. Roles & Responsibilities
          - a. Defines the lead, support, and risk mgmt team membership for each type of action
        3. Budgeting
        4. Timing
          - a. Defines how often the risk mgmt process will be performed throughout the project life cycle
        5. Scoring & Interpretation
        6. Thresholds
        7. Reporting Formats
        8. Tracking

## RISK IDENTIFICATION

- Determining WHICH risks might affect the project and documenting their characteristics
- Participants:
  - a. Project team
  - b. Risk mgmt team
  - c. Subject matter experts from another part of the company
  - d. Customers
  - e. End users
  - f. Other project managers
  - g. Stakeholders
  - h. Outside experts
- An iterative process
- First may be performed by the project team or risk mgmt team
- Second, entire project team and primary stakeholders
- Final, persons NOT involved in the project

### 1. Inputs

#### a. Risk mgmt plan

#### b. Project planning outputs ←

- i. Understanding of the project's mission, scope, and objectives of the owner, sponsor, or stakeholders
- ii. Outputs:
  1. Project charter
  2. WBS
  3. Product
  4. Description
  5. Schedule and cost estimates
  6. Resource plan
  7. Procurement plan
  8. Assumption & constraints list

#### c. Risk categories ←

- i. Well defined
- ii. Should reflect common sources of risk for the industry
- iii. Categories:
  1. Technical, quality, or performance risks
    - a. Reliance on unproven or complex tech
    - b. Unrealistic performance goals
    - c. Changes to the technology
  2. Project-mgmt risks
    - a. Poor allocation of time and resources
    - b. Inadequate quality of the project plan
    - c. Poor use of project mgmt disciplines
  3. Organizational risks
    - a. Cost, time, and scope objectives that are internally inconsistent
    - b. Lack of prioritization of projects
  4. External risks
    - a. Shifting legal or regulatory environment
    - b. Labor issues
    - c. Weather
      - i. Force majeure risks – Earthquakes, floods, and civil unrest require DISASTER RECOVERY actions rather than risk mgmt

#### d. Historic information

- i. Project files
- ii. Published information

### 2. Tools & techniques CADI

#### a. Documentation reviews

- i. Performing a structured review of project plans and assumptions, both at the total project and detailed scope levels, prior project files, and other information is generally the initial step taken by project teams

#### b. Information-gathering techniques ← BIDSwt

##### i. Brainstorm

1. MOST FREQUENTLY used risk identification techniques
2. Goal is to obtain a comprehensive list of risks

3. Project team performs brainstorming
- ii. **Delphi technique**
  1. A way to reach a consensus of experts, but participate anonymously
  2. Help reduce bias in the data
  3. Keeps persons from having undue influence on the outcome
- iii. **Interviewing**
  1. Interviews of experience project managers or subject-matter experts
- iv. **Strength, weakness, opportunities, and threat (SWOT) analysis**

c. **Checklists** ←

- i. Developed based on historical information and knowledge that has been accumulated from previous similar projects and from other sources of information
- ii. Advantage: QUICK and SIMPLE
- iii. Disadvantage: IMPOSSIBLE to BUILD an exhaustive checklist of risks and limited to the categories in the list
- iv. IMPORTANT to review the checklist as a FORMAL step of every project-closing procedure to improve the list of potential risks, to improve the description of risks

d. **Assumption analysis** ←

- i. Explores assumptions VALIDITY
- ii. It identifies risks to the project from inaccuracy, inconsistency, or incompleteness of assumptions

e. **Diagramming techniques** ←

- i. Cause-and-effect diagrams
  1. Ishikawa or fishbone
- ii. System or process flow
  1. Show how various elements of a system interrelate and the mechanism of causation
- iii. Influence diagrams
  1. Graphical representation of a problem showing causal influences, time ordering of events, etc

3. **Outputs**

a. **Risks** ←

- i. An uncertain event or condition that, if it occurs, has a positive or negative effect on the project objective

b. **Triggers** ← (risk symptoms or warning signs)

- i. Indications that a risk has occurred or is about to occur

c. **Inputs to other processes**

---

## QUALITATIVE RISK ANALYSIS

- Process of:
  - a. Assessing the impact
  - b. Likelihood of identified risks
- Priorities risk according to their potential effect on project objectives is one way determining the importance of addressing specific risks and guiding risk responses
- Requires that the probability and consequences of the risks be evaluated using established qualitative-analysis methods and tools
- Should be revisited during the project's life cycle to stay current with changes in the project risks

