PMI, AACEI, GAO
Risk Management
Perspectives and Resources

DOE Risk Management Workshop
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Presentation Objectives

- Highlight available resources, including recommended or best practices, guidance, certification programs, etc. available through the Project Management Institute (PMI) and AACE International (AACEI), the Association for the Advancement of Cost Engineering, as well as recent guidance from GAO.
- These organizations represent a variety of industries and have derived common approaches, terminology, and practices that are applicable to a wide spectrum of projects and technologies.
- DOE has cooperative agreements in place with PMI and AACEI and the use or adaptation of these resources may facilitate more rapid deployment of improved methodologies and processes throughout the DOE.
A Guide to the Project Management Body of Knowledge

Chapter 11, Project Risk Management, describes the processes involved with identifying, analyzing, and controlling risks for a project.

Processes addressed (with Inputs, Tools and Techniques and Outputs described for each process):
- Plan Risk Management
- Identify Risks
- Perform Qualitative Risk Analysis
- Perform Quantitative Risk Analysis
- Plan Risk Responses
- Monitor and Control Risks
PMI Documentation (continued)

- *Government Extension to the PMBOK® Guide Third Edition*
- Provides information on managing projects within the unique environment of the public sector
- Chapter 11 on Project Risk Management includes the same processes as the *PMBOK® Guide* but recognizes that:
  - Project risks include social, environmental, and political risks
  - Many government projects would be rejected or abandoned if they were subjected to objective financial analysis as used in the private sector
  - The success of a government project may also be evaluated according to subjective criteria such as values held by stakeholders
PMI Documentation (continued)

- **Practice Standard for Project Risk Management**
  - Provides a standard for project management practitioners and other stakeholders that defines the aspects of Project Risk Management that are recognized as **good practice on most projects most of the time**
  - Provides a standard that is globally applicable and consistently applied
  - Descriptive purpose rather than intended for training or educational purposes
  - Applicable to single projects only, and does not cover risk in programs or portfolios of projects
  - Based on Chapter 11 of the *PMBOK® Guide* and is aligned with other PMI practice standards
PMI Principles

- **Definition of Risk:** *Project risk is an uncertain event or condition that, if it occurs, has a positive or a negative effect on a project’s objectives.*

- **Critical Success Factors for Project Risk Management**
  - Recognize the value of risk management
  - Individual commitment and responsibility
  - Open and honest communications
  - Organizational commitment
  - Scale risk effort to project
  - Integrate with project management
PMI Certification

- **PMI Risk Management Professional (PMI-RMP)**
- Eligibility Requirements:
  HS Diploma or global equivalent, at least 4,500 hours spent in the specialized area of professional project risk management within the last 5 consecutive years, and 40 contact hours of formal education in the specialized area of project risk management
  OR
  BS Degree or global equivalent, 3,000 hours and 30 contact hours
- Requires passing of a credential examination comprised of 170 multiple-choice questions, of which 20 are considered pretest (un-scored) questions (exam length is 3.5 hours)
The AACEI technical product hierarchy is:

- **TCM Framework**: Integrated process for applying the skills and knowledge of Cost Engineering
- **Recommended Practices**: “How-to’s” for practices in TCM. RPs are subject to a significant review process to ensure reasonable consensus that practices are reliable
- **Cost Engineer’s Notebook**: the “best of” material from PPGs
- **Professional Practice Guides** (PPGs): the “best of” material from annual meeting *Transactions, Cost Engineering Journal*

The AACEI Decision and Risk Management (DRM) Committee considered “quantification” to be an area of Risk Management not well covered by the literature and an area where AACEI can be considered a leader.
Recently issued Recommended Practices
Find them at www.aacei.org/technical/rp

- 40R-08: *Contingency Estimating: General Principles*
- 41R-08: *Risk Analysis and Contingency Determination Using Range Estimating*
- 42R-08: *Risk Analysis and Contingency Determination Using Parametric Estimating*
- 43R-08: *Parametric Estimating-As Applied in the Process Industries (Example Models)*
- 44R-08: *Risk Analysis and Contingency Determination Using Expected Value*
40R-08: Contingency Estimating:  
**General Principles**

- **Committee Challenge:** *How to identify and get consensus on practices to “recommend”*?
  - Had to be more than just expert opinion
- **Approach:**
  - First, get reasonable consensus on the attributes that define a reliable practice; i.e., “first principles”
  - Then compare each practice to these principles and recommend those that predominately align with them
- **No practice optimally addresses each principle**
  - Provide information in RPs on strengths/weaknesses so that users can make reliable choices and decisions when developing, selecting, or implementing a practice
AACEI’s General Principles

- Meet client objectives, expectations and requirements
- Part of and facilitates an effective decision or risk management process (e.g., TCM)
- Fit-for-use
- Starts with identifying the risk drivers with input from all appropriate parties
- Methods clearly link risk drivers and cost/schedule outcomes
- Avoids iatrogenic (self-inflicted) risks
- Employs empiricism
- Employs experience/competency
- Provides probabilistic estimating results in a way the supports effective decision making and risk management
Range Estimating combines Monte Carlo sampling, a focus on the few critical items, and heuristics to rank critical risks and opportunities.

