Shaking Decision Trees for Risks and Rewards

By Marjorie Corman Aaron and Wayne Brazil

We are two long-time colleagues with many years of work in the courtroom, in the classroom, on the bench, and around the mediation table. Our purpose here is to extend a conversation between us that we hope will enhance our readers' appreciation of the power and the limitations of decision analysis. We write together, approaching this subject from different perspectives, some wholly complementary and others reflecting professionally respectful differences of view.

We hope that what follows will equip lawyers and neutrals to make better informed judgments about how to use decision analysis more instructively and reliably — as well as how to identify circumstances in which its superficial use can yield unreliable assessments of risk and value.

Our topic centers on the theme of this issue of *Dispute Resolution Magazine*: the role of numbers in our corner of the legal subculture. Numbers have huge psychological power, and this power is the principal source of both the value and the danger in decision analysis.

It is ironic that among lawyers, many of whom turned to this profession because they felt so challenged by math, numbers have so much power. Maybe lawyers, who are more comfortable with words, are especially susceptible to measurability bias. We tend to overweigh what is measured, counted, quantified — and to underweigh what is not. Take something out of the language of numbers, and we are less likely to assign it importance for decision-making. Present that same message in numbers, and we consider it significant. Our clients are apt to do the same.

We wonder if this is because humans have a deep need for certainty, or at least for some kind of reassurance. It may be rooted in our raw understanding of how profoundly *un*certainty pervades so much of our existence. But the lure of quantification makes us vulnerable to deception through the slightest manipulation of numbers.

Of course, even with its numerical appearance and mathematical operations, decision analysis provides no certainty. In a legal case, it is based upon human estimates. Thus, the numbers it yields are no more certain than traditional case evaluation, delivered in prose.

The Pure Pluses

Decision analysis marries judgments (best professional guesses) to numbers. A fragile coupling — but not for that reason to be shunned. On the contrary, this union can yield great rewards.

Decision analysis, properly used, can constitute a highly disciplined, rational, analytically demanding and careful approach to decision-making — at least

when the thing about which we need to make decisions is as elastic, dynamic, fluid, and mercurial as civil litigation can be.

This is true because decision analysis exposes, more effectively than any other tool, including a prose summary, the number and character of the "risk pivots" that civil litigation entails and clients and lawyers must try to assess.[1] By exposing these in a graphic presentation, decision trees also help clients and lawyers understand the succession of and the dynamics between the pivot points.

Just as important, carefully constructed decision trees emphatically remind us that to fully comprehend our litigation circumstance, we must assess each risk pivot in relation to the others. Each may contribute to larger cumulative risks. In this way, decision trees succinctly illustrate the complexity, convolution, and uncertainty that inhabit so much of civil litigation.

Lawyers and clients both seek to feel comfortable with their decisions. Many need to be able to explain and defend their choices to themselves and to others, including shareholders as well as people higher on the organizational chart. In our own work, we have found that when used with appropriate refinement and circumspection, the method's numerical yields — cumulative probabilities of possible outcomes and overall discounted value — may provide people with such comfort. Decision trees' numbers can help clients feel that their settlement decisions (yea or nay) are not undisciplined or arbitrary but supported by a process that provides logic and reasoning.

Important Precautionary Refinements

Decision tree analysis involves cumulating probabilities. Put in the clients' words, "Of all the ways this case could play out, what's most likely to happen? What are my overall chances of getting nothing? Of winning enough to cover my losses? Of getting socked with a verdict that will bankrupt my business?"

The method is also used to derive a "discounted value": the sum of each possible outcome multiplied by its cumulative probability. Given that these results — cumulative probabilities and discounted value — run on math and are often given meaning in settlement decisions, anyone who wants to use decision trees effectively and properly needs to deeply understand the process's sophistication and limitations. In that spirit, we offer the following discussion of important cautionary refinements. Far from an exhaustive list, it addresses some of our own concerns about the method's use.

