**OBJECTIVES**

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

* Recognize what a decision is, what is meant by a ‘good’ decision, and what makes decisions hard
* Recognize some of the most common traits of human decision‐making
* Heuristics and tendencies used in multiple‐objective decision making, and associated biases
* Heuristics used in forecasting (predicting the future), and associated biases
* Cognitive biases and tendencies in group decision making
* Explain how these tendencies can keep us from making decisions that are in our best interest

**WHAT IS A DECISION?**

* “Decisions are the only means you have to change your future life.” Ronald Howard
* A decision is a conscious choice among two or more alternatives that allocate resources (e.g., time, money) in a decision-maker’s control. For example,
* I decide to take the day off and go fishing.
* You buy a new car
* An important decision is characterized by an irrevocable allocation of resources. Irrevocable in the sense that the allocation cannot be undone without substantial loss or cost.
* Halfway to the fishing spot I remember a deadline and turn around.
* You try out the car for a week and then return it to the dealer.
* Some things represent an intention to allocate resources but are not actually a decision. Planning is a mental commitment, but not an actual commitment of resources.
* At what point does planning become a decision?

**Your important decisions**

* Think of 5 important decisions you’ve made in the last 5 years or so
* List them here (think about these decisions throughout the course)

1.

2.

3.

4.

5.

**How do you know when you’ve made a good decision?**

* When you achieve a good result?
* Or when you follow a good process?
* Choices (even smart ones) do not always result in good outcomes because the future is often uncertain
* There are no guarantees. We want to follow a decision process that will improve, or even maximize, the chance for a good outcome.

**What makes decisions hard?**

* The objectives may be hard to identify because they are complex, contradictory, or in dispute
* Sometimes you don’t know all the possible choices or alternatives
* Uncertainty about what will result from a decision is a major challenge
* The best choice among complex alternatives may be difficult to figure out because of tradeoffs among objectives and uncertainty in the outcomes

**Why do we structure our decision making?**

* Structuring a decision helps us deal with those challenges and avoid some human foibles
* Structured decision making represents the ‘best management practices’ for making a good decision in the sense that it improves our chances of meeting our objectives and achieving what we want
* We want a rational approach to decision making (AKA normative decision making)

Before we dive into structured decision making, let’s talk a bit about human decision making

How does the human mind intuitively approach decisions?

**START WITH A QUIZ** (source: Daniel Kahneman “Thinking Fast and Slow”)

1. A bat and a ball cost $1.10 in total. The bat cost $1.00 more than the ball. How much does the ball cost?
2. If it takes 5 machines 5 minutes to make 5 widgets, how long would it take 100 machines to make 100 widgets?
3. In a lake, there is a patch of lily pads. Every day, the patch doubles in size. If it takes 48 days for the patch to cover the entire lake, how long would it take for the patch to cover half of the lake?

**HOW THE MIND INTUITIVELY MAKES DECISIONS**

* The human mind tends to jump to conclusions using heuristics and cognitive biases
* We rely on easily available information and substitute an ‘easier’ question for the real question
* The better we feel about the easier question, the more confident we are about our judgement (but if you are solving the wrong problem, that confidence may be misplaced)
* Kahneman and colleagues postulate two cognitive systems (System 1 and System 2)
* System 1 makes snap judgments
* System 2 does the hard thinking but it’s lazy and defers to System 1
* In what ways can System 1 and System 2 be advantageous or disadvantageous?

A Quick Puzzle (source: The New York Times)

* I’ve chosen a rule that some sequences of three numbers obey — and some do not. Your job is to guess what the rule is.
* I’ll start by telling you that the following sequence obeys the rule: 2, 4, 8
* Give me 3 numbers and I will tell you if they obey the rule
* Can you describe the rule, or do you want to test another sequence?

Confirmation Bias

* The previous test is intended to illustrate confirmation bias
* People tend to stop after one guess and confirmation rather than test further, in part, because people do not want to get it wrong
* But proposing an incorrect sequence could be informative
* Can you share any examples of confirmation bias from your professional or personal life?

Heuristics and Cognitive Biases

* Humans are subject to a number of heuristics and cognitive biases
* In decision making, cognitive biases and heuristics can lead to:
* Failure to carefully define the problems that we are trying to solve
* Failure to identify and properly account for all our objectives
* Being too restrictive and narrow when we identify a set of alternatives
* Insufficiently considering the consequences of our actions
* Any of the above can make it less likely that we will meet our objectives

Heuristics and Cognitive Biases

* Confirmation bias ‐ focus inordinate attention on evidence that confirms your beliefs
* Motivational bias – allow self‐interests to color decision, disregarding or out of proportion with other objectives
* Sunk costs – decide based on past investment, disregarding future
* Escalation of commitment – continue investing in a suboptimal choice

Question

* 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?
  + Which of the cognitive traps does this relate to?
  + What examples can you share from your professional or personal life?

Sunk Costs

* Decide based on past investment, disregarding future
* Related to that is escalation of commitment – continue investing in a suboptimal choice
* Examples of sunk costs?

