DECISION MAKING

You have to make decisions both large and small throughout every single day of your life. What do you want to have for breakfast? What time should you meet a friend for dinner? What college should you go to? How many children do you want to have?

When faced with some decisions, you might be tempted to just flip a coin and let chance determine your fate. In most cases, we follow a certain strategy or series of strategies in order to arrive at a decision. For many of the relatively minor decisions that we make each and every day, flipping a coin wouldn’t be such a terrible approach. For some of the complex and important decisions, we are more likely to invest a lot of time, research, effort, and mental energy into coming to the right conclusion. So how exactly does this process work? The following are some of the major decision-making strategies that you might use:

The Single-Feature Model

This approach involves hinging your decision solely on a single-feature. For example, imagine that you are buying soap. Faced with a wide variety of options at your local superstore, you decide to base your decision on price and buy the cheapest type of soap available. In this case, you ignored other variables (such as scent, brand, reputation, and effectiveness) and focused on just a single feature.

The single-feature approach can be effective in situations where the decision is relatively simple and you are pressed for time. However, it is generally not the best strategy when dealing with more complex decisions.

The Additive Feature Model

This method involves taking into account all the important features of the possible choices and then systematically evaluating each option. This approach tends to be a better method when making more complex decisions. For example, imagine that you are interested in buying a new camera. You create a list of important features that you want the camera to have, then you rate each possible option on a scale of -5 to +5. Cameras that have important advantages might get a +5 rating for that factor, while those that have major drawbacks might get a -5 rating for that factor. Once you have looked at each option, you can then tally up the results to determine which option has the highest rating.

The additive feature model can be a great way to determine the best option among a variety of choices. As you can imagine, however, it can be quite time consuming and is probably not the best decision-making strategy to use if you are pressed for time.

The Elimination by Aspects Model

The elimination by aspects model was first proposed by psychologist Amos Tversky in 1972. In this approach, you evaluate each option one characteristic at a time beginning with whatever feature you believe is the most important. When an item fails to meet the criteria you have established, you cross the item off your list of options. Eventually, your list of possible choices gets smaller and smaller as you cross items off the list until you eventually arrive at just one alternative.

Making Decisions in the Face of Uncertainty

The previous three processes are often used in cases where decisions are pretty straightforward, but what happens when there is a certain amount of risk, ambiguity, or uncertainty involved? For example, imagine that you are running late to your psychology class. Should you drive above the speed limit in order to get there on time, but risk getting a speeding ticket? Or should you drive the speed limit, risk being late, and possibly get docked points for missing a scheduled pop quiz? In this case, you have to weigh the possibility that you might be late for your appointment against the probability that you will get a speeding ticket.

When making a decision in such a situation, people tend to employ two different decision-making strategies: the availability heuristic and the representativeness heuristic. Remember, a heuristic is a rule-of-thumb mental short-cut that allows people to make decisions and judgments quickly. Every day, people are inundated with decisions, big and small. Understanding how people arrive at their choices is an area of cognitive psychology that has received attention. Theories have been generated to explain how people make decisions, and what types of factors influence decision making in the present and future. In addition, heuristics have been researched to understand the decision making process.

Several factors influence decision making. These factors, including past experience, cognitive biases,
and individual difference, belief in personal relevance, and an escalation of commitment, influence what choices people make. Understanding the factors that influence decision making process is important to understanding what decisions are made. That is, the factors that influence the process may impact the outcomes.

Heuristics serve as a framework in which satisfactory decisions are made quickly and withease. Many types of heuristics have been developed to explain the decision making process; essentially, individuals work to reduce the effort they need to expend in making decisions and heuristics offer individuals a general guide to follow, thereby reducing the effort they must disburse. Together, heuristics and factors influencing decision making are a significant aspect of critical thinking here is some indication that this can be taught, which benefits those learning how to make appropriate and the best decisions in various situations.

