

Chapter 4

Decision Analysis

We Are All Students of the Same Game

Students in my Decision Analysis class have to create one decision log per week. The assignment requires that they analyze an actual decision they have faced or are currently facing. The decisions they choose to analyze include whether they should break up with their girlfriend or boyfriend, where they should go for spring break, what job to accept and how much to spend on their weddings. Initially I provide very little guidance, so they do their best to produce an analysis that they believe will show me they are methodical and deliberate in their approach. Even when it is clear that they simply chose the path of least resistance, they will attempt to generate a narrative that explains their approach as rational and thoughtful.

Much to their chagrin, I actually provide very little advice as it specifically relates to the assignment throughout the entire semester. At least that's what many of them believe. Truth is, the entire course, including reading material, case studies, and lectures is about the process of decision-making. We cover statistical concepts such as probabilities and Bayes Theorem, mistakes some very smart people have made in applying

these concepts, the components of a decision, and real-world examples for applying it all to actual business and policy decisions. Students are also exposed to esoteric terms used to describe proper process and systematic errors. I purposely provide little guidance for the decision logs so that I can ascertain whether they are making the connection between the material they are studying and the concurrent decisions they are facing.

Before going further, let me be clear. These students are some of the smartest, most driven individuals among their contemporaries around the world. They finished high school with highly competitive GPAs and standardized test scores, are graduating seniors or graduate engineering students at one of the finest engineering programs on Earth (UCSB's College of Engineering has more Nobel Laureates on the faculty than any other). Despite these qualifications, it typically takes many weeks before they are able to make the direct connection between the material and their own actions. Regardless of how long it takes for it to click that these aren't merely theories we are covering and that this course isn't simply about memorizing a collection of terms they'll never use again, the progression toward that realization follows a very consistent pattern.

Stage 1: Autopilot

In this phase students follow the protocol that's served them well for their entire academic careers. Very little thought is put in. Instead, they rely on their intuition to produce just another in a long line of documents meant to satisfy yet one more course requirement.

Stage 2: Cognitive Ease

Even though they are incorporating the proper terminology into the log, they aren't actually applying the ideas. In other words, they are attempting to satisfy what they believe I want to see by effectively delivering the same decision analysis, except this time they've swapped out layman's terminology in favor of the more technical terms. Nothing really about their approach to decision-making has changed except for how they describe the process. It is a superficial adjustment – no real substantive progress has been made.

Stage 3: Stress

After a number of logs have been submitted – all of which have likely received grades well below what they're used to – the stress sets in. They worry about the final course grade based on the current trajectory. Office hours become more crowded and pleas for extra credit opportunities flood in. My response is the same every time. Spend less time worrying about grades and more effort applying what you are learning to your own decisions. Invite cognitive strain. Dig deeper, ask tougher questions and replace leaps of faith with statistical analysis. This is the phase that can act like quicksand, even for many of the top students. They will dig in their heels, working harder to argue their case rather than applying the concepts. They will complain, beg me to just tell them what I want so they can deliver it, pass blame and claim too little time available before finally dropping their defenses. Hopefully, it happens before the semester comes to an end, but when it does ... fireworks!

Stage 4: Cognitive Strain

This is the phase that keeps me coming back for more each semester. When students drop their defenses, when they stop fighting cognitive strain and instead invite it, that's when the magic happens. They begin seeing the whole world through new, high-powered lenses. Some have described it as similar to that moment in *The Matrix* when Neo (Keanu Reeves) takes the red pill. Although the benefits are amazing, they require hard work to achieve, and that is perhaps one of the best lessons they will learn. Thankfully, most of them seem to realize it. The evidence can be found in their course feedback:

“Taking this class has changed my life! I learned the importance of questioning everything. It helped me quit smoking, deal with rejection, among other serious negative outcomes and more than that, it allowed me to open my mind to possibilities. This is the most rewarding class I have taken, but demands you putting in work. Please utilize this with an open mind and do not be very sticky to what you believe in.”

Author's Note: The red pill – as opposed to the blue pill – is swallowed by Neo when offered a choice by Morpheus in the movie's famous scene. Taking the red pill is perceived as Neo's desire to see undoctored truth (things as they really are).

“If I could I would take this course every term. What you learn here is something to be used every day. It is difficult to master the subject, but you will feel the difference in your life if you make the effort.”

“Incredibly challenging course, but I enjoyed every single class. Duneier is the GOAT.”

“If taken advantage of and if you delve yourself into applying concepts of this class to real life, very valuable stuff! Thank you!”