Beware of biases when estimating the probabilities and case outcomes.[2]

Lawyers and clients are both subject to optimism and partisan perception biases, notwithstanding commitments to remain "objective." Also relevant is the anchoring bias; initial numbers unduly influence our judgments.

These biases may be old news to our highly educated readers. The bad news is that, even when aware, people tend to believe they are less susceptible to these biases. But that's just not true.[3] Research establishes that most lawyers are not terribly competent at predicting how a judge, jury, or arbitrator will rule. Attorneys tend to be overconfident and inaccurate. Interestingly, research suggests that the risk of excessive optimism increases with the complexity of the task or the target of estimation — and forming "guesstimates" about litigation outcomes is a notoriously complex task.[4] Thus, we urge humility when estimating probabilities on a decision tree. It is good practice to try a range of probability estimates for critical risk pivots. Even if your current estimate is 65% for a certain event (say, liability), try calculating the tree with that probability at 60% or 70%, or 55% or 75%.

The same advice holds for predicting verdict awards. While plaintiffs and their counsel certainly overestimate, research suggests that defense lawyers are particularly prone to optimism when (under) estimating awards.[5] Defense counsel are advised to remember: the jury that finds liability is a jury that favors the plaintiff. One of us served as a mediator in a case where, in a caucus, we all waved away the possibility of damages beyond a few million dollars. The case proceeded to trial, and the jury awarded damages of $40 million. Don't fail to consider the worst-case scenario.

Judgmental anchoring — a previously considered number's influence on a numeric judgment — also critically impacts the decision analyst. Much as an anchor pulls a boat in its direction, a first number — that first guess or reference point, even if obviously wishful — pulls subsequent numerical judgments up or down. Anchoring is another robust, consistently demonstrated phenomenon in research on psychology

and decision-making, across domains, for novices and experts, including lawyers. It is easy to see how a lawyer or client could be anchored to a number generated by his or her own biased guess, or by a recent high or low verdict reported online or in the papers.

We'd like to think an intelligent lawyer would adjust an early number for new information or further thinking. Unfortunately, research confirms that, while some adjustment occurs, most people adjust insufficiently from initial anchors. People estimate ranges too narrowly, and they tend to remain confident and optimistic.

Probability estimates must be true to their location on the tree and must assess interdependence of outcomes at risk pivots.

Effective estimates of probabilities at any given risk pivot must reflect what the circumstances would be on that particular branch of the decision tree at that particular juncture, i.e., at the moment in time represented on the tree. In a tree that presents a risk pivot at summary judgment, probabilities *after* "summary judgment denied" should be estimated *in that light*. After all, only after such a ruling will everyone know that the judge found some merit to arguments about a serious factual question.

To dig more deeply into the litigation weeds and the litigator's judgment, imagine a case involving a hard-fought motion to dismiss a cluster of fraud claims. Along each tree branch after the motion, the next risk pivot might be labeled "liability or no liability." The litigator's common sense knows to adjust chances of liability based on whether the risk pivot sits on a tree branch following a positive or negative ruling on the fraud claims. After all (let's assume), if the fraud claims remain, the jury will hear additional, inflammatory evidence that may also impact the odds of its finding liability.

Thus, before working through a decision tree analysis, defense counsel might have roughly estimated the chances of winning a defense verdict at, say 50% to 60%. But when constructing the tree, counsel is compelled to recognize that these percentages are credible only if the fraud claims are dismissed. Given the judge's revealed proclivities and the potentially inflammatory evidence, counsel would be wise to estimate that the chances of a defense verdict along that path are much lower.

Under probability theory, an analyst can determine the *cumulative* or *joint probability* of a particular outcome by multiplying the likelihood of one event by the likelihood of another event *only* if the likelihood that each event will occur is truly independent. In civil litigation, sometimes the same important factor, or set of closely related factors, can significantly affect the likely outcome at different pivot points along a decision tree. When this is the case, a decision analyst must be very careful to assess the impact of the interdependence of the factors at each pivot point.

