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6-1996

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Using Decision Trees As Tools for Settlement

By Marjorie Corman Aaron and David P. Hoffer

Even when parties to a dispute acknowledge weaknesses on certain issues, it can be extremely difficult for them to link individual strengths or weaknesses to an overall settlement. This problem often arises in cases that are highly complex, involve enormous pre-trial investment, or present issues of great emotional significance.

While experienced lawyers can sometimes develop an intuitive sense of what a case is worth, their intuition may not be sufficient in a case of considerable complexity. Furthermore, intuitive "gut sense" valuations are hard to support or explain to clients.

Decision trees allow the parties and their lawyers to see more clearly how the strengths and weaknesses of their positions on specific issues will affect the overall value of a case. Long popular in the business community, decision analysis has evolved as a tool for lawyers to help make decisions in complex litigation.

The method involves four steps: (1) List the various possible events which might occur in the course of litigation (or beyond). (2) Consider the costs or gains associated with each possibility. (3) Discount each possibility by its probability—the estimated likelihood that it will in fact occur. (4) Weight the overall picture—multiplying each possibility by its probability.

To choose between litigation and settlement, a lawyer would estimate ranges of damage awards and legal fees, and approximate probabilities of different rulings or judgments based on previous experience with similar

cases. Decision analysis can be extremely helpful in sorting out the relative importance of different issues and stages in a case.

For example, a plaintiff in a complex environmental liability case may have to win several important discovery rulings, survive motions to dismiss and for summary judgment, and succeed in coaching its fact and expert witnesses to testify credibly—all before the case even reaches a jury. In such cases, where victory is contingent on multiple uncertainties, a case value is very hard to assess analytically without decision analysis.

Working with Decision Trees

Decision trees are organized chronologically, from left to right, with events depicted in the tree in the order in which they are likely to occur. Decision trees contain three different types of branch points or "nodes": *decision*, *chance* and *terminal*. A *decision node* denotes the point at which the decision-maker has to choose between two or more options. A *chance node* (O) denotes a point at which various possible outcomes may occur, which the decision-maker does not control. Each possible outcome after the chance node is reflected on a branch (in litigation, typically "litigate" or "settle"), which is assigned a probability reflecting how likely it is to occur. A *terminal node* (<]) denotes a final outcome. Each terminal node is assigned a "payoff" value (negative or positive) which reflects the net dollar

cost or gain associated with that outcome.

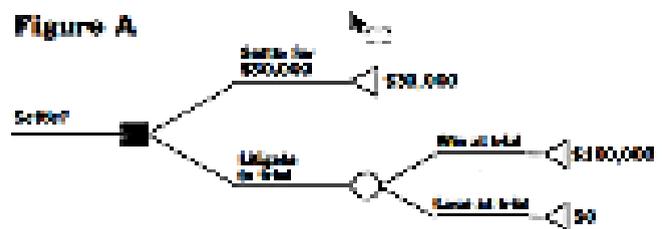
Building a decision tree requires precise statement of the estimated probability percentages of each possibility on each issue. One cannot calculate a decision tree containing branches labeled "very likely" or "extremely unlikely." Decision analysis uses numbers—probabilities expressed in percentages and specific cost or payoff estimates.

A Case Example

Often, the exercise of assigning probabilities to important uncertainties in a case clarifies communication between lawyer and client. The party who has been consistently reassured by counsel that he has a "good case" may be startled (and sobered) to learn that counsel still only assigns it a 55 percent chance of success.

For legal disputes, decision analysis is used to value the parties' litigation alternatives. A typical decision tree used in litigation has two branches: "litigate" or "settle." The settle branch may reflect the other side's most recent offer, or it may reflect the lawyer's estimate of what the adverse party might accept in settlement. The litigate branch is generally an extended chance tree, whose branches represent the different events that may transpire during litigation.

Figure A, below, represents a situation in which a plaintiff must decide whether to accept a settlement offer of \$30,000 or proceed to trial with a chance of recovering \$100,000. Assume that you represent the plaintiff, with whom you have a contingent fee arrangement in this lawsuit.



