

Harvard Negotiation Law Review
Spring 1996

Note

***113** DECISION ANALYSIS AS A MEDIATOR'S TOOL [FNd]

David P. Hoffer

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AMS -- Arbitration/Mediations/Settlement/Other Forms of ADR

I. Introduction

Mediators are continuously searching for new tools and techniques to help overcome the barriers to settlement that render direct negotiations between disputing parties futile. One such technique, decision analysis, [FN1] is rapidly becoming popular with mediators and parties for its usefulness in breaking difficult impasses. [FN2]

Although decision analysis is an extremely valuable addition to a mediator's toolbox, it must be used with forethought and a clear understanding of what problems it is best suited to solve. Part II of this Note explains how decision analysis is used in litigation generally; Part III describes how decision analysis is used by mediators. Part IV presents a summary of the obstacles to the use of decision analysis in mediation. Finally, Part V ties together these ideas and proposes a normative framework for the effective use of decision analysis in mediation.

II. Decision Analysis in Litigation [FN3]

Decision analysis has been traditionally used by businesspeople to model complex decisions involving multiple uncertainties. More ***114** recently, it has gained acclaim in the legal community as a methodology for making decisions in complex litigation. [FN4] Litigators facing increasing delays and costs have intensified their efforts to reach fair settlements early in the litigation process, when each side's evaluation of its case is still being formed. They have increasingly used decision analysis as a means of structuring the issues in the case, communicating about the dispute (both among co-counsel and between lawyer and client), determining settlement value, and allocating resources before trial. [FN5]

Decision analysis helps disputing parties to value their litigation alternatives, or BATNAs (Best Alternative To Negotiated Agreement). [FN6] A typical decision tree used in litigation has two branches: "litigate" and "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 often an extended “chance tree” the branches of which represent the different events that may transpire during litigation. Sometimes, it is useful merely to model the litigation alternative, without reference to a received or anticipated settlement offer. The result is a chance tree, like that emanating from the “litigate” node in a conventional litigate/settle decision tree, whose expected value is the expected value (or cost) of litigation.

Figure 1 presents a sample tree illustrating a corporation's decision regarding an hypothetical employment dispute. [FN7] Assume that a *115 former employee, Ms. Jones, has sued the XYZ Company alleging sex discrimination, and she seeks back pay, emotional distress damages, and “front pay” (compensation for lost future earnings). If settlement negotiations fail, XYZ is shielded from liability by the legal hurdles that Jones must surmount. First, she must establish a prima facie case of sex discrimination as defined in the applicable statute. Second, once XYZ Company offers a “legitimate business justification” for the dismissal, Jones must prove that the justification is a pretext for discrimination. [FN8] Satisfying this burden establishes XYZ's liability and entitles Jones to back pay; Jones must then prove the amount of emotional distress damages and front pay to which she is entitled. Figure 1

Each terminal node reflects one possible outcome. For example, the fourth terminal node from the top reflects the outcome in which liability is found (and back pay is awarded), medium front pay is awarded, and emotional distress damages are not awarded.

The costs and probabilities associated with each event are missing from this diagram. While lawyers often have an empirical basis for estimating costs, estimates of probabilities and damage awards can be more elusive. The decision analyst must rely on his professional judgment to develop reasonable approximations based on the circumstances, the applicable law, the litigation forum, the skill of opposing counsel, the astuteness of the judge, and so forth. [FN9] For purposes of this example, if we make some reasonable assumptions, the tree would look like Figure 2. [FN10]

*116 Figure 1

Jones v. XYZ

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*117 Figure 2

Jones v. XYZ

*118 In this case, a settlement of \$130,000 would be financially preferable for XYZ, ceteris paribus, to litigation with an expected cost of \$138,875.

Design and calculation of the tree are just the first steps in litigation risk analysis. Few litigators would be confident on the basis of this simple calculation that settlement is preferable to litigation, particularly in light of the substantial uncertainties inherent in the probability estimates. Most litigators would want to know how sensitive the decision is to change in specific areas, such as the probability of motions being granted, liability being found, and various levels of damages being awarded. Litigators would also want to consider the level of risk that their clients are willing to tolerate. [FN11]

Sensitivity analysis [FN12] can be a useful tool in answering these questions. Suppose, in our employment example, that we were uncertain about the accuracy of our estimate of the probability that Jones could make out a prima facie case. A sensitivity analysis on that probability would yield the following result:

***119** Figure 3

Sensitivity analysis on probability of establishing prima facie case

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The positive slope of the “litigate” line shows that the cost of litigation increases as the probability of Jones's establishing a prima facie case increases. Changes in this probability do not affect the cost of settlement, \$130,000. Since the “litigate” line is above the “settle” line at all points, the graph indicates that the decision is not sensitive to a 5% change in the probability of Jones's making out a prima facie case. At any probability from 75 percent to 85 percent, settlement is still cheaper than litigation.