Basic probability theory agrees. *Indeed, when calculating cumulative probabilities, bedrock rules of probability require deliberate adjustment if probabilities along a path are not independent.*

To discuss the question of independence in cumulative probability, it's worth illustrating how cumulative probabilities work with a game involving serial jars of marbles. The rules of the game are that to win the pot of gold, you have to draw two red marbles (while blindfolded), one from each of two jars placed in a row. The first jar holds 100 marbles, 80 red and 20 black. The second jar also holds 100 marbles, but 50 red and 50 black. What happens on the first draw has no impact on the draw from the second jar (except that you won't proceed to the second jar if you draw a black marble from the first). In this game, the cumulative probability of winning the end pot of gold is 40%: 80% (first jar) x 50% (second jar) = 40%. These two independent probabilities are not affected by any hidden, shared factors. In other words, drawing that first red marble does not have any hidden but powerful effect on the odds that you will later draw another.

Returning to the jars of marbles: what if, as soon as you drew a red marble from that 80/20 first jar, an invisible hand altered the black-to-red marble ratio in the second jar? That invisible hand changed the marble mix in the *second* jar from 50 red/50 black to 70 red/30 black. Now, the cumulative probability of drawing two red marbles is no longer 40% (the product of 80% x 50%); it is 56% (the product of 80% x 70%).

In the case example, the judge's ruling on the fraud claims functions as the invisible hand in the marble jar. It changes the "marble mix." The rules of probability are satisfied only if players use the new, altered probability.

Let's look at another example to illustrate the challenge presented when the same factor affects the likelihood of outcomes at different risk pivots. In personal injury cases, the same factor — what the jury thinks of the plaintiff as a human being — can affect both the likelihood that the jury will believe her account of how the accident occurred (thus how the jury will resolve the liability issue) and the likelihood that the jury will be generous when it awards general damages (a notoriously elastic determination). When the same variable can play a significant role in the outcome at two formally distinct risk pivots, a risk analyst who is trying to determine the *cumulative* probability of an ultimate outcome faces a very difficult task. She must take fully into account her judgment about the likelihood that the jury will believe (and believe in) the plaintiff when she is developing her estimate of the most likely zone of general damages.

What's crucial here: *Pay attention to the interdependence/independence of outcomes at the risk pivots and stay on top of the rolling analytical logs.* As reality unfolds, return to earlier developed decision trees to adjust estimates and structure based on new insights. Take into account what has happened in the litigation, unforeseen developments with evidence and witnesses, and new information learned in discovery. A judge's comments at oral argument or in a written opinion might call for some reevaluation. After all, the judge may have been the first neutral to weigh in and will rule on evidentiary motions at trial.

Reflect what triers of fact are asked to decide — and how they return verdicts.

The decision analyst is charged with thinking carefully about how judges and juries may rule. To do that, the decision analyst should consider what questions the triers of fact will be asked, imagine their possible answers, and estimate the likelihood of their (determinative) answers.

For that reason, the decision analyst should be aware of the importance of the form of verdict a jury will use. Let's assume that the jury will understand the judge's formal instructions that in order to find liability, it must first find both causation and negligence. Where the jury will be given only a simple general verdict form, should the decision analyst assess the probabilities of each separately and multiply them to get the cumulative probability of a liability finding? Probably not. After all, when jurors return verdicts on general verdict forms (without addressing specific questions), a litigator's experience suggests that despite the legal distinctions, the jurors will slip unselfconsciously into a gut sense of what's right — of the justice they want to bring about. If you don't believe they will assess the negligence and causation issues separately, but rather holistically, then your probability estimate should be holistic. It should reflect the way you believe the jury will approach the question.

