CONCEPT

Decision Support Systems and Business Decision Models: Optimisation, Simulation and MCDA

3 – 7 May 2027
London - Central London four-star



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Introduction:

Planning and engineering teams often hand managers a static spreadsheet with one answer, no stated criteria and no way to test what happens when a constraint moves. Choices on crew allocation, maintenance windows, supplier selection or field development then rest on whoever argues loudest. This Core Concept course trains analysts, planners and engineers to design decision support systems: structuring the decision, building what-if, optimisation and simulation models, scoring options with multi-criteria decision analysis and encoding rules. Participants produce an Optimisation Decision Model and Manager Dashboard for a case decision.

Course Objectives:

- Classify a decision support system as model-, data-, knowledge-, document- or communication-driven and specify its data store, model base and user interface
- Structure a managerial choice into objectives, alternatives, criteria and uncertainties using influence diagrams and decision trees with expected value rollback
- Build spreadsheet what-if, scenario and sensitivity models and linear programming models solved with a spreadsheet solver, interpreting binding constraints and shadow prices
- Run Monte Carlo simulation on an operational model and rank alternatives with weighted scoring, AHP and TOPSIS, testing the ranking against weight changes
- Encode operating rules as a rule-based or expert system component and set data lineage, version control and validation checks for every model
- Deliver an Optimisation Decision Model and Manager Dashboard that lets a manager change inputs and see the recommended option

Target Audience:

- Business and operations analysts who turn managers' questions into quantitative models
- Planners who schedule resources, maintenance, logistics or production across sites and assets
- Project and cost engineers who prepare option comparisons for project and asset decisions
- Reservoir, process and facilities engineers in oil and gas who model development and operating choices
- Reporting and business intelligence specialists who publish decision dashboards for line managers
- Internal consultants and PMO analysts who support steering committees with option analysis

Course Outline:

Day 1: Decision Support System Types, Architecture and Current Tools Review

- Power's DSS Classification: Model-, Data-, Knowledge-, Document- and Communication-Driven
- DSS Architecture: Data Store, Model Base and Dialogue Interface
- Passive, Active and Cooperative DSS Roles in Operational Choices
- Holsapple and Whinston Structures: Spreadsheet, Solver, Rule-Oriented and Compound DSS
- Inventory of Existing Decision Spreadsheets Against a DSS Maturity Checklist

Day 2: Structuring Decisions: Objectives, Alternatives, Criteria and Uncertainty

- Objectives Hierarchy and Means-Ends Network for a Planning Decision
- Alternatives Generation with a Strategy Table
- Influence Diagram Mapping of Decision, Chance and Value Nodes
- Decision Tree Construction and Expected Value Rollback
- Value of Perfect Information for a Well Test or Equipment Trial

Day 3: Spreadsheet What-If, Scenario and Optimisation Models

- Input, Calculation and Output Sheet Layout for a What-If Model
- Data Tables, Scenario Manager and Goal Seek for Threshold Questions
- Linear Programming Formulation: Decision Variables, Objective Function and Constraints
- Spreadsheet Solver Setup: Simplex LP, GRG Nonlinear and Integer Constraints
- Sensitivity Report Reading: Binding Constraints, Shadow Prices and Allowable Ranges

Day 4: Simulation, Multi-Criteria Scoring, Expert Rules and Model Governance

- Monte Carlo Simulation Basics: Input Distributions, Iterations and Output Histograms
- Weighted Sum Scoring and Swing Weighting for Supplier or Contractor Selection
- AHP Pairwise Comparison, Priority Vectors and Consistency Check Compared With TOPSIS
- Rule-Based Expert System Design: Knowledge Base, Inference Engine and Forward and Backward Chaining
- Model Governance: Data Lineage, Version Control, Validation Tests and Error Traps

Day 5: Case Build: Optimisation Decision Model and Manager Dashboard

- Case Data Pack: Rig and Crew Allocation or Maintenance Shutdown Window Decision
- LP Optimisation and Scenario Layer Build for the Case
- MCDA Overlay Ranking Non-Financial Criteria Across Feasible Options
- Manager Dashboard Build with Input Sliders, Recommendation Panel and Tornado View
- Dashboard Walkthrough to a Mock Operations Manager and Peer Model Audit

Skills You Will Gain:

- Decision Structuring
- Influence Diagram Mapping
- Linear Programming Formulation
- Spreadsheet Solver Modelling
- Simulation Modelling
- Multi-Criteria Scoring
- Rule-Based System Design
- Decision Dashboard Design

Why Attend This Course:

- Leave with an Optimisation Decision Model and Manager Dashboard audited by peers and walked through with a mock manager
- Replace one-answer spreadsheets with models that show managers the effect of moving a constraint, weight or assumption
- Explain solver output such as shadow prices and binding constraints in plain terms a planning meeting can act on
- Compare modelling practice with analysts and engineers from oil and gas, utilities, logistics, manufacturing and public services

Conclusion:

Decision support systems earn their place when managers can question a model and see the answer change for a clear reason. The course moves from DSS types and architecture, through structuring objectives, alternatives and uncertainty, to what-if, linear programming and solver models, then simulation, multi-criteria scoring, expert rules and model governance. The final day combines these methods into an Optimisation Decision Model and Manager Dashboard that participants can adapt for decisions in their own projects and operations.