Question

* For this question we will divide the class in half and each half will answer a different question.
* First, if your birthday is between January and June inclusive, close your eyes. The rest of the class keep your eyes open and write down answers to the question on the screen
* Second, if your birthday is between July and December inclusive, close your eyes. The rest of the class keep your eyes open and write down answers to the question on the screen.
* Now everyone open your eyes. Let’s hear some of the answers. Are any patterns apparent?
* The last question is designed to illustrate a heuristic, or ‘mental shortcut’ called anchoring. There are several such heuristics that effect forecasting.

Anchoring

* We are better at thinking relatively than absolutely.
* We tend to anchor on the first piece of information we get, and then adjust.
* Our final answer tends to be pulled in the direction of that initial information.
* Other examples?

Heuristics and cognitive biases that affect forecasting

* There are a variety of heuristics and biases that affect our ability to do forecasting – our ability to make predictions
* Why are these heuristics and biases important? We must forecast to make decisions.

Question

* Which caused more fatalities in the US between 1990‐2006, shark attacks or sand hole collapses?

Availability heuristic

* We tend to judge probability of events by the ease with which events come to mind (i.e., the availability of information)
* Thus, if you can think of more examples of an event, then you will tend to think it is more likely to occur
* This can be misleading if there is not a correlation between the ‘availability’ of events and their frequency.

Question

* From a series of coin tosses, which is more likely: HHTTHTHTTH or HHHHHHHHHH?

Representativeness heuristic

* We tend to judge the frequency or likelihood of an event by the extent to which it resembles the typical case
* This can lead to overestimating the likelihood of an event because inherent frequencies are ignored

Question

* Linda is 31 years old, 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 of the following two alternatives is more probable?
  + - Linda is a bank teller
    - Linda is a bank teller and active in the feminist movement

Conjunction fallacy

* + The probability of the conjunction of 2 events cannot be greater than each event alone.
  + Kahneman and Tversky argue that we seek the closest match between cause and effect (here, between Linda’s background and her behavior)
  + Humans might do better at assessing frequencies than probabilities. “How many out of 100” versus “Which is the more probable alternative”.

Question

Unfortunately, your car died today, but on the bright side you now have an excuse to buy a new 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

Some common heuristic strategies for making decisions

* Elimination by Aspects ‐ Eliminate alternatives by establishing threshold value for the most important attribute(s) (same as the ‘new car buying’ example)
* Easy to apply and explain (avoids detailed trade‐off assessments)
* Not a thorough comparison – could miss a better solution that lies just outside the thresholds
* Minimalist Strategy – uses the first objective in mind, randomly
* “Take the Best” is a variant – uses the first attribute that differentiates between the alternatives
* Recognition Heuristic – choice based on familiarity or recognition
* Works well when recognition is tightly correlated with the quality of the option
* 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.
* Lexicographic Strategy – Use the single most important attribute only
* Works well when the one attribute is considerably more important than all others or when data are scant
* Satisficing ‐ the first choice evaluated to meet cutoff values for all attributes is chosen, even if it is not the best
* Same pluses and minuses as Elimination by Aspect
* Pros and Cons – all choices are compared to the cutoff values for each attribute, and the choice that has the most "pros" that exceed the cutoff values is the chosen
* A bit more thorough than Satisficing but falls short of a thorough comparison of alternatives and evaluation of tradeoffs

Take home messages about heuristics and cognitive biases

* Heuristics are not exclusively bad things – consider the heuristic Sully Sullenberger used to decide whether to land in the Hudson River. Also, for decisions with small consequences, heuristics can work fine.
* They can cause you to limit the search for relevant information
* They can make you rely on innate, standardized shortcuts
* They can lead you to be overconfident by discounting complexity or disconfirming information
* They often bias our perceptions and lead to sub‐optimal decisions, sometimes dramatically

**Sully Sullenberger used the “gaze heuristic” to decide not return to LaGuardia, but instead to execute an emergency water landing in the Hudson River after bird strikes caused multiple engine failure. The gaze heuristic is “Fix your gaze on the tower: If the tower rises in your windshield you won’t make it.” There’s lots of system 2 thinking from geometry and aerodynamics, which has been boiled down into something that can be implemented with system 1 thinking. In this case, not only is a heuristic adequate, it’s essential because of limited time. The hard structured thinking was done well before it was needed and passed along to pilots through training in the form of a heuristic.**

Group Think

* The short cuts and pitfalls in individual judgement, forecasting, and decision making are also present in group dynamics.
* In addition, groups are subject to insular thinking (i.e., group think), which narrowed thinking and incomplete analysis of the problem and solution.
* Group think is fostered by
* High group cohesiveness
* Authoritarian‐style leadership
* Insularity
* Absence of structured process
* Similar backgrounds and viewpoints
* Complex situation that causes stress

Challenger: The Untold Story Part 7 of 10 (9 minutes 30 seconds)

<https://www.youtube.com/watch?v=xV25ol-NedQ>

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