In federal courts, juries commonly return their verdicts in the form of answers to special interrogatories. Special interrogatories are designed to cabin decision-making sloppiness by compelling juries to make separate findings about legally separable issues, e.g., to address separate components of multi-element claims or defenses one component or one element at a time. When the court thus parses and isolates separate issues, it asks the jury to determine, separately for each issue, whether the party bearing the burden of proof has met its burden. To assess probabilities, the decision analyst could ask the parallel questions: What is the likelihood of the jury answering yes to

each and every one of the questions required for a liability finding?

Pay attention to your gut — and to the arithmetic.

What if the cumulative probability of a particularly important result — liability or a desirable damages award — ends up far, far from a lawyer's gut sense? Should we look to the gut or the math as the distortionist? The answer, of course, is that we should re-examine both with some care.

A decision tree that is too simple fails to represent complex realities. Imagine an employment case with serious dispositive motions, controversy about back pay, emotional distress, front pay, and punitive damages. A tree with one risk pivot for liability and one round damages estimate, or even a rough undifferentiated range, would not fairly map the litigation. This case will involve multiple risk pivots on liability and damages components. There is more than one way the plaintiff could lose or end up with pretty low damages.

One of the strongest reasons to use decision analysis is that the lawyer's intuitive gut calculator cannot know the cumulative probabilities for each possible outcome in a complicated case. We know that, in rare instances, everything or nothing will break our way. But reality is more often a dastardly combination of positive and negative breaks. When the tree fairly captures an informed analysis of the risk pivots and yet the cumulative probabilities of desirable and undesirable outcomes contradict the lawyer's gut sense, it's time for the lawyer and client to carefully consider arithmetic's counsel.

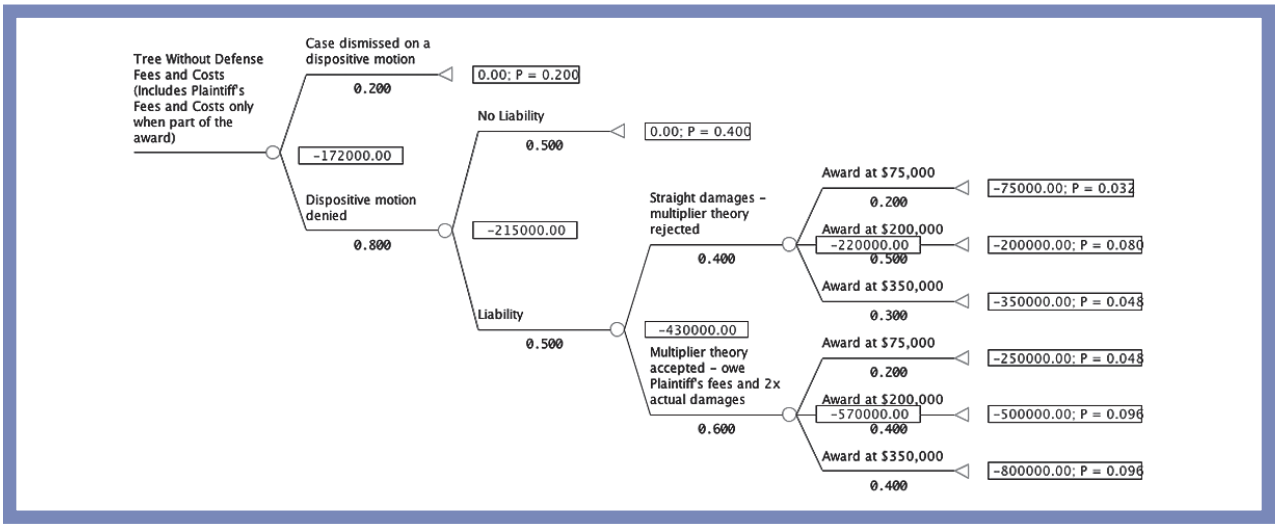
On the other hand, experienced lawyers also have a legitimate gut sense that the more branch clusters along a given decision-tree path, the lower the cumulative probability of each possible result and the lower the discounted value. A highly complex tree with many layers of branch clusters may also serve to distort reality. This kind of tree should be "read" with some caution, with a critical eye for *over*-complexity, for too many risk pivots, and too much interdependence between their outcomes.