“I learned a lot that I believe will have a measurable impact on my life.”

“Best course ever! Very challenging and practical course. By far the most interesting class I’ve taken with a noticeable change in personal decision-making.”

“The most interesting/insightful course I have taken in college. Extremely practical and applicable to real-world apps. Course is challenging and encourages students to think.”

I share this with you, because the stages are very similar to what I’ve discovered in working with clients. We all want to avoid cognitive strain. Our brains are phenomenal at convincing us that we are invoking it even when we are simply using more technical terms or codifying a poor process so that it appears more systematic and rational. Thanks to technology we can gather all kinds of data, run all kinds of analysis, but if we don’t ask the right questions at the right moments, we risk turning sporadic mistakes into systematic flaws.

These days, I am interviewed regularly about the rise of artificial intelligence and machine learning in the world of finance. Here’s the thing about the ease with which we can gather data and run massive analytical programs, not to mention the ability to effectively outsource optimization to machines that can think and process far faster than we could ever hope. Optimization requires that you properly define the outcome you desire, and that is what I’ve discovered is so often ignored by decision-makers at the university and CIO level.

As an example, when my students submit a decision log about where they should go for spring break, they will typically present three potential destinations from which they must choose. Often, the choices are something along the lines of Acapulco, Las Vegas, or New York City. Three terrific options for your typical spring breaker! The problem is,

they don't have much in common. The fact that they are the options being considered tells me that very little work has been done as it relates to properly defining what it is they hope to achieve, what the important factors are, and how they will choose from among them. In other words, what gives them pleasure? What are the key factors by which they will judge the trip a success or failure?

They will express frustration in quantifying the difference in utility gained by lying around a pool as scantily clad, beautiful people circulate around them and enjoying a beer at a trendy restaurant in SoHo. They have difficulty comparing a \$5 margarita on the beach to a "free" cocktail served at the blackjack table. Instead, they choose to imagine a moment of peak pleasure in each location and compare the utility gained in each of those scenarios as judged in the moment of contemplation. If they happen to be sitting in the hot sun, struggling with the humidity as they are weighing their options, it's likely a trip to humid Acapulco will be less desirable than a visit to bone dry Las Vegas, and so on.

You can see how quickly all these considerations become burdensome, and perhaps unnecessarily so. That's when we say things like, "we could think about this forever, but ultimately, we just need to make a decision. After all, all three are phenomenal options and I'm sure I'll enjoy any of them." That's when the brain's desire to maintain cognitive ease has officially won.

The same goes for investing. It seems like such a simple process. Find a machine that can generate the best returns and allocate to it. Oh, if only it were that simple. You see, the best a machine can do is improve the accuracy of our predictions, and it does so by gathering more information and considering more factors in its analysis. Given that most in this industry do little more than the bare bones minimum in this area, it's easy to see how depending on machines for this part of the job will yield great improvement. Still, producing more accurate odds of success is only a small piece of the decision-making and investment process. An investor must define *and understand* their risk tolerance. A machine doesn't guarantee results, it simply optimizes its predictions of the future based on how the investor defines his objectives. Therein lies the potential conflict. A machine is programmed to play the odds,

it doesn't care if it wins or loses whereas the investor (programmer) clearly does.

Just as students should take the time to understand what they enjoy, what their monetary constraints are (beyond simply, "How much is in my bank account today") and what aspects of each of their options can affect their ability to achieve the outcome they desire, so, too, should investors consider what it is they desire, before choosing between a systematic, long-short equity fund, a 30-year US Treasury, and an equity index ETF

Decision Analysis

We use the term *decision* without batting an eye, yet when I ask a classroom of graduate students enrolled in my course called Decision Analysis, "What is a decision?" you could hear a pin drop. Some might say, it's a choice that you make, but that's only a small component of it. A decision is the combination of a problem you want to solve, the data you collect to understand it, the analysis you conduct to find the optimal solution, as well as the action you choose in order to achieve the result you desire. All combined these steps form a decision.

I find it easiest to visualize a decision by breaking it down into its three key components: acts, states, and outcomes. The *outcome*, as stated earlier, is essentially the problem you are trying to solve. As an example, say you want to lose 10 pounds ahead of next month's high school reunion. A loss of 10 pounds is the outcome you desire and the problem you want to solve. You could choose to cut out all carbs, run 10 miles a day, or eat a box of jelly donuts twice a week. Each of these *acts* represents a potential solution to the problem at hand. Yes, eating jelly donuts is a possible solution, albeit one that is very unlikely to result in the desired outcome. The reason it probably won't get you where you want to be, has to do with what we call *states*. These are the factors that affect our ability to convert an act into the outcome we seek to achieve. We can't control them, but we must account for them if we are to have any hope of succeeding. The fact that our bodies convert sugar into fat, exercise burns more calories than sitting still, and jelly donuts are calorie-dense is simply how these things work. They are *states* of the

world. If we hope to choose the act that provides the best odds of us losing 10 pounds ahead of our reunion we'd be wise to factor them in.

