K.T. Decision Analysis

1. Write a concise decision statement about what it is we want to decide
   - Use first four problem-solving steps to gather information
2. Specify objectives of the decision, and divide into **musts** and **wants**
3. Evaluate each alternative against the musts
   - Go vs. No Go
4. Give a weight (1-10) for each want
   - Pairwise comparison can help with relative weights
5. Score each alternative

K.T. DA Example

MUSTS		**Paint Right**		**New Spray**		**Gun Ho**
Adequate flow control		Go		Go		No Go
Acceptable appearance		Go		Go		Go
WANTS	**weight**	**Rating**	**Score**	**Rating**	**Score**	
Easy service	7	2	14	9	63	NO
Low cost	4	3	12	7	28	GO
Durability	6	8	48	6	36	
Experience	4	9	36	2	8	
Total			110		135	

K.T. Potential Problem Analysis

- Analyze potential solutions to see if there are potential problems that could arise
- Ones not analyzed in prior steps
- Particularly appropriate for analyzing safety issues

K.T. PPA Example: Buying Car

Problem	Possible Cause	Preventive Action	Contingency Plan
Improper alignment	Car in accident	Check alignment	Don't buy
Body condition	Car in accident; body rusted out	Inspect body for rust	Offer lower price
	Car in flood	Check for mold/ hidden rust	Offer lower price
Suspension problems	Hard use, poor maintenance	Check tires	Require fixes
Leaking fluids	Poor maintenance	Inspect	Require fixes
Odometer incorrect	Tampering/broken	Look for signs, check title	Offer lower price
Car ready to fall apart	Poor maintenance	Look for signs	Don't buy

Implementing Solution

- Approval
- Planning
- Carry through
- Follow up

Approval

- From authorities or clients
- Make a proposal
  - All of the presentation issues apply
  - Must especially focus on the client's goals

Planning Techniques

- Gantt chart for allocating resources, time
- Deployment chart
- Critical path analysis
- Allocating/budgeting resources

Carry Through and Follow Up

- Carry Through
  - Actual management of the implementation
- Follow Up
  - This refers to monitoring process and adjusting as necessary
  - Deadlines, budgets, relevance

Evaluation

- Evaluation should be an ongoing process throughout life of the project
- Each phase of the project should have a review to verify that goals of the phase were accomplished
- This might cause adjustments to future plans
- For each decision, carry out a PPA before implementing the solution

Evaluation Checklist

- Have you challenged the information and assumptions?
- Does the solution solve the real problem?
- Is the problem permanently solved? Or is this a patch?
- Does the solution have impact?
- Have all consequences of the solution been considered?
- Have you argued both sides, positive and negative?
- Has the solution accomplished all that it could?
- Is the solution economically efficient and justifiable?
- Have the “customers” bought in?
- Does solution cause problems (environment, safety)?

Ethics Checklist

- Is it legal? Does it violate the law, or organizational policy?
- Is it balanced? Is it fair to all concerned in short and long term? Is it a win-win solution?
- How will it make me feel about myself? Will it make me proud? How would I feel if it were published in the newspaper? If my family knew?

Multi-dimensional Problems

- Some problems ask to find an optimal solution.
  - Ex: Buy the best computer under $1000
- There may be multiple factors, and they may interact.
  - Ex: CPU, memory, disk, graphics card
- The goal can be thought of as finding the best point in a multi-dimensional space, where each point has a value
  - Ex: For some combination of CPU, memory size, disk drive, and graphics card, what is the performance?
  - Constraint: Cost < $1000

Experimental Design

- There might be so many factors, and possible values for the factors, that you can't afford to test every combination
- Experimental design refers to selecting specific combinations of factor values to test
- Ex: Test the high and low values for each factor, in combination.
  - With 4 factors, that is 16 experiments

Statistics

- Often you wish to get a measure of some performance metric from either a random event or a given population
  - Ex: Mean height of college students
  - Ex: Mean performance of a given computer configuration
- Any given event instance is not the true mean
  - It is a random variable with some distribution
  - You need to figure out how to get a reasonable estimate for the mean

Estimating Issues

- Sample the population
  - How to sample
  - How many to sample
  - How confident you are about the result
- Hypothesis testing
  - Is one mean bigger than another?
  - With what probability?
- These are the things that a statistics course attempts to teach you