



Decision Analysis



Decision Theory

- An analytic and systematic approach to the study of decision making
- Develop mathematical models useful in helping make the best possible decisions

Good Decisions	Bad Decisions
<ul style="list-style-type: none">- Based on logic- Considers all available data and possible alternatives- Applies the quantitative approach	<ul style="list-style-type: none">- Not based on logic- Does not use all available information- Does not consider all alternatives- Does not employ appropriate quantitative techniques



Six Steps in Decision Making

- Clearly define the problem at hand.
- List the possible alternatives.
- Identify the possible outcomes or states of nature.
- List the payoff (typically profit) of each combination of alternative and outcomes.
- Select one of the mathematical decision theory models.
- Apply the model and make your decision.



Example: Thompson Lumber Company

Step 1: Define the problem.

- Whether to expand his product line by manufacturing and marketing a new product (backyard storage sheds)



Step 2: List alternatives

- Alternative is a course of action or strategy that the decision maker can choose
- To construct:
 1. A large new plant to manufacture the storage sheds;
 2. A small plant; or
 3. No plant at all



Step 3: Identify possible outcomes

- **States of nature** – these are outcomes over which the decision maker has little or no control
- Two possible outcomes:
 1. The market for the storage sheds could be favorable
(high demand for the product)
 2. It could be unfavorable (low demand for the sheds)



Step 4: List payoffs

- **Conditional Values** – payoffs or profits resulting from each possible combination of alternatives and outcomes
- In our example, we use the profit to evaluate each consequence.
- **Decision Table or Payoff Table** – used to present these conditional values

Decision Table

Alternatives	State of Nature	
	Favorable Market	Unfavorable Market
Construct a large plant	200,000	- 180, 000
Construct a small plant	100,000	- 20, 000
Do Nothing	0	0

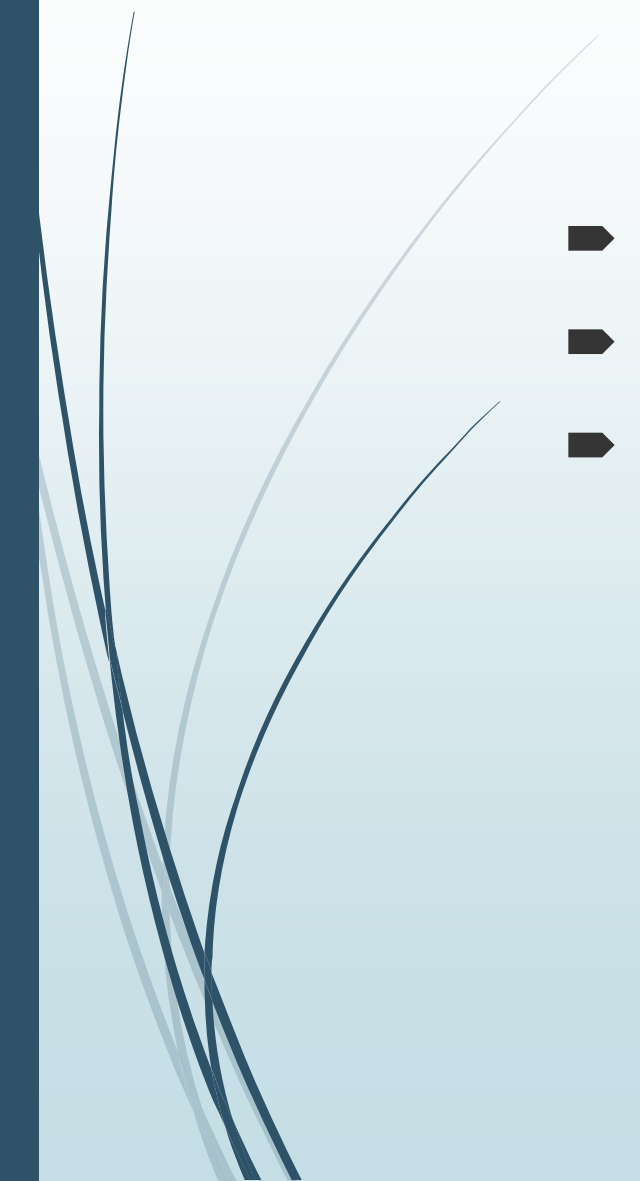


Step 5 & 6: Select and Apply the Decision Theory Model

- Selecting a model depends on the environment in which they are operating and the amount of risk and uncertainty involved.
- The types of decisions made depend on how much knowledge or information they have about the situation



Types of Decision-Making Environment

- Decision making under Certainty
 - Decision making under Uncertainty
 - Decision making under Risk
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Type 1: Decision Making under Certainty

- Decision makers know with certainty the consequence of every alternative or decision choice.
- Let us say you have 100,000 to invest for a 1-year period
 - Open a savings account paying 6% interest
 - Invest in a government Treasury bond paying 10% interest



Type 2: Decision Making under Uncertainty

- There are several possible outcomes for each alternative, and the decision maker does not know the probabilities of the various outcomes
- There exists several criteria for making decisions under these condition
 - Optimistic (maximax)
 - Pessimistic (maximin)
 - Criterion of Realism (Hurwicz)
 - Equally likely (Laplace)
 - Minimax regret



Type 3: Decision Making under Risks

- There are several possible outcomes for each alternative, and the decision maker knows the probability of occurrence of each outcome.
- The decision maker usually attempts to maximize his or her well-being
- Maximization of expected monetary value and minimization of expected opportunity loss