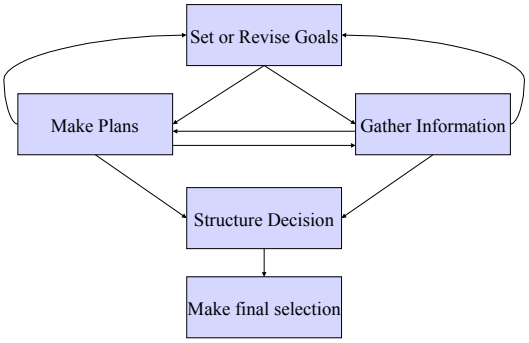
Decision Making:

- Involves evaluating alternatives and making choices among them.

Phases of Decision Making



Setting Goals

- Goals frequently determine types of decisions
- Take stock
  - Plans for future, principles/values, priorities
- "What am I trying to accomplish?"

Gathering Information

- Options
  - Choices and possible consequences of those choices
  - Choosing one and closing off another
- Criteria
  - To use when making a decision
  - Wish list
- "What are my options?"

Structuring the Decision

- Organize all the information gathered
  - Especially true for complex decisions
    - Great number of options
    - Lots of considerations
  - Need to determine or invent a way of managing all the information
- "How do I manage my information?"

Making a Final Choice

- Select from a final set of options
  - Simple or complex process
- May involve other decisions
  - When to stop gathering information
  - Deciding which information is most reliable, relevant
- "What do I want to do?"

Evaluating

- Reflect on and identify parts of process
  - That can stand some improvement
  - That ought to be used again in future decisions
- Useful but often neglected stage
- "What went well?"
- "What didn't go so well?"

Difficulties in Decision Making

- Short term Memory Limitations
  - Complex decisions with many alternatives
  - Difficult to hold all variables in memory
- Variability in Alternatives
  - Difficult to determine means of comparison
- Unknowns
  - Unanticipated variables might affect decisions

Modeling Decision Making

- Normative models
  - Specify what a person should do
  - Provide a standard for how closely actual decisions match normative decisions
- Descriptive models
  - Describe how people actually make decisions

Types of Decision Making Models

- Compensatory
- Noncompensatory
- Can be either normative or descriptive

Compensatory Models

- Allow positive attributes to compensate for negative attributes
- Difficult decisions have many attributes
  - Decide whether to eliminate from consideration
  - Decide how to account for unpleasant alternatives

Compensatory Models

- Modify summation rule
  - Makes it sensitive to other factors
  - Increase weight of attributes
- Reflect interactions between variables
  - Increase weight of combinations of attributes

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Noncompensatory Models

- Alternatives are rejected when they have negative attributes
  - No consideration of negative attributes
- Gradually eliminate alternatives with less attractive attributes

Elimination by Aspects

- Variables
  - Cost, RAM, memory, video card, upgradeable
- Computers
  - Dell, Mac, HP

Elimination by Aspects

- **Needs**
  - Costs less than $2100, Has at least 2G RAM, 120 Gig hard drive, 512 Mb video; extra RAM and drive bays.
- (Dell, HP) < $2100; (Dell, HP) 2G RAM and 120 G hard drive; (HP) has 512 Mb video card

Elimination by Aspects

- Final choice
  - Determined by order of evaluation
- Most important variables should be evaluated first
- Advantages
  - Does not require any calculations

Conjunctive Model

- Minimum requirements
  - Costs less than $2100, Has at least 2G RAM, 120 Gig hard drive, 512 Mb video; extra RAM and drive bays.
- Computers
  - Mac, Dell, HP
- Selection Process
  - Mac: $2500, 2G RAM, 160 G hard drive, 512 Mb video **- eliminate**
  - Dell: $1799, 2G RAM, 120G hard drive, 512 Mb video **- pick**
  - ~~HP: $1499 , 2G RAM, 120G hard drive, 512 Mb video~~

