

## Module F — Descriptive Decision Making

---

Module developed by:  
Jennifer A. Szymanski, *USFWS Midwest Region*  
Jean Fitts Cochrane, *IAP World Services, Patuxent Wildlife Research Center*

### **START WITH A QUIZ:**

1. In the US, which cause of death is more likely to occur?
  - a) A stroke
  - b) An auto accident
  
2. If a coin will be tossed six times, which sequence is less likely to occur?
  - a) HHHTTT
  - b) THHTHT
  
3. Circle the city with the larger population size among the sets below.
  - a. Leeds vs Oxford (Great Britain)
  - b. Acapulco vs Leon (Mexico)
  - c. Mumbai vs Delhi (India)
  - d. Rio de Janeiro vs Sao Paulo (Brazil)
  
4. During the summer, a brewery's sales of canned beer are largely influenced by chance factors, such as weather and the number of people watching sporting events. In the first week of August exceptional sales of 1.2 million cans were achieved. In the absence of other information, would you judge that it is more likely that sales the following week will be?
  - a) Higher than 1.2 million
  - b) About the same
  - c) Lower than 1.2 million
  
5. Linda is 31, single, outspoken, and very bright. She majored in philosophy. As a student, she was deeply concerned with issues of discrimination and social justice, and also participated in anti-nuclear demonstrations. Which is most likely?
  - a) Linda is a bank teller
  - b) Linda is a bank teller who is active in the feminist movement

**Descriptive Decision Making**  
***An Overview of Structured Decision Making***

---

6. For a communication system to work, each of the 7 independent relay centers must be operational. Each center has a 0.90 probability of being operational at any given moment. You are about to send a message through the system. Estimate the probability that your message will reach its destination: \_\_\_\_\_.
7. Suppose that you want to acquire a new notebook computer. According to your IT contact, you are limited to four options. Your concerns—listed by relative importance--include processor speed, screen size, and weight. Among the four options, which one do you choose?

Option 1: 2.0 GHz, 15.0" LCD, 5.00 lbs      Option 2: 2.1 GHz, 13.3" LCD, 5.39 lbs  
Option 3: 2.2 GHz, 14.1" LCD, 6.11 lbs      Option 4: 1.3 GHz, 13.3" LCD, 2.72 lbs

8. Suppose that a chemical plant will leak dangerous fumes if at least one of the 10 independent subsystems fails. Each subsystem is designed to have only a 1/100 chance of failure in a course of a year. Estimate the probability of a leakage occurring in the next 12 months: \_\_\_\_\_.
9. Unfortunately, your car died today, but on the bright side you now have an excuse to buy a convertible car (something you have wanted for a long while), and by good fortune there are many on the lot from which to choose. Cost is very important to you, so you decided it is prudent to pay less than \$25,000. Of course, MPG is quite important, followed by reliability. So, you would like a vehicle that gets at least 25 miles per gallon and better than poor reliability. Also, it would be bonus if it is a fun “juicy” color (lime, cherry or lemon). Which option would you choose?

Car 1: 26K, 33 mpg, good reliability, lime  
Car 2: 23K, 25 mpg, good reliability, white  
Car 3: 30K, 33 mpg, superior reliability, cherry  
Car 4: 18K, 20 mpg, good reliability, silver  
Car 5: 20K, 22 mpg, good reliability, lemon  
Car 6: 24K, 28 mpg, good reliability, lime  
Car 7: 28K, 26 mpg, superior reliability, black  
Car 8: 24K, 28 mpg, poor reliability, cherry

10. Suppose you buy a pair of shoes. Although they were comfortable in the store, the first day you wear them, they hurt badly. A few days later you try them again, but they hurt even worse than they did the first time. You try again a few more times, to no avail. They hurt. Do you donate (or otherwise get rid of them) or do you keep them in your closet? \_\_\_\_\_

## Descriptive Decision Making *An Overview of Structured Decision Making*

---

By the end of this module, you should be able to:

Recognize some of the most common traits of human decision making

- Heuristics and tendencies used in multiple-objective decision making & associated biases
- Heuristics used in forecasting (predicting the future) & associated biases

Explain how these tendencies can keep us from making 'best' or optimal decisions

Use a few strategies for guarding against psychological pitfalls in decision making

### Psychology of Decision Making

Study of how people *typically* make decisions ~ or '**descriptive**' decision making

- ❖ We have innate cognitive processes that enable us to make decisions despite our limited capacity for processing complex and uncertain information
- ❖ We've evolved to be reasonably good decision-makers in the kinds of situations we encountered throughout evolution
- ❖ We exhibit "bounded rationality" – in other words, we (mostly) make decisions rationally, but within constraints or bounds.
- ❖ We "satisfice." We pick the first 'pretty good' choice & do not search systematically for 'best' solutions.
  - Jump to alternatives
  - Use rules-of-thumb ("heuristics")
  - Simplify complex problems
- ❖ These cognitive tendencies and short-cuts often bias our perceptions and lead to sub-optimal decisions, sometimes dramatically

In contrast, structured decision making is '**prescriptive**' decision making

- ❖ A rational framework for how people *should* make decisions, if they want to get as close their true objectives as they can, and techniques to aid them in doing so

**Descriptive Decision Making**  
***An Overview of Structured Decision Making***

---

Some Common Heuristics in Multiple Objective Decision Making

1. Recognition Heuristic – choice based on familiarity or recognition (Q3)
  - ❖ Works well when recognition is tightly correlated with the quality of the option
  
2. Minimalist Strategy – uses the first objective in mind, randomly
  - ❖ “Take the Best” is a variant –uses the first attribute that differentiates between the alternatives
  
3. Take the Last – pick the same option you did in the last decision (*status quo*)
  - ❖ Works if the “last” is correlated with quality of the options you are currently evaluating.
  