By contrast, the decision is sensitive to a similar change in the probability of Jones's proving pretext, as Figure 4 demonstrates. Figure 4

At the estimated probability of a finding of pretext (67 percent), settlement is less costly than the expected value of litigation; however, once the probability of pretext drops beneath 61.5 percent, the litigation alternative becomes less costly than the proposed settlement. Thus, if XYZ's lawyer were not completely confident that the probability was greater than 61.5 percent, he would invest resources in narrowing the range of probability that Jones would prove that the justification for the termination was a pretext for discrimination.

***120** Figure 4

Sensitivity analysis on probability of proving pretext

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III. Decision Analysis in Mediation [FN13]

A mediator is usually called in to facilitate the settlement of a dispute in which direct negotiations have been derailed by one or more “barriers to settlement.” [FN14] Mediators can overcome some barriers to settlement more easily than others. For example, when mediators facilitate communication between parties and defuse emotional obstacles, they help to correct informational imbalances. Mediators are less effective at facilitating the resolution of issues of principle, since the party seeking vindication often cannot achieve that goal in a private forum. Also, mediators may have less success *121 in harmonizing different predictions about trial outcomes, because the trial preparation process encourages parties to focus on the strengths rather than the weaknesses of their respective cases.

A mediator can utilize decision analysis to help parties overcome barriers to settlement, by working with both sides to develop a joint model. [FN15] This technique usually entails designing a chance tree that represents the litigation alternative for both sides, such as that in Figure 5.

*122 Figure 5

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*123 The parties can then focus their debate on specific aspects of the joint decision tree, which can lead to a more efficient, productive negotiation. [FN16]

A. Surmounting Common Barriers to Negotiation

The most common barriers to settlement are described below, along with an explanation of how decision analysis can help the mediator to surmount them.

1. Different Predictions About Trial Outcomes

When parties' lawyers reach different conclusions about the legal merits of their clients' cases, their disparate valuations of the case can impede settlement. Many contrasting predictions can be translated into differing probability estimates at specific points in a decision tree: the probability of winning a motion, a specific factual finding, or a certain level of damage award. This “translation” can narrow the focus of discussions, forcing counsel to refine their arguments and justifications to make a credible case in the course of the mediation. Experimentation with a decision tree can also influence the parties' actual perceptions of the overall value of the case.

2. Asymmetric Information

When one party is acting on information to which the other party is not privy, settlement

may be more difficult. If one party possesses a piece of evidence of which the other party is unaware, their respective valuations of the case will be different, and unassisted settlement may be impossible. [FN17]

By serving as a repository for information about the issues and uncertainties in the case, a decision tree can facilitate sharing of information that otherwise might have remained private. Through a *124 decision tree, each party will learn more about the assumptions underlying the opposition's case, as the lawyers explain the basis for probability and value estimates. This process enables each party's counsel to consider all of the issues influencing the other side's valuation, and it also provides a valuable opportunity for each party to see the case from the other's perspective. Ultimately, it may help the parties to reach convergent expectations about the value of the case.

3. Emotional Issues

Parties (and their lawyers) can become emotionally involved in their case, which can impair rational decision-making about settlement. By providing a logical valuation tool that effectively transforms the dispute into a business problem, the mediator can use decision analysis to move beyond emotional issues and toward a rational resolution of the dispute. Emotions are less likely to be triggered by a debate over a specific probability than by a general debate about the merits of the case. Decision analysis can thus help to “separate the people from the problem.” [FN18]

4. Different Views of the Facts

Parties will value litigation differently when their perceptions of the relevant facts differ. When parties predict different litigation outcomes, settlement is more difficult. [FN19] Decision analysis can differentiate between those factual disputes whose resolution is essential to a settlement and those whose resolution is not. Sensitivity analysis can help parties identify, and focus their attention on, those factual disputes that have the greatest impact on the settlement value of the case.

