



## Petroleum Risk and Decision Analysis - PRD - eLearning

### COURSE

#### About the Course

Good insight technical and business decisions are based on competent project costs, benefits, and risk analysis. Participants learn the decision analysis process and foundation concepts to participate actively in multi-discipline evaluation teams. The focus is on designing and solving decision models. About half the problems relate to exploration. The methods apply to R&D, risk management, and all capital investment decisions. Probability distributions express professional judgments about risks and uncertainties and are carried through the calculations. Decision trees and influence diagrams provide clear communications and the basis for valuing each alternative. A hand-calculation exercise delivers a detailed experience in Monte Carlo simulation. The mathematics are straightforward and mostly involve only common algebra. The emphasis is on practical techniques for immediate application.

#### Target Audience

Personnel working on development projects in the upstream, midstream, downstream, and transportation segments of the petroleum industry. This includes project managers, project engineers, facility engineers, production and operations engineers, wellsite supervisors, project controls representatives, and supply chain personnel.

#### You Will Learn

##### Decision Analysis Process [BASIC]

- **Introduction to Decision Analysis:** Is there anything more important to success than good decision making? This introductory topic provides an overview of the discipline and problem-solving approach of decision analysis.
- **Decision Analysis Process:** This lesson recommends a 10-step process, ranging from identifying a decision opportunity to the post-decision review. This is much like a typical problem-solving process as in engineering design.
- **Expected Value Calculation Tools:** Decision trees and Monte Carlo simulation are the principal tools for calculating expected values. Though both methods solve for expected values, they do so in very different ways.
- **Influence Diagrams and Structural Decision Trees:** Developing a structural decision model is a good practice and is often an output of decision framing.

## Value of Control [FOUNDATION]

- **Decision Trees – Expanded:** Decision trees are the most recognizable feature of decision analysis. So, many people think these are synonymous.
- **Value of Control I:** Investing to reduce project and operations risk are typical value of control (VOC) problems. Improving "control" means taking action to improve the probability and/or outcomes of a chance event.
- **Value of Control II:** An oil tanker has a heightened risk of collision accidents and oil spills if it loses its steering or propulsion power system. This exercise is to develop a decision model to decide whether to spend additional money on maintaining the tanker's steering and propulsion systems.

## Value of Information and Bayes' Rule [FOUNDATION]

- **Probability Types, Venn Diagrams, and Probability Rules:** Venn diagrams and probability trees are good ways to explain the foundation probability rules.
- **Bayes' Rule I. Introduction:** Bayesian analysis is central to information applications. Machine learning and variants are central to popular artificial intelligence methods, such as natural language processing. Typical investment decisions seldom have much data and rely instead on expert judgments.
- **Bayes' Rule II. Practice Problems:** Becoming comfortable with Bayes' rule calculations requires practice for most people to develop a deep intuition about how the calculations work.
- **Bayes' Rule III. Platform Sizing Decision:** This is an extended exercise to set up and solve for: 1. Optimal Platform Size decision with present information; and 2. Valuing additional, though imperfect, information to improve the platform size decision; and 3. whether to build in a capacity expansion option.

## Decision Policy and Value Calculations [FOUNDATION]

- **Decision Policy Components:** This course mostly focuses on maximizing shareholder value, measured as expected monetary value (EMV), which is risk-weighted (expected value) NPV. See Social Factors, below, about adding-in non-monetary metrics.
- **Time Preference:** When costs and benefits occur across time, the time value of money is an important consideration. Present value discounting converts future cashflows into an equivalent amount today or the reference time of investment. Price escalation and inflation work similarly.
- **Social Factors in Decision Policy:** A multi-criteria decision policy may include metrics for non-monetary criteria in such areas as Health, Safety, and Environment (HSE), Corporate Social Responsibility (CSR), and Environment, Social, and Governance (ESG).
- **Establishing a Risk Tolerance Coefficient for Risk Policy:** The exponential utility function is an easy-to-use representation of risk policy. Expressing risk policy in this form requires only assessing the risk tolerance coefficient for the company or individual decision maker.

## Monte Carlo Simulation and Distributions [FOUNDATION]

- **Quality technical and business decisions:** Require competent analyses of costs, benefits, and risks. You will learn a decision analysis process and foundation concepts so you can actively participate in multi-discipline evaluation teams. The focus is on designing and solving decision models.

## Judgments and Biases [FOUNDATION]

- **Judgments and Biases:** Analysis quality depends mainly on the quality of inputs, and some of the inputs may be highly subjective. We rely upon subject matter experts (SMEs) to judge input probabilities and input distributions.
- **Calibration Exercises:** Most people are poorly calibrated and overestimate the quality of their information and knowledge. It is common for outcomes to miss the 80% confidence range. With practice and feedback, most people greatly improve their calibration.
- **Judgment Elicitation:** Typically, one or two interviewers will elicit a distribution or probability judgment from one or several subject matter experts (SMEs). Thinking through what questions you would ask as an interviewer will prepare you for the role.

## Course Content

- Decision Analysis Process
- Value of Control
- Value of Information and Bayes' Rule
- Decision Policy and Value Calculations
- Monte Carlo Simulation and Distributions
- Judgments and Biases

## Product Details

Categories: [Upstream](#)

Disciplines: [Energy Business](#)

Levels: [Foundation](#)

Product Type: [Course](#)

Formats Available: [On-Demand](#)

Instructors: [John Schuyler](#)

## On-Demand Format

| Course | On-Demand (Available Immediately )

\$3,000.00

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