The net matters.

A competent decision analysis *should at the very least* account for all quantifiable costs along the path to any outcome. Estimated attorney's fees and costs must be subtracted from the plaintiff's potential positive "payoffs" (in non-fee shifting cases) and added to the defense's potential negative payoffs.

Estimated verdict amounts should also include any statutory interest. Particularly in times of higher general interest rates and when final judgment is far in the future, it's best to calculate the time value of the future award.

Let's imagine a case with a potentially dispositive preliminary motion, with a relatively low chance of success. Assume that if the plaintiff wins on liability, base damages could be $75,000, $200,000, or $350,000 — depending. The plaintiff could succeed on some theory that would entitle her to collect her



attorneys' fees from the defendant, and a 2X multiplier of actual damages. The defense costs will be approximately $30,000 through the dispositive motion (including discovery, which is only partially complete), and an additional $70,000 through trial. Plaintiff's counsel's "reasonable fees and costs" through trial would also be $100,000.

The tree on page 16 details the discounted value from the defense perspective without considering anyone's costs or fees.

See the bottom of page 17 for the tree after including costs and fees the defense will or may pay. Quite a difference in the discounted value.

Having decided to use this method, it would be misleading to omit these fees and costs. They will be real when incurred.

Best practice could also include subtracting other quantifiable costs from net payoffs. For example, the client might estimate that he will pay $8,000 in overtime labor to comply with discovery. And what if five executives will have to testify on deposition and at trial? Using their high salaries as a base, the lost value of their time in depositions, prep, and trial may be in the tens of thousands of dollars. While quantifying everything would be impossible, we should try to think through all significant additional costs of the process.

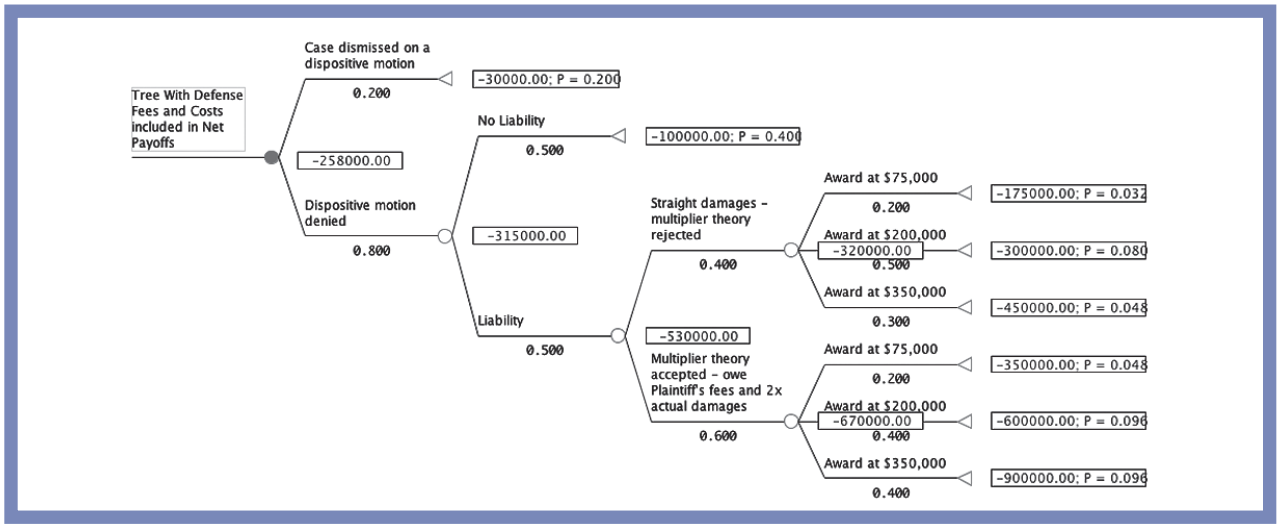
Don't ignore intangibles.