5. Constituencies

When lawyers (or other agents) represent diverse constituencies whose approval is necessary for settlement, the bargaining process may be difficult. [FN20] This phenomenon may be seen as a “two-level game” in which the agents are negotiating both with each other and *125 with their respective clients or constituencies. [FN21] In such situations, the parties may design a decision tree to explain the reason for entering into an agreement. After a tentative settlement has been reached, a negotiator can present the decision tree to his constituency and explain why a settlement is rational in light of the risks modeled by the decision tree. Such a tangible demonstration can be very effective in securing a group's support for an agreement that might otherwise seem unwarranted.

6. Agency Problems

The negotiation process is complicated when the lawyer takes into account his own interests. When the lawyer's incentives differ from those of the client, as is often the case with both hourly fee arrangements and certain contingent fee arrangements, these differences in interests can block agreement. [FN22]

Decision analysis diminishes the lawyer's ability to persuade the client to act counter to his self-interest by highlighting the client's true goals. The process of designing the decision tree forces the client and the lawyer to formulate an objective jointly (usually the maximization of net income or minimization of total cost). Faced with a decision tree that demonstrates clearly which course of action is best suited to achieve the client's goals, the lawyer will be less able to manipulate the process to serve his own ends.

7. Poor Communication

Poor communication between parties or between lawyers--resulting from hostile relations or poor communication skills--can prevent crucial information from being shared by all stakeholders. [FN23] Decision analysis can make communication more productive by narrowing the issues, sharpening the arguments, and improving understanding. Parties will gain a better sense of the issues on which they *126 disagree. Some issues will turn out to be sources of little disagreement; others will be revealed through sensitivity analysis to have little impact on the total case value. This educational process allows the parties and the mediator to focus their efforts on the key areas of dispute. Furthermore, reduction of the litigation to a decision-analytic model helps lawyers and mediators transform an abstract, heated debate about the overall merits of a case into a concrete, detached discussion about the probabilities and costs associated with specific events.

8. Reactive Devaluation

This psychological mechanism, in which the recipient of an offer concludes that "it must not be good enough for us if they're willing to offer it," can prevent workable solutions from being ratified. [FN24] Decision analysis can minimize reactive devaluation by creating acceptable settlement figures through the application of a rational framework, rather than by a traditional exchange of offers and counteroffers. A party is less likely to devalue the other's offer if it understands the offer's genesis.

9. Linkage to Other Disputes

When the resolution of the instant dispute depends on the disposition of another conflict, settlement may be hindered unless the linked dispute can be addressed in a settlement package. [FN25] To the extent that a decision tree model can be broadened to address the possible results of collateral disputes, the parties can use it to determine a reasonable settlement value for multiple disputes that exist between the parties. The parties can expand the tree to account for the options and uncertainties associated with the collateral disputes and then use the ag-

gregate model to determine an appropriate “package” settlement value.

10. Unfavorable Combinations of Risk and Loss Aversion

Risk aversion explains a party's willingness to forego a chance to win a large gain in order to be guaranteed a smaller one. [FN26] Conversely, loss aversion explains a party's inclination to risk a large loss *127 in order to avoid having to make a smaller, certain payment. [FN27] If plaintiff is risk averse and defendant is not loss averse, the case may settle more easily because each party wants to avoid the risk of being defeated; however, settlement will be unlikely if a loss averse defendant is willing to risk a costly judgment rather than pay out a certain sum in settlement.

While negotiation often masks differences in risk and loss aversion (since neither party wants the other to know when it is bluffing), decision analysis can illuminate differences in risk preferences in a constructive way. Each party can use the decision tree to test its own and its opponent's risk preferences. The ability of decision analysis software to develop and apply risk-preference curves can account more precisely for risk.

11. Strategic Behavior and Posturing

Uncooperative behavior is central to many lawyers' strategies; indeed, it may be perceived as poor lawyering to forego such behavior. In an effort to shift the bargaining range in his favor (or to avoid letting the range shift in the adverse party's favor), a lawyer may exaggerate the merits of his case to create the appearance that there is no zone of potential agreement. These persuasive arguments may commit the lawyer to a recalcitrant posture, which may be hard to abandon in settlement discussions. [FN28]

By encouraging parties to work together on a joint solution, a mediator can use decision analysis to minimize posturing and other strategic behavior. Some posturing will necessarily take place as the details of the tree are developed, but it is likely to be more focused and less obstructive than “grandstanding” about the value of the case.