### 1. Inputs

- a. **Risk mgmt plan**
- b. **Identified risks**
  - i. Risk discovered during risk identification process
- c. **Project status**
  - i. Project's progress through its life cycle
- d. **Project type**
- e. **Data precision**
  - i. Describes the extent to which a risk is known and understood
- f. **Scales of probability and impact**
- g. **Assumptions**

### 2. Tools & Techniques

- a. **Risk probability and impact** ←
  - i. **Risk probability** is the likelihood that a risk will occur
  - ii. **Risk consequences** is the effect on the project objectives if the risk event occurs
  - iii. Both applied to specific risk events NOT to the overall project
  - iv. Helps identify those risks that should be managed aggressively
- b. **Probability/impact risk rating matrix** ←
  - i. Constructed that assigns risk rating to risks or conditions based on combining probability and impact scales
  - ii. Risk's probability scale naturally falls between 0.0 and 1.0
  - iii. Risk's impact scale reflects the severity of its effect on the project objective
  - iv. **Ordinal scales** are simply rank ordered values
  - v. **Cardinal scales** assign values
  - vi. The intent of both approaches is to assign a relative value to the impact on project objectives if the risk in question occurs
- c. **Project assumptions testing** ←
  - i. Must be tested against two criteria:
    1. Assumption stability
    2. Consequences on the project if the assumption is false
- d. **Data precision ranking** ←
  - i. To evaluate the degree to which the data about risks is useful for risk mgmt
  - ii. It involves examining:
    1. Extent of understanding of the risk
    2. Data availability about the risk
    3. Quality of the data
    4. Reliability and integrity of the data

### 3. Outputs

- a. **Overall risk ranking for the project** ←
    - i. May indicate the overall risk position of a project relative to other projects by comparing the risk scores
  - b. **List of prioritized risks** ←
  - c. **List of risks for additional analysis and mgmt**
  - d. **Trend in qualitative risk analysis results**
-

## QUANTITATIVE RISK ANALYSIS

- Aims to analyze numerically the probability of each risk and its consequences on project objectives
  - Uses Monte Carlo simulation and decision analysis to:
    - a. Determine the probability of achieving a specific project objective
    - b. Quantify the risk exposure and determine size of cost & schedule contingency reserves
    - c. Identify risks requiring the most attention by quantifying their relative contribution to project risk
    - d. Identifying realistic and achievable cost, schedule, or scope targets
  - Generally follows qualitative risk analysis
  - It requires risk identification
1. Inputs
    - a. **Risk mgmt plan**
    - b. **Identified risks**
    - c. **List of prioritized risks**
    - d. **List of risks for additional analysis and mgmt**
    - e. **Historical information**
    - f. **Expert judgment**
    - g. **Other planning outputs**
  2. Tools & Techniques **DISS**
    - a. **Interviewing** ←
      - i. Used to quantify the probability and consequences of risks on project objectives
      - ii. Risk interview with project stakeholders and subject-matter experts may be the **FIRST** step in quantifying risk
      - iii. Continuous probability distributions are usually used in quantitative risk analysis
      - iv. Distribution represents both probability and consequences of the project component
      - v. Common distribution types: uniform, normal, triangular, beta, and log normal
    - b. **Sensitivity analysis** ←
      - i. Helps determine WHICH risks have the MOST potential impact on the project
    - c. **Decision tree analysis** ←
      - i. A diagram that describes a decision under consideration and the implications of choosing one or another of the available alternatives
      - ii. Incorporates probabilities of risks and the costs or rewards of each logical path of events and future decisions
      - iii. Solving the decision tree indicates which decision yields the greatest expected value to the decision-maker when all the uncertain implications, cost, rewards, and subsequent decisions are quantified
    - d. **Simulation** ←
      - i. Uses a model that translates the uncertainties specific at a detailed level into their potential impact of objective that are expressed at the level of the total project
      - ii. Typically performed using the Monte Carlo technique
      - iii. For **COST** risk analysis, a simulation may use the traditional project **WBS**
      - iv. For **SCHEDULE** risk analysis, the Precedence Diagramming Method (**PDM**) is used
  3. Outputs
    - a. **Prioritized list of quantified risks** ←
      - i. List of those that pose the greatest threat or present the greatest opportunity to the project together with a measure of their impact
    - b. **Probability analysis of the project** ←
      - i. Forecast of potential projects schedule and cost results listing the possible completion dates or project duration and costs with their associated confidence levels
    - c. **Probability of achieving the cost and time objectives** ←
      - i. Forecasts of potential project schedule and cost results listing the possible completion dates or project duration and costs with their associated confidence levels
    - d. **Trends in quantitative risk analysis results**
-