It's tempting to view the world so simplistically. I want to lose 10 pounds, so I'll work out every day until the reunion. After all, it's not rocket science. Working out burns calories. If I burn more than I consume, I will lose weight. Everyone knows that, therefore no data needs to be collected. No analysis is required. Problem solved.

This is how we typically make decisions. Through a combination of common knowledge, logic, and intuition, we make assumptions about the states and use them as the foundation for additional assumptions, before eventually leaping to conclusions about the most appropriate act. Every step of the way, we attempt to achieve and maintain a state of cognitive ease (i.e., avoid cognitive strain). In other words, we do our best to avoid thinking deeply. It's not our fault though. The human body is an efficiency-maximizing machine. Consider the evidence.

If you take in precisely the same number of calories and follow the exact same fitness routine when you are 50 as you did when you were 20, you will gain weight. The reason is, as we age, our bodies become more efficient at utilizing calories. Therefore, we don't need to consume as many of them in order to complete a particular task, which was certainly helpful for aging hunter-gatherers thousands of years ago. As their ability to find food slowed so too did their need to consume it. There's another aspect to efficiency maximization that relates to productivity.

Heuristics

Recall those images of the predator species such as lions, lounging lazily in the shade of a lone acacia tree in the Serengeti. Lionesses, the ones who do the majority of hunting for the pride, can sleep up to 18 hours a day, whereas their male counterparts often do so even longer. When they aren't sleeping, they move methodically, conserving as much energy as possible, until an opportunity for a high-probability kill presents itself, and then they go all out. Running at full speed, bringing down beasts two or three times their size, then tearing the flesh from bone is physically demanding work, requiring a tremendous number of calories to

execute. After a big meal they can sleep a full 24 hours before waking up again. Cheetahs, the fastest land animals, are even more efficient. If the kill doesn't happen quickly, it will give up the chase, otherwise it risks exhausting its store of calories before it can replenish them, leading to death by starvation. So, while predator animals might appear lazy, they're actually being efficient with the limited amount of energy they have at their disposal.

Although very few of us still hunt for our survival, the technology that has made food so plentiful evolved at a much more rapid pace than have our bodies. As a result, we remain hard-wired to conserve calories which is not quite so advantageous in an age when calorie-dense foods are so readily accessible, in microwavable, bite-sized pieces. Hence the increase in extra chins, love handles, and the plethora of health issues that accompany them.

As it happens, we are just as efficient when it comes to cognitive activity, and the effects are similarly destructive, even if they aren't visible to the naked eye. Throughout our lives, we are constantly accumulating information, with the great majority of it being gathered indiscriminately. Meaning we don't deliberately seek it, nor do we really investigate it. More accurately, we rub up against it. Unless that information is challenged at the moment we come into contact with it, it becomes part of our beliefs, regardless of its validity. Once stored in our mental database, it is difficult for us to recall its specific origins, which puts information sourced from academic journals on equal footing with those derived from, say, the plot of a novel, a movie trailer, or even a satirical article. This is significant, because all new information that we gather is assessed according to that which came before it. You can see how this might lead to problems if we were to base our decisions on such a flawed database. As they say, "Garbage in, garbage out." Unfortunately, that is exactly what we do.

In order to achieve and maintain a state of cognitive ease, we employ heuristics, a fancy term for mental shortcuts, such as intuition and gut feel. Rather than questioning the validity of our beliefs, we assume they are based on solid evidence, the result of thoughtful research and analysis over the course of our lives. Its reliability is therefore unassailable, at least in our view. That confidence extends from information gathering to the

intuitive analysis of the data it produces. We may, for instance, recall a decision from our past that, at least on the surface, appears very similar in nature to the one we are facing today. As far as we remember, that one worked out well, so without having to invest much mental energy, we can draw the conclusion that the same act chosen back then would be the most appropriate this time around as well. Do that enough times and you will develop a rule of thumb, allowing for even less mental effort and speedier decisions the next time around. In effect, the mistake is being codified, like an athlete who practices incorrectly, over and over again. The more highly educated, more experienced, and especially the more successful we believe ourselves to be, the more confident we will be in our intuition, which, in turn, encourages us to rely on it even more often. That is how we become more mentally “efficient” as we get older.