12. Issues of Principle

When an issue of law, precedent, public policy, or personal pride is at stake, parties will often resist settlement because the privacy of the process does not allow this interest to be vindicated in a public forum. [FN29] While it is difficult to put a monetary value on issues of *128 principle, a mediator can use a decision tree to highlight and challenge parties' implicit valuation of the principles at hand. For example, suppose that the XYZ Company refuses to settle for more than \$50,000, preferring to go to court as a matter of principle. The mediator can ask the defendant whether he is willing to sacrifice over \$88,000 (the difference between the acceptable settlement figure and the expected cost of litigation) to establish the principle that one should not settle baseless claims. If the principle is so important to the defendant that he answers in the affirmative, the parties can save time and money by terminating the mediation and the settlement negotiations. On the other hand, if the defendant determines that the

value of the principle is not as great as the exposure to liability modeled by the decision tree, he will decide to relax the artificial \$50,000 settlement cap in the name of rational decision-making.

B. Collateral Effects

In addition to resolving some of the above barriers to settlement, the use of decision analysis by a mediator can benefit the parties through several collateral effects.

1. Setting Client Expectations

The translation of focused discussions into hard numbers serves as a valuable tool through which lawyers can communicate with their clients about case valuation and settlement decisions. The average layperson is ill-equipped to decipher legal argument and strategy for purposes of decision-making. If he has an effective lawyer who argues persuasively, the layperson may find it difficult to see weaknesses in his own case. Much as a mini-trial affords decision-makers the opportunity to hear opposing counsel's arguments directly, [FN30] decision analysis affords the opportunity to demonstrate the expected bottom-line impact of those arguments on the range of potential litigated outcomes.

2. Enhancing Cooperation

When both parties and the mediator understand the grounds for the parties' differing valuations of the case, the mediator can help the parties to treat the dispute as a joint problem. The decision tree can divert the lawyers' energies away from battling one another and toward finding creative ways to exploit their different perceptions in a *129 settlement agreement. This shift in focus can also defuse the emotional barriers to settlement by fostering an atmosphere in which specific disagreements on points of law are addressed in technical rather than rhetorical debate.

3. Legitimacy

The use of a recognized methodology to model litigation risk, combined with the use of a computer and specialized software, adds legitimacy to the mediation process. This legitimacy is helpful both in motivating the attorneys to settle and in persuading clients that there is a rational and articulable basis for agreeing to a particular settlement.

C. Implications

Once decision analysis has been utilized, the dispute resolution process can take any of several turns. The case may settle immediately. The parties may reach agreement on subsidiary issues and use the momentum from a partial settlement to propel them toward a more complete one. The parties may identify a limited number of issues on which they fundamentally disagree, submit those issues to binding arbitration, and design a settlement package

whose terms depend, in whole or in part, on the arbitration result. The parties may fail to reach any agreement; however, they will walk away with a more complete understanding of the weaknesses and risks associated with their respective cases, which may lead to a future settlement.

IV. Obstacles to Use of Decision Analysis in Mediation

Parties or their lawyers may resist using decision analysis because of unfamiliarity with either the underlying concepts or their application. These obstacles to the use of decision analysis are encountered frequently and can resurface in different ways as the tree is created and analyzed. Thus, if decision analysis is to be employed successfully, mediators should be aware of the various obstacles to the use of decision analysis, as well as available techniques for overcoming them. [FN31]

***130** A. Overcoming Common Obstacles

1. Discomfort With Mathematics

Many lawyers are uncomfortable with the mathematical concepts that underlie decision analysis. A lawyer may be reluctant to engage in decision analysis out of fear that (1) his lack of familiarity with the techniques for assigning probabilities and analyzing results will put him at a competitive disadvantage, or (2) he will be embarrassed in front of his client or opposing counsel. To induce the lawyer to engage in the conceptual process of designing the tree, the mediator can start with its structure while omitting probabilities and payoffs. The lawyer who has helped to create the tree will be more willing to make the leap to mathematics when the time comes. At that point, the mediator can teach the basic principles of decision analysis using simple examples and apply the mathematical principles to the case only when they are understood by all.