People make decisions about many things. They make political decisions; personal decisions, including medical choices, romantic decisions, and career decisions; and financial decisions, which may also include some of the other kinds of decisions and judgments. Quite often, the decision making process is fairly specific to the decision being made. Some choices are simple and seem straight forward, while others are complex and require a multi-step approach to making the decisions.

**Heuristics**

Heuristics are general decision making strategies people use that are based on little information, yet very often correct; heuristics are mental short cuts that reduce the cognitive burden associated with decision making. Heuristics reduce work in decision making in several ways. Heuristics offer the user the ability to scrutinize few signals and/or alternative choices in decision making. In addition, heuristics diminish the work of retrieving and storing information in memory; streamlining the decision making process by reducing the amount of integrated information necessary in making the choice or passing judgment.

When making decisions or judgments, we often use mental shortcuts or "rules of thumb" known as heuristics. For every decision, we don't always have the time or resources to compare all the information before we make a choice, so we use heuristics to help us reach decisions quickly and efficiently. Sometimes these mental shortcuts can be helpful, but in other cases they can lead to errors or cognitive biases.

**Representativeness heuristic:**

The representativeness heuristic is one type of heuristic that we use when making judgments. In this particular example, we estimate the likelihood of an event by comparing it to an existing prototype that already exists in our minds. Our prototype is what we think is the most relevant or typical example of a particular event or object.

The representativeness heuristic was first described by psychologists Amos Tversky and Daniel Kahneman during the 1970s. Like other heuristics, making judgments based upon representativeness is intended to work as a type of mental shortcut, allowing us to make decisions quickly. However, it can also lead to errors. When we make decisions based on representativeness, we may be likely to make more errors and more likely to overestimate the likelihood that something will occur. Just because an event or object is representative does not mean that it is more likely to occur.

Consider the following description:

Sarah loves to listen to New Age music and faithfully reads her horoscope each day. In her spare time, she enjoys aromatherapy and attending a local spirituality group.

Based on the description above, is Sarah more likely to be a school teacher or a holistic healer? Many people would identify her as a holistic healer based on representativeness. She fits in with our existing ideas of how a holistic healer might behave. In reality, it is far more likely that Sarah is actually a school teacher based purely on probability. School teachers are far more common than holistic healers.

In their classic experiment, Tversky and Kahneman presented the following description to a group of participants:

"Tom W. is of high intelligence, although lacking in true creativity. He has a need for order and clarity, and for neat and tidy systems in which every detail finds its appropriate place. His writing is rather dull and mechanical, occasionally enlivened by somewhat corny puns and by flashes of imagination of the sci-fi type. He has a strong drive for competence. He seems to feel little sympathy for other people and does not enjoy interacting with others. Self-centered, he nonetheless has a deep moral sense."

The participants were then divided into three separate groups and each group was given a different task.
The first group was asked how similar Tom was to one of nine different college majors. The majority of participants in this group believed Tom was most similar to an engineering major and least similar to a social science major.

Participants in the second group were asked to rate the probability that Tom was one of the nine majors. The probabilities given by the participants in the second group were very similar to the responses given by those in the first group.

In the third group, participants were asked a question unrelated to Tom's description. They were asked to estimate what percentage of first-year graduate students were in each of the nine majors.

What the researchers found was that people were highly likely to believe that Tom was an engineering major, despite the fact that there was a relatively small number of engineering students at the school where the study was conducted. People were likely to believe that Tom was an engineering major based on representativeness, ignoring other pertinent information such as the small number of engineering students.

"The representativeness heuristic is the tendency to judge the frequency or likelihood of an event by the extent to which it resembles the typical case. For example, in a series of 10 coin tosses, most people judge the series HHTTHTHTHTH to be more likely than the series HHHHHHHHHH (where H is heads and T is tails), even though both series are equality likely. The reason is that the first series looks more random than the second series. It "represents" our idea of what a random series should look like."

