INTELLIGENT CHOICES:

Scientific Decision-Making Based on Rationality and Creativity

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OBJECTIVE OF PRESENTATION

- To introduce a *scientific* approach, based on *rationality and creativity,* to decision-making, which we do consciously or unconsciously *every moment of our lives.*

- To present some basic concepts and tools for making *intelligent choices under uncertainty*

A SCIENTIFIC APPROACH

- Analytical
- Logical
- Systematic
- Measurable
- Repeatable

The scientific approach is based on *rationality*, which is a *part of human nature*.

To be effective, it also needs *creativity.*

A TYPICAL BUT SIMPLIFIED DECISION: CAREER CHOICES

A graduating senior is considering two choices:

(1) To take an entry position at a company for $20,000 that has a 0.4 probability of being promoted to a $30,000 staff position a year later

(2) To pursue a one-year MBA degree that costs $10,000, which he thinks that there is a 0.6 probability of completing the degree. Then, he will have a 50-50 chance of getting a $40,000 management job or a $30,000 staff job at the company. However, if he fails the MBA, then he has to take the $20,000 entry job at the beginning of the second year with the stigma of failure

APPLYING THE SCIENTIFIC APPROACH

Key decision elements based on logical analysis:

- Values: *Time* horizon, value of *money*, *intangible* values
- Alternatives: *Creative* choices
- Relationships: Utility *function* and decision *structure*
- Best choice: The *series* of intelligent choices *leading to outcome with maximum expected utility*

Quantitative or semi-quantitative analysis with creative but systematic search for the best choice

COMPLEXITY OF THE KEY ELEMENTS

- Values: objectives, *preferences -* difficult to *express* and quantify
- Alternatives: options, *choices -* requires *productive creativity* to identify
- Relationships: *linkages* between alternatives and values, payoffs, models - *little understanding* and *much uncertainty* in business, economic, and socio-political decisions
- Best choice - also requires much *creativity*

THOUGHTS ABOUT CREATIVITY

- Some interesting stories
  - Bus stop dilemma
  - Retrieving a national treasure
  - Creative better with a business implication
  - How to deal with a speeding ticket?
- Obstacles to creativity – *fear, laziness*
- Tools for creativity
  - *Brainstorming* to generate diversity in thinking
  - *Deep thinking* to understand the root cause of the problem
  - *Lateral thinking* to challenge the traditional approach
  - *Reverse thinking* to find a solution
- Challenge: *productive* creativity
- Applications:
  - Career choices
  - Torn between marriage and parental care

COMPLEXITY WITH PROBABILITY

- Event: outcome of an experiment
- Probability: *chance* of an event occurring
- Assigning probabilities:
  - *Classical*: equal-likelihood of elementary events
  - *Experimental*: relative frequency of occurrence
  - *Subjective*: decision-maker's integrated judgment
- Probability paradoxes:
  - *How to reduce bomb threats*
  - *"Let's make a deal" and decision implications*

A BASIC CONCEPT FOR INTELLIGENT CHOICES: UTILITY THEORY

- Utility (U): measure of the *relative* degree of *preference*
- Five axioms:
  - *Rankability*: For two choices A and B, either U(A)>U(B), or U(A)<U(B), or U(A)=U(B)
  - *Transitivity*: For three choices, A, B, and C, if U(A)>U(B), and U(B)>U(C), then U(A)>U(C)
  - *Computability*: For a lottery L that has outcome A with probability p and outcome B with probability 1-p, U(L)=pU(A)+(1-p)U(B)
  - *Substitutability*: If U(A)=U(B), then A and B are substitutable
  - *Continuity*: If U(A)>U(B)>U(C), then there must be a lottery L that has outcome A with probability p* and outcome C with probability 1-p* such that U(L)=p*U(A)+(1-p*)U(C)=U(B)

SOME PRACTICAL APPLICATIONS

- Utility of money
- Risk preference
- Insurance decision and risk premium
- Job offer decision
- Career decision

MORE COMPLEX DECISIONS AND ADVANCED TOOLS

- Expected value of information – decision-tree analysis and Bayes theorem
- Production decisions for uncertain demand – decision-tree and marginal analysis
- Capacity allocation decisions and shortest route problems – dynamic programming
- Resource allocation decisions – linear programming
- Social decisions – game theory
- Investment decisions with flexibility – real option analysis

INTERESTING CHARACTERISTICS OF DECISION-MAKING

- Decision-making is always *subjective*.
- Because of values, decision-making is always *emotional*, but finding the best choice is *rational*.
- People are often afraid of taking actions, which is viewed as being responsible for the consequences; however, *not taking an action is also a choice* the decision-maker will be responsible for.
- The *appropriate level of analysis is itself a decision problem*: we do not want to under-analyze which leads to rash and poor choices, nor over-analyze which leads to confusion and a waste of resources.

MAJOR STEPS TO INTELLIGENT CHOICES

- Build good *habits*: *observe more, think deeper, act intelligently and swiftly, and learn from mistakes*
- Develop *positive* mental attitude and values
- Take *total system* and *long* views
- Create *innovative alternatives* with *win-win* values
- Use *adequate analysis* to gain *understanding* of the relationships between values and alternatives
- Conduct *creative but systematic and efficient* search for the best or most intelligent choice

May we all make Intelligent Choices☺