Conjunctive Model

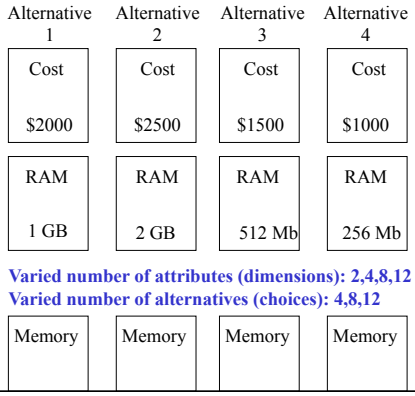
- Uses a satisficing search
  - Memory, time, or availability constraints
  - Choose first available alternative
    - Not always the best alternative

Mixed Strategy

- Decision makers work with demands of task
  - Keep within a limited capacity
  - Change strategies as task demands change
- Payne (1976)

Decision Making Research Paradigm

- Cards
  - Attributes
    - Alternatives for each attribute
- Independent variables
  - Number alternatives
  - Number attributes
- Dependent variables
  - Order in which cards were turned over
  - Verbal protocols



Decision Making Results

- Ss changed strategies as alternatives decreased
  - Many alternatives
    - Reduce complexity
      - Conjunctive, Elimination by aspects
  - Few remaining alternatives
    - Use cognitively demanding strategy
      - Additive, Additive-difference

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Expected Value

- Assessing both probability of event and consequences of actions
- Prescriptive model
- Investigated using gambling situations
  - Chances of winning (probability)
  - Money won (consequences)

Expected Value

- Expected value = P(win) X Value(win)
- Example #1

  A = 0.5 chance of winning $50

  B = 0.25 chance of winning $110
- Example #2

  A = 1 chance of winning $1

  B = 0.00000014 chance of winning $3 million

Expected Utility

- Descriptive model
- Utility = Subjective value of outcome
  - Expected utility = P(win) X Utility(win)

Subjective Expected Utility

- When having to estimate unknown probability of win
  - Subjective Expected Utility = Subjective P (win) X Utility(win)
- Descriptive model
  - Even better predictor of behavior

Heuristics

- **Heuristic**: rule of thumb or strategies that are likely to produce a correct solution
- Used when dealing with uncertainty
  - Estimate probability of an event
- Do not guarantee success
  - People sometimes fail to realize limitations of heuristic

Representativeness Heuristic

- **"Representative"** sample
  - Looks similar in important characteristics to the sample from which it was selected
    - Systematic versus random bombing

Random Looking Outcomes

- Coin toss

  HHHHHH vs. HHHTTT vs. THHTHT
- Random process so people (incorrectly) choose the sequence that appears random

  THHTHT

Sample Size

- Larger populations reflect true population distributions
- Ignore sample size in favor of representativeness
  - "Man who" arguments
- People more likely to take into account sample size in their areas of expertise

Gambler's Fallacy

- Representativeness leads to misconceptions of chance
  - Confusing independent and dependent events
  - Random looking outcomes
  - Ignoring sample size

Imagine that some psychologists have administered personality tests to 30 engineers and 70 lawyers, all people who are successful in their fields. Brief descriptions were written for each of the 30 engineers and the 70 lawyers. A sample description follows. Judge that description by indicating the probability that the person described is an engineer. Use a scale from 0 to 100.

Jack is a 45 year old man. He is married and has 4 children. He is generally conservative, careful, and ambitious. He shows no interest in political and social issues and spends most of his free time on his many hobbies which include home carpentry, sailing, and mathematical puzzles.

The probability that the man is one of 30 engineers in a sample of 100 is _____%

Base Rate

- Ignore base rate in favor of representativeness
  - Base estimate on characteristics of individual/ sample

Bill is 34 years old. He is intelligent, but unimaginative, compulsive and generally lifeless. In school, he was strong in mathematics but weak in social studies and humanities.

Which statement is more probable:

A. Bill is an accountant that plays jazz for a hobby
B. Bill plays jazz for a hobby.

Conjunction Fallacy

- Conjunction rule
  - The probability of the conjunction of two events can not be greater than the probability of its constituents
    - Accountant and jazz player can not occur more frequently than just jazz player.