The plaintiff faces two choices—litigate or settle—which are represented by branches emanating from the decision node at the left. If the plaintiff settles, the inquiry is complete: he will get \$30,000 and the dispute will be over. If he chooses to litigate, there are two possible outcomes: win (a payoff of \$100,000), and lose (a payoff of \$0). (continued on following page)

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of the Program on Negotiation at Harvard Law School. David P. Hoffer, a 1996 graduate of Harvard Law School and Harvard Business School, plans to join the law firm of Mundt, MacGregor, Happel, Falconer, Zulaf and Hall in Seattle. This article is adapted from a longer chapter in the forthcoming book, "Mediating Legal Disputes," edited by Dwight Golann (Little, Brown), and also from the note, "Decision Analysis as a Mediator's Tool," forthcoming in the Harvard Negotiation Law Review (1996).

Decision Trees Can Be Helpful Settlement Tools

(continued from previous page)

To make this decision intelligently, the plaintiff must assess how likely he is to win if he pursues litigation. The \$30,000 settlement offer may be inadequate if the plaintiff has an excellent chance of winning \$100,000. However, the offer may be much more attractive if the chance is low.

Assume that, in the attorney's professional judgment, the plaintiff has a 60 percent chance of winning at trial (see Figure B). This probability would be displayed beneath the chance node labeled "win." Accordingly, it follows that a probability of 40 percent would be displayed beneath the node labeled "lose." The sum of the probabilities assigned to the branches coming from each chance node must always equal 100 percent.

Litigation is apparently preferable to settlement (at least given the current settlement offer) in this case because the probability of winning is more than high enough to warrant gambling at trial. This evaluation is based on the concept of "expected value" or "expected monetary value." The expected value of a node is defined as the sum of the products of the probabilities and the payoffs of its branches.

In simple terms, the expected value of a course of action is the average value of taking that course of action many times. If one were to try the identical case 100 times, and there is a 60

percent likelihood of a plaintiff's verdict, approximately 60 trials would result in a plaintiff's verdict, while 40 would result in a defense verdict. The average recovery would be 60 victories multiplied by \$100,000 per victory or \$6 million, plus 40 losses multiplied by \$0 per loss, divided by 100 cases, for an average recovery of \$60,000. Thus, the expected value associated with the litigate node is \$60,000. In fact, this case will be tried only once. Still, the analysis can be useful for decision-making.

Using an expected value approach, the plaintiff should not accept the settlement offer unless other issues (such as the need for immediate cash) make immediate settlement especially attractive, or unless the plaintiff simply cannot tolerate the risk of losing. However, the plaintiff should accept any settlement that's more than \$60,000. In reality, risk aversion and the value of current (instead of future) dollars would even make settlement a

Figure B

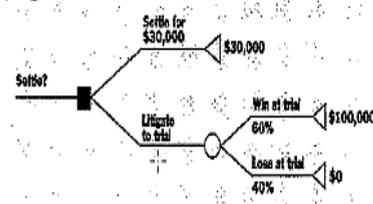
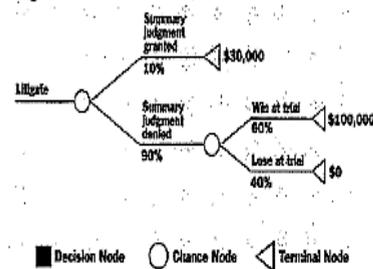


Figure C



■ Decision Node ○ Chance Node ◁ Terminal Node

wise choice if the offer was slightly less than \$60,000.

A More Complex Tree

In more complex cases, there will be multiple layers (or "generations") of chance nodes. Before the case goes to trial, for example, it may be heard on summary judgment. Thus, there would be a chance node for summary judgment (granted or denied). Assume, as we do in Figure C, a 10 percent chance that the summary judgment motion will

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be granted. On the branch of the tree that represents "summary judgment denied," one would find the chance node for liability at trial. This figure illustrates how a motion for summary judgment would be interposed between the decision to litigate and the outcome of trial.

As in all decision trees, the calculations start at the right side. By multiplying the probability of defeat at trial by the payoff, and adding the two figures together, an expected value of \$60,000 is calculated (or "rolled back") and displayed next to the node "denied." Thus, the expected value of the case upon denial of summary judgment is \$60,000.