2. Discomfort With Computers

Complex decision analysis is simply impractical without the use of a computer. Software exists to model complex decision trees easily and powerfully, [FN32] and it also allows real-time testing of different values and estimates in the course of mediation. To the extent that a lawyer is uncomfortable with computers, he may be resistant to their use in the mediation. Mediators can avoid this barrier by starting with pen and paper to model the tree in its early stages, and moving to the computer only when the lawyer realizes the tedium of drawing diagrams by hand.

3. Unwillingness to Cede “Control” to a Model

Even the most mathematically-inclined, computer-literate lawyer may be reluctant to engage in decision analysis because it may appear to wrest control of the settlement away from

him in a way that simple mediation does not. When a model is designed to represent the litigation, the mediator's ability to manipulate it and achieve different results may seem to appropriate from the lawyer a crucial element of his role: the ability to persuade others to adopt his view of a case's value. The prospect of allowing opinions to be swayed through the click of a button may be quite frightening.

***131** To counteract this reaction, a mediator can reframe the activity in terms of simply thinking through the parties' decisions. By emphasizing that no irrevocable commitments are made by engaging in the analysis and that the effort is merely an attempt to assess the value of the case in a structured fashion, the mediator can defuse some of the lawyer's anxiety about losing control of the process.

4. Unwillingness to Share Probability Estimates With Mediator; Resistance to Changing Perceptions

Lawyers often posture with the mediator and try to convince him that their cases are stronger than they really are, particularly in evaluative mediation. To the extent that strategic advantage may be gained by convincing the mediator of the merits of one's case, each lawyer may be unwilling to share his real probability estimates with the mediator, or to change his beliefs about the merits on the other side. A lawyer who knows that his chances of winning a motion for summary judgment are infinitesimal is unlikely to say so to the mediator; he is even less likely to admit his poor position to his opponent. These problems inhere in any mediation, and techniques used by the mediator (such as reality testing and exploration of contingent settlements) to address them in other circumstances are equally applicable here.

5. Failure to Achieve Buy-in

As with settlement agreements in general, lawyers and their clients will be more reluctant to accept decision-analytic models if they do not help to forge them. At the same time, a mediator will get bogged down in details if he seeks to mediate the addition of each branch and probability. The mediator can circumvent this conundrum by mediating the design of the tree's structure without allowing the entry of any probabilities or other numbers. Once the parties have developed a mutually acceptable structure, they will often feel enough ownership of the model to surmount the buy-in problem.

6. Reluctance to Anchor Expectations at an As-yet-undetermined Figure

Lawyers may refuse to use decision analysis for fear of anchoring. Once the model is developed, the party whose position is closer to the model's result may anchor his bargaining position to the model ***132** and resist further concessions. [FN33] Because neither party knows in advance whether the model will favor its position, both parties may decide that it is safer to avoid the risk of an unfavorable anchor.

This obstacle to the use of decision analysis may be the most difficult to overcome, partly because parties will rarely state the objection explicitly. The mediator can surmount this

obstacle by reemphasizing that the numbers reflect merely a preliminary attempt at an accurate model and represent only points in a range of reasonable figures. By explaining the use of sensitivity analysis early in the process, the mediator can reinforce the idea that precision is rather unimportant with respect to certain numbers, and that parties should thus reserve judgment on the importance of accuracy until after initial analyses have been performed.

V. Conclusion

Whether or not to employ decision analysis is, like many decisions faced by a mediator, a strategic decision. Just as mediation is not appropriate to all disputes, decision analysis is not appropriate to all mediations; unfortunately, there is no concrete set of rules that can be applied to determine whether a particular mediation would benefit from using the methodology.

In some instances, characteristics of the dispute itself will drive a mediator's election to use decision analysis. For example, a mediator might be more likely to do so if a major barrier to settlement is different predictions of trial outcome than if issues of principle, pride, or precedent dominate. A mediator should contemplate which barriers to settlement are hindering resolution of the dispute and consider whether, under the circumstances, decision analysis would aid in overcoming them.

In other instances, characteristics of the individuals involved might lead a mediator to draw conclusions about the suitability of decision analysis for the mediation of their dispute. For example, if the parties and lawyers demonstrate a complete lack of familiarity with mathematical concepts and computers, the effort required by the mediator to overcome their hostility and teach them the necessary fundamentals may not be worth the potential benefits. A mediator should thus consider the qualities of the individuals involved and formulate a strategy appropriate to them.