Conjunction Fallacy

Table 1
Tests of the Conjunction Rule in Likelihood Rankings

		Direct test				Indirect test		
Subjects	Problem	V	R (A & B)	R (B)	*N*	R (A & B)	R (B)	Total *N*
Naive	Bill	92	2.5	4.5	94	2.3	4.5	88
	Linda	89	3.3	4.4	88	3.3	4.4	86
Informed	Bill	86	2.6	4.5	56	2.4	4.2	56
	Linda	90	3.0	4.3	53	2.9	3.9	55
Sophisticated	Bill	83	2.6	4.7	32	2.5	4.6	32
	Linda	85	3.2	4.3	32	3.1	4.3	32

Note. V = percentage of violations of the conjunction rule; R (A & B) and R (B) = mean rank assigned to A & B and to B, respectively; *N* = number of subjects in the direct test; Total *N* = total number of subjects in the indirect test, who were about equally divided between the two groups.

- Conjunction fallacy confounds researchers
  - Fallacy not prevented by knowledge of statistics

Availability Heuristic

- Estimate frequency or probability on the basis of how easily examples come to mind
- Generally useful but can lead to errors
  - Availability of examples may be influenced by something other than likelihood of occurrence

Factors affecting Availability

- Vividness
- Recency
- Familiarity

Factors affecting Availability

- Which of the following is more likely in a given year?
  - Dying from **All Accidents Combined** or from **Stroke**?
  - Dying from **Electrocution** or from **Asthma**?
  - Dying from **Homicide** or from **Diabetes**?
  - Dying from **Motor Vehicle Death** or from **Cancer of the Digestive System**?
  - Dying from **Lightning** or from **Appendicitis**?
  - Dying from **Drowning** or from **Leukemia**?

Factors affecting Availability

- Which of the following countries has the most people living in it?
  - **Morocco** or **Saudi Arabia**?
  - **Myanmar** or **Australia**?
  - **Vietnam** or **South Africa**?
  - **Sri Lanka** or **Libya**?
  - **Tanzia** or **Iraq**?

Factors affecting Availability

- Which of the following cities has the highest crime rate per 100,00 people?
  - **Detroit** or **Gary**?
  - **Chicago** or **Baltimore**?
  - **Manhattan** or **San Juan**?
  - **Boston** or **New Haven**?
  - **Dallas** or **Flint**?
  - **San Francisco** or **Durham**?

Familiarity and the Media

- What percentage of crimes are violent crimes rather than property crimes?
- What percentage of accused felons plead insanity? What percentage are acquitted?
- What percentage of convictions for felony crimes are obtained through trial instead of plea bargaining?

Other Factors Affecting Decision Making

- Framing effects
- Sunk cost effects
- Causal scenarios

Station A

- Price for Gas
  - $1.00 per gallon
- Discount for cash
  - $ 0.05 per gallon

Station B

- Price for gas
  - $.95 per gallon
- Surcharge for credit cards
  - $0.05 per gallon

Framing Effect

- Evaluate outcomes as changes from a reference point (current state)
- Description of current state
  - Determines whether outcome is seen as gain or loss
- Treat losses more seriously than equivalent gains

Sunk Cost Effects

- Never get back the investment
  - Investment does not affect likelihood of future success
- Decision should be based on expected benefits and costs of each option

Causal Scenarios

- Generating estimates of unique situations
- Construct causal scenarios
  - Stories in which one event leads to and causes another
- Probability of outcome based on ease with which scenario comes to mind

Overconfidence Phenomenon

- Decision making heuristics contribute to the overconfidence phenomena
  - Overestimate accuracy of our knowledge and judgments
  - Knowledge of phenomenon does not lead to more accurate judgments

Overconfidence Phenomenon

- Overconfidence is adaptive in the long run
  - Increases self-confidence
  - Happier lives
  - Easier to make difficult decisions
- Estimates of probability can become more accurate with prompt and clear feedback