## RISK RESPONSE PLANNING

- Process of developing OPTIONS and determining ACTIONS to enhance opportunities and reduce threats to the project's objectives
- Ensures that identified risks are properly addressed
- Effectiveness of response planning will directly determine whether risk increases or decreases for the project
- Must be appropriate to the:
  - a. Severity of the risk
  - b. Cost effective in meeting the challenges
  - c. Timely to be successful
  - d. Realistic within the project context
  - e. Agreed upon by all parties
  - f. Owned by a responsible person

### 1. Inputs

- a. Risk mgmt plan
- b. List of prioritized risks
- c. Risk ranking of the project
- d. Prioritized list of quantified risks
- e. Probabilistic analysis of the project
- f. Probability of achieving the cost and time objectives
- g. List of potential responses
- h. Risk thresholds
- i. Risk owners
- j. Common risk causes
- k. Trends in qualitative and quantitative risk analysis results

### 2. Tools & Techniques MAAT

- a. **Avoidance** ←
  - i. Changing the project plan to eliminate the risk or condition or to protect the project objectives from its impact
- b. **Transference** ←
  - i. Seeking to shift the consequences of a risk to a third party together with ownership of the response
  - ii. Transferring liability is MOST effective in dealing with financial risk exposure
  - iii. Nearly always involve payment of a risk premium to the party taking on the risk (**insurance, performance bond, warranties, and guarantees**)
- c. **Mitigation** ←
  - i. Seeks to **REDUCE the probability and/or consequences** of an adverse risk event to an acceptable threshold
  - ii. May take the form of implementing a new course that will reduce the problem
  - iii. When NOT possible to reduce probability, response might address the risk impact by targeting linkages that determine the severity (redundancy)
- d. **Acceptance** ←
  - i. Project team has decided NOT to change the project plan to deal with risk or is unable to identify any other suitable response strategy
  - ii. Active acceptance include developing a contingency plan
  - iii. Passive acceptance requires NO action, leaving the project team to deal with the risks as they occur
  - iv. Contingency Plan
    1. Applied to identified risks that arise during the project
    2. Developing in advance can greatly reduce the cost of an action
  - v. Fallback Plan
    1. Developed if the risk has HIGH IMPACT or if the selected strategy may not be fully effective
  - vi. Contingency Allowance
    1. MOST usual risk acceptance response
    2. Including amounts of time, money, or resources to account for the KNOWN risks

### 3. Outputs

- a. **Risk response plan** ←
  - i. Written to the level of detail at which the actions will be taken
  - ii. Identified risks, their descriptions areas of the project affected, causes, & how affects project objectives
  - iii. Risk owners and assigned responsibilities
  - iv. Results from quantitative and qualitative risk analysis processes
  - v. Agreed responses
  - vi. Level of residual risk expected
  - vii. Specific actions to implement
  - viii. Budget and times for response
  - ix. Contingency and fallback plans
- b. **Residual risks** ←

- i. Those that REMAIN after avoidance, transfer, or mitigation responses have been taken.
- c. **Secondary risks** ←
  - i. That arises as a direct result of implementing a risk response
- d. **Contractual agreements**
- e. **Contingency reserve amounts needed**
- f. **Inputs to other processes**
- g. **Inputs to a revised project plan**

---

## **RISK MONITORING AND CONTROL**

- Process of keeping track of the identified risks, monitoring residual risks and identifying new risk, ensuring the execution of risk plans, and evaluating their effectiveness in reducing risks
- Records risk metrics that are associated with implementing contingency plans
- Ongoing process for the life of the project
- Provides information that assists with making effective decision in advance of the risk's occurring
- Purpose:
  - a. Risk response have been implemented as planned
  - b. Risk response actions are effective
  - c. Project assumptions are still valid
  - d. Risk exposure has changed from its prior state
  - e. Risk trigger has occurred
  - f. Proper policies and procedures are followed
  - g. Risk have occurred or arisen that were not previously identified
- May involve choosing alternative strategies, implementing a contingency plan, taking corrective action, or replanning the project
- Risk response owner should report periodically to the project manager and the risk team leader of the effectiveness of the plan, any unanticipated effects, and any mid-course correction needed to mitigate the risk