(Roy F. Baumeister & Brad J. Bushman, *Social Psychology and Human Nature*, 2011)

"The representativeness heuristics affects many real-life judgments and decisions. For example, jury decisions depend partly on the degree to which a defendant's actions are representative of a particular crime category. So someone who abducts a child and asks for ransom is more likely to be convicted of kidnapping than someone who abducts and adult and demands no ransom. Both crimes constitute kidnapping, but the first is a more representative example."

"For an illustration of judgment by representativeness, consider an individual who has been described by a former neighbor as follows: "Steve is very shy and withdrawn, invariably helpful, but with little interested in people, or in the world of reality. A meek and tidy soul, he has a need for order and structure, and a passion for detail." How do people assess the probability that Steve is engaged in a particular occupation form a list of possibilities (for example, farmer, salesman, airline pilot, librarian, or physician)? ... In the representativeness heuristic, the probability that Steve is a librarian, for example, is assessed by the degree to which his is representative of, or similar to, the stereotype of a librarian."

**Availability heuristic:**

An availability heuristic is a mental shortcut that relies on immediate examples that come to mind. When you are trying to make a decision, a number of related events or situations might immediately spring to the forefront of your thoughts. As a result, you might judge that those events are more frequent and possible than others. You give greater credence to this information and tend to overestimate the probability and likelihood of similar things happening in the future. The term was first coined in 1973 by psychologists Amos Tversky and Daniel Kahneman. They suggested that the availability heuristic occurs unconsciously and operates under the principle that "if you can think of it, it must be important." Things that come to mind more easily are believed to be far more common and more accurate reflections of the real world.

For example, after seeing several news reports about car thefts, you might make a judgment that vehicle theft is much more common than it really is in your area. This type of availability heuristic can be helpful and important in decision-making. When faced with a choice, we often lack the time or resources to investigate in greater depth. Faced with the need to an immediate decision, the availability heuristic allows people to quickly arrive at a conclusion.

While it can be useful at times, the availability heuristic can lead to problems and errors. Reports of child abductions, airplane accidents, and train derailments often lead people to believe that such events are much more typical than they truly are.

After seeing news reports about people losing their jobs, you might start to believe that you are in danger of being layed-off. You start lying awake in bed each night worrying that you are about to be fired.
• After seeing several television programs on shark attacks, you start to think that such incidences are relatively common. When you go on vacation, you refuse to swim in the ocean because you believe the probability of a shark attack is high.

• After reading an article about lottery winners, you start to overestimate your own likelihood of winning the jackpot. You start spending more money than you should each week on lottery tickets.

"Perhaps the most obvious demonstration of availability in real life is the impact of the fortuitous availability of events or scenarios. Many readers must have experienced the temporary rise in the subjective probability of an accident after seeing a car overturned by the side of the road. Similarly, many must have noticed an increase in the subjective probability that an accident or malfunction will start a thermonuclear war after seeing a movie in which such an occurrence was vividly portrayed. Continued preoccupation with an outcome may increase its availability, and hence its perceived likelihood. People are preoccupied with highly desirable outcomes, such as winning the sweepstakes, or with highly undesirable outcomes, such as an airplane crash. Consequently, availability provides a mechanism by which occurrences of extreme utility (or disutility) may appear more likely than they actually are."

"The availability heuristic refers to a tendency to form a judgment on the basis of what is readily brought to mind. For example, a person who is asked whether there are more English words that begin with the letter t or the letter k might try to think of words that begin with each of these letters. Since a person can probably think of more words beginning with t, he or she would (correctly) conclude that t is more frequent than k as the first letter of English words."

"People not only consider what they recall in making a judgment but also use the ease or difficulty with which that content comes to mind as an additional source of information. Most notably, they only rely on the content of their recall if its implications are not called into question by the difficulty that they experience in bringing the relevant material to mind."

**Anchoring and adjustment**

Anchoring and adjustment is a psychological heuristic that influences the way people intuitively assess probabilities. According to this heuristic, people start with an implicitly suggested reference point (the “anchor”) and make adjustments to it to reach their estimate. A person begins with a first approximation (anchor) and then makes incremental adjustments based on additional information. These adjustments are usually insufficient, giving the initial anchor a great deal of influence over future assessments.