“Critical items” is a key concept in this RP.

- Project uncertainty is concentrated in a relatively small number of items

If you range non-critical items, you introduce “iatrogenic” risks (i.e., self-inflicted) because the resultant output from Monte Carlo will be a too narrow (i.e., too low contingency)
A form of parametric estimating where the output is predicted *cost growth* and the input parameters are *risk drivers*

- Based on empirical research of cost growth for actual projects in the process industries
  - Studies by John Hackney and RAND Corporation
- Used only for “systemic” risks (i.e., artifact of a system, culture, technology, complexity, etc)
  - The most dominant systemic risk at Early Phases is the Level of Project Scope Definition
  - The other type of risks that are not covered are *project-specific* (see RP on Expected Value method)
Contingency Determination Using Expected Value

- A time honored concept (fundamental to decision tree analysis and risk screening) where:

  \[ \text{Expected Value} = \text{Probability of Risk Occurring} \times \text{Impact If It Occurs} \]

  - Explicitly links risks & impacts and provides continuity between risk screening and contingency estimate

- Applied on project-specific risks (i.e., those with less commonality of occurrence and/or impact such as the weather and how it affects site and work)
  - These risks are amenable to more deterministic impact estimates

- Monte-Carlo is applied using PDFs for the probabilities and impacts
A Proposed Hybrid Approach: Parametric + Expected Value

- Not a Recommended Practice (at least at this time)
- Goal is to address **Systemic & Project-Specific** risks using the methods most appropriate for each
  - Both methods explicitly link risks and impacts to facilitate risk management
- **Parametric** model addresses Systemic risk
- **Expected Value** addresses Project-Specific risks
- Methods are combined by including the Parametric output (which is a PDF) as the first risk in the Expected Value model and running Monte-Carlo on the total risks
AACEI: Need for Empirical Research

- A survey study by RAND found a “striking lack” of empirical research or studies to support the methods used for “quantitative risk analysis”
  - A main cause is failure to capture reliable data
- Need to encourage companies and institutions to support such research
- There is one empirical study based on a robust database of actual project data and its findings were an indictment of common contingency estimating methods
AACEI Caution

• IPA research findings:

  ➢ “…contingency estimates are, on average, getting further from the actual contingency required.”
  ➢ “This result is especially surprising considering that the percentage of projects using more sophisticated approaches to contingency setting has been increasing.”
  ➢ For projects with poor scope definition the common approaches were “a disaster”

• That common approach is “line-item ranging”

  ➢ Unfortunately, for schedules, there is a corollary practice that could be called “activity ranging” which uses nearly identical methods applied to CPM schedules instead of the cost estimate
Line-Item Ranging with Monte Carlo Is Not Recommended (and Can Be Dangerous)

- Line-item (or Activity) Ranging
  - Monte-Carlo model is a spreadsheet of ALL the estimate “line-items” or summary items (or activities) which are treated as probability profiles
  - A ranging exercise assigns low, most likely and high values, often inconsistently
  - Monte-Carlo is run without defining dependencies of all the line-items

- Reasons for failure (referring to 40R-08 Principles)
  - Not part of process (risk register not integrated with method)
  - Not fit-for-use (fails to address systemic risks)
  - Does not link risk drivers and cost/schedule outcomes
  - Introduces iatrogenic (self-inflicted) risks
  - Does not employ empiricism
AACEI Certification

- Development of a *Decision and Risk Management Professional* Certification program is currently underway.
- Will be marketed to cost engineer types with a risk focus working within the TCM Framework capital project world.
- Will cover usual qualitative risk information (registers, matrices, etc.) and add in AACEI's strength on quantitative side.
- Will differ substantially from PMI’s in terms of increased focus on investment decision analysis, contingency and reserve analysis, etc.
- Certification process will not be completed until full set of related RPs have been established and published.
- Requirements will be similar to CCC/CCE plus risk experience.
GAO Cost Estimating and Assessment Guide

- Published in March 2009 to “establish a consistent methodology that is based on best practices and that can be used across the federal government for developing, managing, and evaluating capital program cost estimates.”

- Chapter 14 – “Cost Risk and Uncertainty”
  - Provides recommended steps for assessing and analyzing cost risk and uncertainty
  - Provides a checklist of best practices