Decision Analysis

- **Objective**
  - To present a particular, effective technique for evaluating alternatives to risky situations

- **Three conclusions brought out by Decision Analysis.**
  Think in terms of:
  1. **Strategies for altering choices** as unknowns become known, rather than optimal choices
  2. **Second best choices** which offer insurance against extremes
  3. **Education of client** especially about range of alternatives

Motivation

- **People, when acting on intuition, deal poorly with complex, uncertain situations**
  - They process probabilistic information poorly
  - They simplify complexity in ways which alter reality
    - Focus on extremes
    - Focus on end states rather than process
    - Example: Mexico City Airports
- **Need for structured, efficient means to deal with situation**
- **Decision Analysis is the way**
General Features

- Simple way of defining the wide range of choices
- Over several Periods
- Includes Risks
- Includes Levels of Consumer Satisfaction
- Standard Method

Identifying Issues

- What is the Important Risk for Situation?
- What Factors Define this Risk?
- What Management Decisions Relate to it?
- How do we represent the
  - Range of possible decisions,
  - Risks, and
  - Outcomes?
Decision Tree

- Representing the Analysis -- Decision Tree
  - Shows Wide Range of Choices
  - Several Periods
  - Permits Identification of Plans that
    - Exploit Opportunities
    - Avoid Losses

- Components of Decision Tree
  - Structure
    - Choices; Possible Outcomes
  - Data
    - Risks; Value of Each Possible Outcome

Constructing Decision Tree (1)

- Structure
  - The Decision Tree as an organized, disciplined means to present alternatives and possible states of nature

- Two graphical elements
  1. Decision Points
  2. Chance Points (after each decision)
Constructing Decision Tree (2)

- Two data elements
  1. Probability
  2. Value of each outcome

- When does it become a “messy bush”??
For Sequence of Alternatives

- Start at end of tree (rightmost edge)
- Calculate Expected Value for last (right hand side) alternatives
- Identify Best
  - This is the value of that decision point, and is the outcome at the end of the chance point for the next alternatives
- This is also the best choice, if you ever, by chance, reach that point
- Repeat, proceeding leftward until end of tree is reached
- Result: A sequence of optimal choices based upon and responsive to chance outcomes - “A Strategy”

Results Of Decision Analysis

- NOT as Simple Plan
  - Do A in Period 1; Do B in Period 2; etc.

- A DYNAMIC PLAN
  - Do A in Period 1,
  - BUT in Period 2:
    - If Growth, do B
    - If Stagnation, do C
    - If Loss, do D
Decision Analysis Consequences

- Education of client, discipline of decision tree encourages perception of possibilities
  - A strategy as a preferred solution
  - NOT a single sequence or a Master Plan

- In general, Second Best strategies not optimal for any one outcome, but preferable because they offer flexibility to do well in a range of outcomes

In short: It is best to buy insurance!

Consequences Example

- You can choose
  - Drive a car
  - Don’t drive

- You may have an accident - or not
  - If accident
    - Drive: Worst
    - Don’t Drive: Best
  - If no accident
    - Drive: Best
    - Don’t Drive: Worst

- Optimal Solution: Drive with insurance
  Never best - but never worst