The anchoring and adjustment heuristic was first theorized by Amos Tversky and Daniel Kahneman. In one of their first studies, participants were asked to compute, within 5 seconds, the product of the numbers one through eight, either as 1 × 2 × 3 × 4 × 5 × 6 × 7 × 8 or reversed as 8 × 7 × 6 × 5 × 4 × 3 × 2 × 1. Because participants did not have enough time to calculate the full answer, they had to make an estimate after their first few multiplications. When these first multiplications gave a small answer – because the sequence started with small numbers – the median estimate was 512; when the sequence started with the larger numbers, the median estimate was 2,250. (The correct answer was 40,320.) In another study by Tversky and Kahneman, participants observed a roulette wheel that was predetermined to stop on either 10 or 65. Participants were then asked to guess the percentage of the United Nations that were African nations. Participants whose wheel stopped on 10 guessed lower values (25% on average) than participants whose wheel stopped at 65 (45% on average). The pattern has held in other experiments for a wide variety of different subjects of estimation.

**Over confidence:**

When asked how confident people are in the accuracy of their beliefs or answers to particular questions, data show that confidence consistently exceeds accuracy; that is, people are more confident that they are right than they should reasonably be. For instance, if subjective assessments were really correlated with reality, then subjects who claimed to be “100% confident” in their answers should be right 100% of the time; if they were “80% confident” they should be right 80% of the time, and so on. Yet this is of course not how things work, in particular when subjects are answering harder questions about unfamiliar questions. In an experiment by subjects were given a spelling task and asked to assess their confidence in their answers. When claiming that they were “100% certain” the test subjects would be right 80% of the time. In a different experiment, subjects were made to answer a series true-or-false responses to general knowledge statements, and were overconfident at all levels; a confidence of “100% certainty” corresponded to an accuracy of 80%. The overconfidence effect is pervasive, and persists even when subjects have been made explicitly aware of the bias and how it works.

A related effect is the planning fallacy, the tendency for subjects overestimate their own rate of work
and how long it will take to get things done when the tasks are big or complicated.

**Confirmation bias:**

Confirmation bias is the tendency of people to favor information that confirms their beliefs or hypotheses. People display this bias when they gather or remember information selectively, or when they interpret it in a biased way. The effect is stronger for emotionally charged issues and for deeply entrenched beliefs. People also tend to interpret ambiguous evidence as supporting their existing position. Biased search, interpretation, and memory have been invoked to explain attitude polarization (when a disagreement becomes more extreme even though the different parties are exposed to the same evidence), belief perseverance (when beliefs persist after the evidence for them is shown to be false), the irrational primacy effect (a greater reliance on information encountered early in a series) and illusory correlation (when people falsely perceive an association between two events or situations).

A series of experiments in the 1960s suggested that people are biased toward confirming their existing beliefs. Later work re-interpreted these results as a tendency to test ideas in a one-sided way, focusing on one possibility and ignoring alternatives. In certain situations, this tendency can bias people's conclusions. Explanations for the observed biases include wishful thinking and the limited human capacity to process information. Another explanation is that people show confirmation bias because they are weighing up the costs of being wrong, rather than investigating in a neutral, scientific way.

**The framing effect:**

THE term framing effect refers to a phenomenon whereby the choices people make are systematically altered by the language used in the formulation of options. How a problem is worded (or framed), either in terms of cost or value effects how people make decisions. The difference between a perceived loss or perceived gain helps people reach a decision.

**Example:**

You are a patient with lung cancer. Which of the following two option would you prefer?

**Surgery:** Of 100 people having surgery 90 live through the post-operative period, 68 are alive at the end of the first year and 34 are alive at the end of five years.

**Radiation Therapy:** Of 100 people having radiation therapy all live through the treatment, 77 are alive at the end of one year and 22 are alive at the end of five years.

You are a patient with lung cancer. Which of the following two option would you prefer?