### 1. **Inputs**

- a. **Risk mgmt plan**
- b. **Risk response plan**
- c. **Project communication**
- d. **Additional risk identification and analysis**
- e. **Scope changes**
  - i. Often require NEW risk analysis and response plans

### 2. **Tools & Techniques**

- a. **Project RISK RESPONSE AUDITS** ←
  - i. Risk auditors (external) examine and document the effectiveness of the risk response
  - ii. Risk audits are performed during the project life cycle to control risks
- b. **Periodic project RISK REVIEWS** ←
  - i. Should be regular scheduled
  - ii. Should be an agenda item at all team meetings
- c. **Earned values analysis** ←
  - i. Used for monitoring overall PROJECT PERFORMANCE against a baseline plan
  - ii. Results may indicate potential deviation of the project at completion from cost and schedule targets
  - iii. When a project deviates significantly from the baseline, UPDATED RISK IDENTIFICATION and ANALYSIS should be performed
- d. **Technical performance measurement** ←
  - i. Compares technical accomplishments during project execution to the project plan's schedule of technical achievement
- e. **Additional risk response planning**

### 3. **Outputs**

- a. **Workaround plans** ←
    - i. Unplanned responses to emerging risk that were previously unidentified or accepted
    - ii. Must be properly documented and incorporated into the project plan and risk response plan
  - b. **Corrective action** ←
    - i. Consist of performing the contingency plan or workaround
  - c. **Project change requests** ←
  - d. **Updates to the risk response plan**
  - e. **Risk database**
  - f. **Updates to risk identification checklists**
-

## EXAMPLE ON HOW TO ACCOUNT FOR YOUR EXPERIENCE HOURS

		start	complete	initiating	planning	execution	controlling	closing	total
ACME	XYZ project	17-May-99	23-Jul-99	8	55	88	33	8	<b>192</b>
PILOT	XYZ project	6-Sep-99	1-Oct-99	3	88	230	65	5	<b>391</b>
	XYZ project	11-Oct-99	19-Nov-99	6	22	107	51	2	<b>188</b>
	XYZ project	1-Dec-99	28-Jan-00	4	39	217	32	4	<b>296</b>
	XYZ project	31-Jan-00	3-Mar-00	5	30	199	19	3	<b>256</b>
	XYZ project	6-Mar-00	28-Apr-00	6	101	287	83	2	<b>479</b>
	XYZ project	8-Mar-00	7-Apr-00	2	19	140	14	2	<b>177</b>
	XYZ project	17-Apr-00	12-May-00	2	28	66	8	4	<b>108</b>
	XYZ project	20-Apr-00	26-May-00	5	15	93	18	1	<b>132</b>
	XYZ project	5-Jun-00	21-Jul-00	4	55	155	30	3	<b>247</b>
	XYZ project	5-Jul-00	28-Aug-00	5	120	200	19	1	<b>345</b>
ENRON	XYZ project	4-Sep-00	1-Dec-00	20	105	260	168	10	<b>563</b>
	XYZ project	4-Dec-00	12-Dec-00	12	29	166	19	6	<b>232</b>
	XYZ project	13-Dec-00	22-Dec-00	19	40	77	15	5	<b>156</b>
	XYZ project	15-Jan-01	19-Jan-01	3	15	18	2	2	<b>40</b>
	XYZ project	29-Jan-01	2-Feb-01	2	13	17	5	2	<b>39</b>
	XYZ project	26-Feb-01	30-Apr-01	20	96	209	45	8	<b>378</b>
	XYZ project	14-May-01	19-Oct-01		187	240	150	28	<b>605</b>
				<b>126</b>	<b>1057</b>	<b>2769</b>	<b>776</b>	<b>96</b>	<b>4824</b>
<b>35 hours of PM education (minimum)</b>									
	PMP Exam Prep	San Jose		12					
	project Mgmt	ACME		8					
	MS Project	PILOT		12					
	project Mgmt	Enron		24					
				56					