The Biggest Mistake in Decision-Making

Making good decisions is a skill like any other. Sure, you can be taught the fundamentals, even some of the key mistakes that the majority of people make. After reading all the books, taking courses, starting the journals, and even employing a coach, there will remain a wide dispersion in the abilities among decision-makers. In other words, decision-making isn't a binary endeavor, where either you've read the books and are an expert, or you haven't and you're not. There are degrees of expertise and excellence, as there are for all skills.

To improve our decision-making skills, we must take what we as a species have learned about ourselves through decades of research and incorporate it into our process. Then, not only must we practice it consistently, but gather data and make additional marginal adjustments along the way in order to build upon our strengths, and either diminish our weaknesses or reduce their impact on the results. It sounds simple but it's not. It turns out there's one incredibly powerful impediment standing in our way: Ourselves.

It's difficult to compare decision-making as a skill in its own right against other endeavors such as swinging a tennis racquet or running a business, because when you distill everything and anything down to its

simplest form, you are left with the decision. Investing, golfing, lifestyle management, even plumbing are nothing more than an amalgamation of millions of decisions, grouped together by common factors. At their root, they are all the same business – the business of decision-making. Focus on and improve the decision-making process, and you will improve your results in any field you choose.

All decisions, whether we're talking about the decision to put the toilet seat down after using it or to cut our losses on a fund manager, are comprised of the same components – outcome, states, and acts. The decision-making process should follow the same pattern, in the same order, whether the decisions being made involve investments, calling a play in the NFL, or launching the space shuttle. The more we know with certainty, the higher the probability the optimal action can be taken. Therefore, evidence should trump beliefs in order to better inform the decision, no matter how strongly those beliefs appeal to our intuition or how many others around us agree with what our gut suggests.

Since I began teaching and coaching others to improve their own decision-making process, I've discovered a key mistake in the approach of nearly everyone with whom I've ever worked. It is a flaw that I have yet to read about in a single textbook or best seller on the subject. Even after weeks of discussing it with clients and lecturing on it with students, it often remains an issue, and perhaps the greatest hurdle to their improvement. This mistake reduces creativity, leads to square pegs being forced into round holes, and endless cycles of firefighting. What I am about to describe is not the *only* mistake commonly on display in human decision-making, but because it is the very first step in a proper decision-making process, it affects everything that comes after it. From that moment on, no matter how consistent, evidence-based, and proactive our decision-making process may be, our choices will very likely be suboptimal.

If you want to improve your decision-making, this is where I recommend you begin focusing your effort, but be forewarned, the solution is so deceptively simple, even after I bring it to your attention and emphasize its importance, it is still very challenging to incorporate. Sure, you'll give a nod to it and maybe even feign an attempt to satisfy the task, but most have difficulty getting their minds to employ the cognitive strain necessary to truly, definitively, and properly attend to it.

What I am talking about is beginning the decision-making process by answering the very simple question, “What is the problem you are attempting to solve?” Yes, *before* you begin considering the advantages of one act versus another, weighing the pros and cons, or running a cost/benefit analysis, you must first very specifically define the true problem you are attempting to solve, the outcome you desire, and the criteria by which you will assess your decision. That is the very first step in normative (proper) decision-making, no matter what decision problem you face.

If that seems obvious to you, yet you didn’t take issue with how I worded the opening sentence four paragraphs ago, there is a disconnect. “All decisions, whether we’re talking about the decision to put the toilet seat down after using it or to cut our losses on that fund manager” is how the sentence started, and immediately it sets you up to skip step number 1. You see, whether you should cut your losses on an investment manager isn’t the decision problem. Cut or don’t cut, are simply two possible acts from which to choose in order to solve a specific problem. They are options typically produced as a result of our employing heuristics, meaning mental shortcuts like gut feel and intuition. We then “analyze the decision” by further employing heuristics rather than a systematic, disciplined and consistent approach.

Think about it. The question about whether you should drop a manager is very likely to be triggered by an event that evoked an emotion, be it a loss, a recent conversation, or comment from a third party. Emotion is a factor we’d rather not have influencing our decision-making. Let’s pretend though that emotion wasn’t a factor. Even then, simply jumping to the question about whether you should drop the fund manager will most likely follow a path derived by the instinctive response to the question. In other words, whatever characteristic you first recall as it relates to this manager, will have a powerful influence on the entire analysis, regardless of the weighting it should hold based on the evidence.