**Surgery:** Of 100 people having surgery 10 die during surgery or the post-operative period, 32 die by the end of the first year and 66 die by the end of five years.

**Radiation Therapy:** Of 100 people having radiation therapy none die during treatment, 23 die by the end of one year and 78 die by the end of five years.

**Results:** respondents who favored radiation therapy rose from 18% to 44%- no difference when subjects were patients or physicians.

**The sunk cost effect:**

A sunk cost is a retrospective (past) cost that has already been incurred and cannot be recovered. Sunk costs are sometimes contrasted with prospective costs, which are future costs that may be incurred or changed if an action is taken. Both retrospective and prospective costs may be either fixed (continuous for as long as the business is in operation and unaffected by output volume) or variable (dependent on volume) costs.

**Example:**

As the owner of a printing company, you must choose whether to modernize your operation by spending $200,000 on a new printing press or on a fleet of new delivery trucks. You chose to buy the press, which works twice as fast as your old press at about the same cost as the old press. One week after your purchase of the new press, one of your competitors goes bankrupt. To get some cash in a hurry, he offers to sell you his computerized printing press for $10,000. This press works 50% faster than your new press at about one-half the cost. You know that you will not be able to sell your new press to raise this money since it was built specifically for your needs and cannot be modified. However, you do have $10,000 in savings. The question is should you buy the computerized press from you bankrupt competitor?

**Rational decision making:**

**Steps in rational decision making:**

1. Identify all possible options (including doing nothing).
2. Quantify the value (or cost) of consequences which may arise if each course of action is adopted.
3. Assess the likelihood of each consequence actually happening.
4. Integrate across all possibilities.
5. Quantifying cost and value, and computing all options is cognitively expensive.
6. Isn't descriptive. It doesn't explain how people do make decisions- or allow for the prediction of how people make decisions.
7. Expected value doesn't take into account things like “subjective utility”. (Lottery: odds of winning...
Bays rule
The ultimate optimal statistical model for making decisions under uncertainty- starting point for all comparisons. People tend to use only the likelihood ratio in making decisions. $P(H_1 | D)$: Conditional probability that event $H_1$ will occur, given that $D$ has occurred.

**REASONING**

Reasoning is the capacity for a person to make sense of things to establish & verify facts, rationally work through data, information, facts, and beliefs. It is the process of forming conclusions and judgments from facts or premises. To put it plain and simple; it is the ability to coherently think from perceived premise to a logical conclusion.

**Types of Reasoning**

There are two main types of reasoning: Inductive Reasoning and Deductive Reasoning. However there are several other types of reasoning. Which are all related to each other.

**Deductive Reasoning** - Deductive reasoning is the form of reasoning in which a conclusion follows logically and coherently from the factual premises and proposition. These deductive arguments are based upon the concept of sound and consistent reasoning. If the premises are true, than the systematic reasoning with a constructed syllogism is considered valid in a deductive argument in making its conclusion certain with a degree of logical certainty. Plainly speaking, deductive reasoning is the rationality of reasoning from pure logic. It is considered sound and pure logic.

**Inductive Reasoning** - Inductive reasoning is a form of reasoning that uses analogies, examples, observations, and experiences to form conclusive propositions. Inductive logic also uses experiences to formulate statements based on general observations of recurring patterns in nature, science, and everyday occurrences pulling from such things as samples cases, experiments, and natural eye observations. It is used mostly to explain properties and relations to objects or types based on previous observations. It must be understood that inductive arguments do not try to establish their conclusions through absolute certainty, but through observable and predictive certainty.

**Syllogistic reasoning:** A syllogism is a kind of logical argument in which one proposition (the conclusion) is inferred from two or more others (the premises) of a specific form. In antiquity, two rival theories of the syllogism existed: Aristotelian syllogistic and Stoic syllogistic. Aristotle defines the syllogism as, “...a discourse in which certain (specific) things having been supposed, and something different from the things supposed results of necessity because these things are so.”