In this case, the plaintiffs expected value of litigation must also take into account the possibility of losing on summary judgment. Thus, the expected value of the litigation is calculated by multiplying the expected value after denial of the motion for summary judgment—\$60,000—by the probability that summary judgment will be denied—90 percent. As Figure C shows, the expected value of litigation is thus \$54,000. The \$6,000 difference between this expected value and the expected value in the earlier example reflects the risk that the plaintiff will lose on summary judgment.

Depending on the level of precision required, one may design a rough-cut model, limiting the range of possibilities and making bold assumptions about damages. Or, one may develop a more refined tree, taking into account numerous possibilities (even if some have low probabilities) and assigning probabilities to different levels of damage awards.

Estimates Are Inevitable

Rough as these estimates may sound, probability and damage figures are implicitly estimated, roughly and in the aggregate, every time a lawyer makes a decision about whether or not to settle a case for a given dollar amount. Estimating them individually and with attempted precision spreads the uncertainty across all of the issues in the case and enables more focused analysis of the uncertainties most crucial to the decision. Fortunately, once the model

is developed, computer software can facilitate the process of honing these numbers (see sidebar).

Decision Analysis in Mediation

Parties in mediation often resist a reasonable but unfavorable analysis of a specific issue if they feel it will undermine their settlement position. In a reasonably complex case, however, the expected value of the decision tree is not readily apparent while the mediator works through the tree structure with the parties and assigns probabilities or values throughout the tree. This phenomenon makes the parties less resistant to the mediator's reasoning on each issue, and more willing to listen because they do not know the implications for the likely settlement range. For an evaluative mediator, decision analysis also can help influence the parties' settlement decisions.

Emotional "Distance"

Decision analysis helps people overcome emotional barriers to resolution and can be particularly helpful in an "extreme" case—one with an extremely low likelihood of a liability verdict, but extremely high damages in that unlikely event. It can also supply a logical justification for making concessions when a large recovery is subject to low odds.

This can be especially helpful when decision-makers in settlement are also involved in decisions leading to the dispute. Instead of worrying that a significant change in settlement position would be an acknowledgment of fault, business executives feel free to seek a business solution. Whatever result the mathematical calculations yield seems neutral, rigorous, and intelligent.

By calculating the expected value of a case, the parties also come up with a benchmark against which they can measure the other side's settlement offer or demand. This comparison is more rational than having each side evaluate the other's offer or demand against its own.

By transforming settlement into an individual or business decision, decision analysis helps parties escape the feeling that they are making personal or corporate concessions. The exercise

Low-Tech + High-Tech Decision Trees

Decision analysis can be performed on a simple note pad, large easel pad, blackboard, or whiteboard; those who wish to use a computer will find comfort in simple, user-friendly decision-analysis software.

Within the realm of "low tech" media, it is best to use a large surface so that all participants can view the tree structure being built. The old-fashioned large paper easel allows multiple versions of the tree to be drawn, calculated and hung up with masking tape to frame discussion. They also can be transported from room to room, rolled and transported between meeting sites, or incorporated into a written evaluation report.

For cases of any complexity, a computer screen and software are the best vehicles for decision analysis. Using reputable computer software prevents mathematical error in performing calculations and creating the tree structure.

One software option is Decision Analysis by TreeAge. It is available for \$449 from TreeAge Software, Inc., 1075 Main Street, Williamstown, MA 01267. Tel.: (413) 458-0104; Fax: (413) 458-()105. E-mail: info@treeage.com; Web: <http://www.trccage.com>.

of creating the tree and mounting it on a large paper easel, blackboard or large computer screen, removes the analysis from the arena of ego and emotion.

Even when the mediator has provided most of the probability assessments, decision analysis encourages participants to see themselves as rational actors facing an important decision. While they may not be delighted by the expected value (which they cannot control), they feel greater control over the settlement decision. As a result of the analysis, a party may decide to adjust its settlement position. But that decision feels like an intelligent, rational choice, rather than capitulation to an opponent.