Chapter 1

Introduction to Decision Analysis
In the winter of 1985, the ODA grappled with the problem of gypsy moth infestation in Lane County in Western Oregon. **Forest Industry representatives** argued strongly for an aggressive eradication campaign using potent chemical insecticides. The ODA instead proposed a plan that involved spraying most of the affected area with **BT (Bacillus thuringiensis)**, a bacterial insecticide known to be (1) **target-specific** (that is, it does little damage to organisms other than moths), (2) **ecologically safe**, and (3) **reasonable effective**. As well as using BT, the ODA proposed spraying three smaller areas near the city of Eugene with the Chemical Spray **Orthene**. Although Orthene was registered as an acceptable insecticide for garden use, there was **some doubt** as to its ultimate ecological effects as well as its dangers to humans.
Forestry officials argued that the chemical insecticide was more potent than BT and was necessary to ensure eradication in the most heavily affected areas. Environmentalists argued that the potential danger from the chemical spray was too great to warrant its use. Some individuals argued that spraying would not help because the infestation already was so advanced that no program would be successful. Others argued that an aggressive spray program could solve the problem once and for all, but only if done immediately. Clearly in making its final Decision the ODA would have to deal with many issues.
Why are Decisions Hard?

- **Complexity**
  - Gypsy Moth Case: Three Objectives, Multiple Perspectives

- **Uncertainty of Key Elements**
  - Gypsy Moth Case: Size of the Infestation, Health Effect, Location of Gypsy Moth

- **Multiple Objectives**
  - Gypsy Moth Case: Target Specific, Ecologically Safe, Effective

- **Different Perspectives**
  - Gypsy Moth Case: Forestry Officials, Environmentalists

- **Sensitivity/Unstability**
  - Gypsy Moth Case: How sensitive is proposed solution to the size of the infestation
Why Study Decision Analysis?

DECISION ANALYSIS:
• Supplies methods for organizing decisions
• Allows Identification of important sources of uncertainty
• Forces representation of uncertainty
• Supplies framework for dealing with multiple objectives
• Modeling and Sensitivity allows one to sort through the problem

LEADS TO BETTER DECISIONS:
• Decisions are consistent
• No surprises due to thorough study of the problem
• Performance of decision making is better on average

A GOOD DECISION:
• Looking back in the past, one can say that one would have made the same decision given the information available at the time of the decision
DEFINITION DECISION ANALYSIS (DA):
• Prescriptive approach for people who want to think hard and systematically about decision problem

COMMENTS DECISION ANALYSIS:
• A DA is an information source
• Should not replace the decision maker but support him/her
• A DA does not only provide a solution, but also insight into
  - Situation
  - Uncertainty
  - Objectives
  - Trade offs

DECISION ANALYSIS CAN ONLY YIELD
A RECOMMENDED COURSE OF ACTION
IMPORTANT INPUTS FOR DECISION ANALYSIS:
• Subjective judgments about uncertainties
• Subjective judgments about preferences

requirement of subjective judgement for decision analysis can be considered both a strength and a weakness

strength:
• Does not ignore subjective judgments prevalent in other management science techniques

weakness:
• Be careful, human beings are imperfect information processors
The Decision Analysis Process

Requisite Decision Models:
“A Model is requisite if no new intuitions emerge about the problem or when it contains everything essential for solving the problem”, Phillips (1982, 1984)

Convergence to Requisite Decision Models:
• Technical Modeling Expertise
• Will of the Decision Maker (DM) not to accept incomplete or inappropriate models
Where is Decision Analysis Used?

BUSINESS & GOVERNMENTS:
• Managing research and development programs
• Understanding the world oil market
• Forecasting sales of a product
• Electric power generation
• Deciding whether to launch a new product or venture

MEDICINE:
• Help doctors make specific diagnoses
• Optimal inventory of blood levels in a blood bank
• Firm’s decision regarding different kinds of medical insurance programs

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Where Are We Going from Here?

MODELING DECISIONS:
• Structuring Decision - Chapters 2 & 3
• Analyze Decision Models - Chapter 4
• Sensitivity Analysis - Chapter 5
• Creativity and Decision Making - Chapter 6

MODELING UNCERTAINTY
• Basic Probability Review - Chapter 7
• Expert Judgment - Chapter 8
• Theoretical Probability Models - Chapter 9
• Data-based Probability Models - Chapter 10
• Simulation - Chapter 11
• Value of Information - Chapter 12

MODELING PREFERENCES
• Modeling Risk Attitude - Chapters 13 & 14
• Multi objective decision making - Chapters 15 & 16