Intangibles matter when making decisions. Litigants care and worry about risk.[6] They experience the emotional value of restoration, vindication, or closure. Litigants appreciate the value (to sense of self and to future prospects) of a good recommendation or endorsement, an enhanced reputation, a trademark's cachet, and the importance of goodwill with customers or upstream vendors. If the decision analyst and the client can jointly formulate reasonable estimates of their value, then theoretically these estimates could be built into the payoffs at the end of the appropriate path on the tree.

Most important is not to allow these intangibles to be overshadowed and undervalued by undue focus on the tree's numerical inputs and outputs. The decision analyst is wise to create space in time and on the page for discussion of intangible consequences and why they matter. Plaintiffs who cannot afford to pay the mortgage in the event of $0 recovery may adjust their sights downward. The possibility of losing future business or a current friendship if a certain witness is subpoenaed may weigh heavily. Intangibles are important, not secondary, because they reflect the very real contexts within which our legal disputes occur.

Summing It Up

When done with integrity and competence, decision analysis can offer considerable insight, improve communication, and add greater rigor to the decision-making process. Yet it is also susceptible to error and manipulation in ways that we hope our readers will come to recognize and avoid. ■



Endnotes

1 We have chosen to use the term "risk pivots" as a less technical way of describing what are called "chance nodes" on a decision tree, usually represented by small circles.

2 Too much experimental and empirical research exists confirming the power of bias in human (including lawyers') decision-making to attempt its thorough citation here. Thus this article includes citations only for highly specific references. Those who wish to delve deeper into the impact of bias and other ways that psychology impacts lawyers' thinking are encouraged to read Jennifer Robbennolt's and Jean Sternlight's comprehensive work, Psychology for Lawyers: Understanding the Human Factors in Negotiation, Litigation and Decision Making (2013). Also, Ch. 5 in Professor Marjorie Corman Aaron's book, Client Science: Advice for Lawyers on Counseling Clients through Bad News and Other Legal Realities (2012) provides a shorter summary on the topics. Important research specific to lawyers' decisions regarding settlement and trial can be found in Randall Kiser's book, Beyond Right and Wrong: The Power of Effective Decision Making for Attorneys and Clients (2010), drawing upon research reported in the Randall Kiser, Martin Asher, and Blakeley B. McShane article, *Let's Not Make a Deal: An Empirical Study of Decision Making in Unsuccessful Settlement Negotiations*, 5 J. Empirical Legal Stud. 3, 551-91 (2008).

3 Joyce Ehrlinger, Thomas Gilovich & Lee Ross, *Peering Into the Bias Blind Spot: People's Assessments of Bias in Themselves and Others*, 31 Pers. Soc. Psychol. Bull. 5, 680-92 (2005).

4 Influential research drawn upon includes: the Elizabeth F. Loftus and Willem A. Wagenaar article, *Lawyers' Predictions of Success*, 28 Jurimetrics 4, 437-53 (1988) and the Jane Goodman-Delahunty et al. article, *Insightful or Wishful: Lawyers' Ability to Predict Case Outcomes*, 16 Psychol. Pub. Pol'y. & L. 2, 133-57 (2010).

5 Roselle Wissler et al., *Decisionmaking about General Damages: A Comparison of Jurors, Judges, and Lawyers*, 98 Mich. L. Rev. 3, 751, 805 (1999). Note that, as defined in Kiser's study, the mean "decision error cost" — defined as the difference between the last offer and trial result — was $52,183 in New York and $73,400 in California for plaintiffs, but $920,874 in New York and $1,403,654 in California for defendants. *See* Kiser et al., *supra*, 566-70.

6 While there are technical ways to include numerical discounts for risk aversion, these are quite technical (and, ironically, fraught with risk for the integrity of the process).

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