4. Use the single most important attribute only (“Lexicographic Strategy”) (Q7)
  - ❖ Works well when the one attribute is considerably more important than all others or when data are scant
  - ❖ Can produce nonsensical choices or violate the axiom of “transitivity” (*if A is better than B, and B better than C, then A must be better than C*)
  
5. Eliminate alternatives by establishing threshold value for important attribute(s) (“Elimination by Aspects”) (Q9)
  - ❖ Easy to apply & explain (avoids detailed trade-off assessments)
  - ❖ But not a thorough search – could miss a more-optimal solution outside the thresholds
  
6. Reason-based choice
  - ❖ Choose alternative based on reason
  - ❖ We often use this heuristic if justification will be required for the decision
  - ❖ Sensitive to how the decision is framed

**Descriptive Decision Making**  
***An Overview of Structured Decision Making***

---

Common Tendencies & Biases (in Multiple-objective Decision Making)

1. Sunk costs – decide based on past investment, disregarding future (Q10)
  
2. Escalation of commitment – continue investing in a suboptimal choice
  
3. Motivational bias – allow self-interests to color decision, disregarding or out of proportion with other objectives
  
4. Confirmation bias - focus inordinate attention on evidence that confirms your beliefs

Heuristics used in Forecasting  
(predicting the future, especially probabilities)

1. Anchoring & Adjustment  
- substantially influenced by a starting point, which acts as an anchor

Example: 2 groups asked to estimate the product of the same number set, but given in different order:

Group 1:  $8 \times 7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1 \rightarrow 2250$

Group 2:  $1 \times 2 \times 3 \times 4 \times 5 \times 6 \times 7 \times 8 \rightarrow 512$

Anchoring can lead to:

- ❖ Conservatism
  
- ❖ Overconfidence
  - ❖ Tendency to overconfidence or underestimating the uncertainty in subjective judgments is very common, unless a person has repeated experience with feedback on their judgment
  
- ❖ Overestimating probability of “conjunctive” events (this *and* that) (Q6)
  
- ❖ Underestimating probability of “disjunctive” events (this *or* that) (Q8)

**Descriptive Decision Making**  
***An Overview of Structured Decision Making***

---

2. Availability – estimate probabilities based on how easily we can think of examples. We tend to search our mind to recall examples of the issue of interest or try to imagine circumstances that lead to the issue. Recall is best for events that are:
- » Vivid
  - » Recent
  - » Unusual
  - » Newsworthy

The availability heuristic is misleading when the recalled event has limited relationship to the probability of an event occurring in the future. Can lead us to:

- Underestimate events that are difficult to imagine
- Overestimate events that are easily recalled (Q1)

3. Representativeness - tendency to judge events by their degree of similarity to other familiar events or some stereotypic image

Representativeness may lead to:

- Ignoring the inherent probability of events (“base-rate frequencies”)
- Expecting *sequences* of events to be or appear to be random (Q2)
- Ignoring the odds that outlier events will be followed by less extreme events (“regression to the mean”) (Q4)
- Expecting the probability of joint events to be larger than the probability of the component events (“conjunctive fallacy”) (Q5)

*Think of a recent decision – did you use any of these heuristics or tendencies?*

---

---

---

**Descriptive Decision Making**  
***An Overview of Structured Decision Making***

---

Guarding Against Cognitive Biases & Tendencies

For Multiple Objective Decisions

***When you are the decision maker:***

- ❖ Use structured decision making
- ❖ Seek review by others (requires transparency, documentation)

***When assisting the decision maker:***

- ❖ Alert them to common tendencies
- ❖ Be clear how they will be accountable for the decision
  - ❖ Documentation for scrutiny
- ❖ Listen for “ought” or “should”
  - ❖ Seek to ferret out hidden objectives and motivations
- ❖ Decompose the problem into smaller questions (SDM)

For Forecasting Outcomes

- ❖ Be alert to cognitive tendencies (e.g., anchoring and overconfidence)
- ❖ Review breadth of relevant information before asking for specific judgments
- ❖ Point out differences between this question and other situations that may be dominating thoughts
- ❖ Provide training and practice with feedback to improve performance
- ❖ Think about extreme outcomes and explain how they would occur (make this possibility ‘available’)
- ❖ Elicit extreme endpoints first

## Cognitive Biases & Tendencies in Group Decision Making

Groups may be more – or less – prone to the same heuristics and tendencies as described for individuals. For example:

### **Representativeness –**

If stereotypes are readily available, groups tend to be even more biased by them than are individuals. However, if no relevant stereotype exists, then groups tend to be less biased by representativeness (reliance on familiar examples) than are individuals.

### **Conjunctive fallacy –**

Groups are more susceptible to this than are individuals

### **Anchoring –**

Groups and individuals share this pitfall.

**Group Think** is the well-known example, where a group settles on one belief, preference, or alternative and stops evaluating alternatives or even accepting contrary information.

Six Conditions that Promote Group Think:

- ❖ High group cohesiveness
- ❖ Authoritarian-style leader
- ❖ Insularity
- ❖ No definite procedure for decision making (no SDM!)
- ❖ Similar backgrounds and viewpoints among group members
- ❖ Group is in a complex decision-making situation that causes stress

**Guarding Against Group Think** Methods are available to reduce non-optimal thinking in groups, including:

- ❖ Structured decision making
- ❖ Delphi methods

*Take home message → be aware that there are inherent heuristics & common tendencies that may be used in decision making, and that they can lead to biases. Take appropriate steps to minimize these biases.*