Fact is, when your decision-making process begins with “should I or shouldn’t I,” you have already stacked the odds of an optimal decision heavily against yourself, and thrown the door wide open to the type of predictable irrationality you’ve read about in all those books and articles.

At that point, cognitive bias isn't just a potential factor that you need to consider, it is an integral part of your process, indistinguishable from any other aspect of your process.

A client I coach provided a terrific example of this during one of his sessions. He described how difficult the end-of-year employee reviews had been. He had all the employee information, feedback from senior management, and data, yet he struggled to conduct what he would consider a "valid" assessment. The reason is that the *Outcome* component of the decision, as it relates to the original hiring of that employee, had never been properly defined, including the criteria by which that decision would be assessed. So, there he sat with all the information you would think necessary to properly assess the decision, yet he had no rational way of assessing the *act* chosen to solve the original decision problem. That left open the very likely possibility that his assessment wouldn't match that of the employee's version, and possibly, the assessment of every other manager. Therefore, rather than conducting a proper assessment that optimally would leave no gap whatsoever between the firm's assessment and the employee's, he was left to craft a narrative. Not an evidence-based decision analysis but, instead, just a coherent story. In the past, that would have satisfied my client, and possibly the employee too, but since working with us, he now thinks about his decisions differently. In that moment, it begged the very simple, yet overlooked questions, "What is the purpose of the assessment itself? What is the firm trying to accomplish with the act, and are we actually achieving that outcome, or are we simply spinning our wheels and wasting time?"

As I said earlier, fixing this mistake is difficult, and it isn't the only common one that we make on a regular basis, but if you are looking for that one marginal adjustment that can radically improve your decision-making and positively impact your performance, this is where you should start. Be forewarned though, this is a skill and it takes time to develop. I can practically guarantee that simply reading about it here won't change your behavior. It requires a feedback loop. It requires a particular type of coaching, but even the best coach cannot help if you are unwilling to change. The exercises that are required in order to overcome this costly mistake are frustrating, aggravating, and often counterintuitive. My students hate me during this phase, and so do

many of my clients. It is the defining phase in our relationship. From that moment it goes one of two ways. Either I never hear from them again, or they become die-hard believers for life. Again, it is that moment in the Matrix when Neo takes the red pill, when everything he's ever believed – down to the way he perceives and interacts with the world around him – changes forever. In the film, his body convulses, he vomits, and falls unconscious. Is it the end of his journey? Quite the contrary! It is a necessary step in order for his journey to begin.

Why is it so difficult to fix? We have been programmed to approach decisions from the wrong end of the process because we have become so accustomed to relying on heuristics (mental shortcuts). Cognitive ease is a habit, a function of our inherent desire to maximize efficiency. Yes, it served us well when we had to conserve calories between meals, but in today's world it can be a true impediment to optimal decision making (and happiness). It's a hassle to properly define decision problems. It requires that you silence the voices in your head, and those around you, that are constantly pushing you to take action before proper analysis and prioritize with incomplete information. How do we prioritize? We focus our attention on putting out fires, but also on those things that just happen to come into our view. It takes serious effort to concentrate your attention on the bigger picture, to contemplate deeper meaning and objectives. It's far easier to just "get this out of the way" and *then* get to that other stuff. Problem is, we rarely get to the other stuff. So, decision after decision, we skip steps one and two, choosing instead to get right to the heart of the matter, step number 3. Choosing between the acts that immediately come to mind, without ever truly understanding what it is the act is intended to achieve or what factors need to be accounted for.

I recently spent an afternoon with a coaching client and his team. My questions were designed to specifically and completely define steps 1 and 2, but every response was about jumping straight to step 3. Keep in mind that there are only three fundamental steps in every decision. If steps one and two are completed correctly, step 3 hardly requires any effort whatsoever. New, outside-the-box ideas immediately spring to mind, and the optimal alternative act is blatantly obvious to everyone in the room. However, if you insist on skipping the first two steps, step three can be debated for hours with little or no progress. As it was for the

client who was attempting to do a proper assessment of his employees, it is nearly impossible to arrive at a normative decision that, if challenged, can be settled definitively. Instead, they are resolved with, “Let’s just agree to disagree.”

A version of that is what most portfolio managers experience every moment after they initiate a position. If the objectives and states aren’t properly defined prior to entry, the choice between alternative acts of “continue to hold” or “unwind” will provide a never-ending quandary, fueling doubt until the trigger is pulled and, very likely, even longer. However, if steps 1 and 2 are properly managed, that final step regarding the unwind requires almost no effort whatsoever. Much more on this as we progress.