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Risk and Opportunity Management

A 3-Day Course

Effective Methods to Work with Uncertainty in Complex Projects

System projects today have more complexity than ever before, because system products far exceed even the dreams of prior years. Projects frequently involve great technical uncertainty, made more challenging by an environment with dozens to hundreds of people from conflicting disciplines. Yet uncertainty has two sides: with great risk comes great opportunity.

Recent work in risk management has revealed new methods that are more effective than ever before. Risks and opportunities, for instance, can be handled together to seek the best balance for each project. Uncertainty issues can be quantified to better understand the expected impact on your project. Technical, cost and schedule issues can be balanced against each other.

Some of the best recent work shows that nearly all project leadership decisions are actually risk-based decisions. So if you apply a conscious approach to risk, your decisions can be better.

This course provides detailed, useful techniques to evaluate and manage the many uncertainties that accompany complex system projects.

***You should attend this course if you are*:**

- A leader or a key member of a complex project team
- Concerned about technical, cost and schedule uncertainty
- Seeking methods to bound risk while reaching for opportunity
- Looking for practical methods to use today

The course is aimed at

- Program managers,
- Project managers,
- Systems engineers,
- Technical team leaders,
- Logistic support leaders, and
- Others who participate in defining and developing complex systems.

Practice the skills on a realistic case study. Identify, analyze, and quantify the uncertainties, then create effective risk mitigation plans.

The ***Submarine Explorer*** case study lets you practice the skills in the course. This realistic project involves the creation of challenging robotic submarines for exploration of marine environments, along with the complex communications and control facilities to manage them.

Topics Covered in the Course

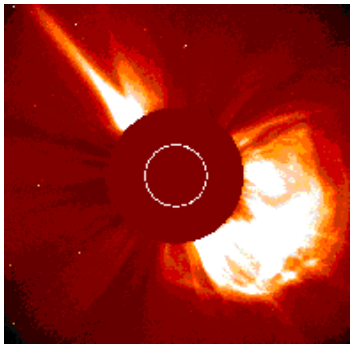
Managing Uncertainty – Concepts of uncertainty, both risk and opportunity. Complex system projects, and expectations for what to achieve. Terms and definitions. Roles of a project leader in relation to uncertainty.

- Uncertainty as a central feature of effective management
- Targets, expectations, and commitments

- Qualitative versus quantitative risk analysis
- Risk efficiency
- Formal risk management concepts
- Impacts of contract types and procurement processes
- Risk management and the contractual process

Practical Probability Theory – Review of essential mathematical concepts related to probability, including the psychological aspects of probability.

- Review of Probability Theory
  - Probability concepts
  - Conditional probabilities
  - Correlation and independence
  - Statistical measures and moments
  - Density and distribution functions
  - Key theorems (central limit, large numbers)
  - Stochastic dominance
- Psychological biases in statistics
- Utility functions



Risk Identification – Methods to find the risk and opportunity issues. Potential sources and how to exploit them. Guiding a team through the mire of uncertainty.

- Sources of risk
- Methods to identify risk issues
- Identifying possible responses
- Secondary sources and responses
- Identifying issue ownership
- *Submarine Explorer Case Study* – Risk Identification

Qualitative Analysis – Understanding the issues and their subjective relationships using simple methods and more comprehensive graphical methods.

- Simple risk analysis using the US DoD method of 5x5 matrices
- Structuring the issues for more complete analysis
- Specific and general responses
- Diagramming methods (source-response diagrams, fault trees, influence diagrams)
- Identifying issue ownership
- Technology readiness assessment
- *Submarine Explorer Case Study* – Qualitative risk analysis

Quantitative Analysis – What to do when the level of risk is not yet clear. Mathematical methods to quantify uncertainty in a world of subjectivity, and then work with the impacts of multiple risks in combination.

- Assessing the usefulness of quantification
- Typical result: Probabilistic PERT networks
- Estimating the variability through expert quantifications
- Restructuring the quantification
- Quantification methods
- Merging subjective and objective data

- Evaluating overall implications of issues in combination
- Dependency among issues
- Portraying the effect through useful graphics that help to diagnose the implications
- Sensitivity tests and financial portrayals
- *Submarine Explorer Case Study* – Quantitative risk analysis

Risk Response Planning – Deciding what to do about the uncertainty. Selecting an appropriate response to each risk, and how to implement those responses.

- Four primary possible responses to risk – control, avoidance, transfer, accept
- Designing/implementing a risk response
- Harnessing the five levels of plans
- Managing and shaping expectations

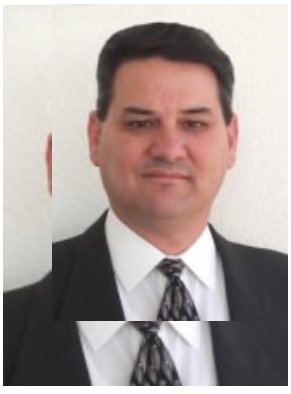
Risk Monitoring and Control – Tracking the risks over time, while taking effective action. How to monitor the risks. Balancing analysis and its results to prevent "paralysis by analysis" and still get the benefits.

- Managing the planned actions
- Risk monitoring and repetitive risk management
- Crisis control
- *Submarine Explorer Case Study* – Risk response planning

Risk Management Planning – Creating the Risk Management Plan. What to include and how to establish effective risk management.

- Risk management planning, and the tools to include in the plan
- Establishing risk management as a culture in an organization
- Practical methods to do effective and efficient risk management using minimal resources

The Presenter:



Mr. Eric Honour, CSEP has been in international leadership of the engineering of systems for a dozen years, part of a 39-year career of complex systems development and operation. His energetic and informative presentation style actively involves class participants. He was the founding Chair of the INCOSE (International Council on Systems Engineering) Technical Board in 1994, was elected to INCOSE President for 1997, and served as Director of the Systems Engineering Center of Excellence (SECOE). He was selected in 2000 for Who's Who in Science and Technology and in 2004 as an INCOSE Founder. He is on the editorial board for *Systems Engineering*. He has been a systems engineer, engineering manager, and program manager at Harris Information Systems, E-Systems Melpar, and Singer Link, preceded by nine years as a US Naval Officer flying P-3 aircraft. He has led or contributed to the development of 17 major systems, including the Air Combat Maneuvering Instrumentation systems, the Battle Group Passive Horizon Extension System, the National Crime Information Center 2000, and the DDC1200 Digital Zone Control system for heating and air conditioning. Mr. Honour has a BSSE (Systems Engineering) from the US Naval Academy, MSEE from the Naval Postgraduate School, and is a doctoral candidate at the University of South Australia.