***133** A key predictor of the success of the technique is the mediator himself. He must be credible to both parties and experienced in both traditional mediation and litigation risk analysis. Unless the parties have faith in the mediator's judgment and ability to guide them in the right direction, the process is likely to fail. Thus, a mediator should familiarize himself in advance with the concepts of decision analysis, the techniques for exploiting it maximally in mediation, and the software necessary to do so efficiently.

Decision analysis is certainly not a panacea for all mediators' woes. Mediators must be aware of the strengths and limitations of decision analysis, as well as the obstacles to its use, before deciding whether and how to use it. Decision analysis has the potential to facilitate the resolution of particularly intractable disputes. A mediator who adds it to his toolbox should find the payoff handsome.

***134** Appendix A: Fundamentals of Decision Analysis

A decision tree is a graphical representation of a complex decision. Developed in the 1960's for use in business education, decision trees are flexible enough to be used for many

types of decisions. Professionals in the fields of business, economics, medicine, public policy, engineering, and law all use decision trees when multiple uncertainties complicate the decision process.

A. Structure

Decision trees are organized chronologically, from left to right. They contain “nodes” of three different types: decision, chance, and terminal. A decision node (represented by a square) denotes a point at which the decision-maker must choose between two or more options. A chance node (represented by a circle) denotes a point where the decision-maker has no control over the outcome; each event following a chance node has a probability associated with it that reflects how likely it is to occur. Terminal nodes (represented by triangles) denote final outcomes, after which no events relevant to the decision are considered.

The following simple decision tree represents a situation in which a personal injury plaintiff must decide whether to proceed to trial with a chance of recovering \$1,000 or settle for \$500. (See Fig. A.) Assume that you represent the plaintiff in this lawsuit.

Figure A

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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 gets \$500 and the dispute ends. If he chooses to litigate, there are two possible outcomes: win (a terminal node with a payoff of \$1,000) and lose (a terminal node with a payoff of zero). For purposes of this example, all of the uncertainties associated with litigation (other than liability), as well as costs, are ignored.

To make this decision intelligently, the plaintiff must assess how likely he is to win if litigation is pursued. A \$500 settlement offer *135 may seem inadequate if the plaintiff has an excellent chance of winning \$1,000; however, the offer may be very attractive if a successful outcome is less certain. In order to be more precise, we must assign probabilities to the uncertain events modeled by the tree. In this simple case, we must assess the likelihood that the plaintiff will win at trial.

Assume that, in your professional judgment, your client has a 40% (.4) chance of winning at trial. This probability would be displayed beneath the node labeled “win.” Accordingly, a probability of 60% (.6) would be displayed beneath the node labeled “lose.” (See Fig. B.)

Figure B

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B. Calculation

Settlement is apparently preferable to litigation in this case because the probability of winning is not high enough to risk the gamble of trial. This evaluation is based on a concept called expected value or expected monetary value. The expected value of a node is defined as the sum of the products of the probabilities and payoffs of its branches. In other words, 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 cases identical to this case one hundred times, about forty would result in a victory while sixty would result in a loss. The average recovery would be 40 victories at \$1,000 per victory, or \$40,000, plus 60 losses at \$0 per loss, divided by 100 cases tried, for an average recovery of \$400. [FN34] Thus, the expected value associated with the “litigate” node is \$400. (See Fig. C.)

*136 Figure C

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C. Different Kinds of Trees

A distinction must be drawn between decision trees and chance trees. A decision tree is a tree whose first node (the “root” node) is a decision node; thus, it models a situation in which the events being modeled are triggered by an initial decision to be made by the decision-maker. A chance tree (or “event tree”) is a tree whose root is a chance node; in other words, no decision is required. It is used to model events over which the decision-maker has no control, and its value represents the value of being faced with the modeled set of uncertainties.

Chance trees are often embedded in decision trees. For example, one can examine the chance tree that represents the litigation alternative in the example above. Its expected value, \$400, represents the expected value of litigation. (See Fig. D.)

Figure D

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D. More Complex Trees

The concept of expected value is at the core of all decision analysis. In more complex trees, the expected value is calculated in stages. In the example below, a motion for summary judgment is interposed between the decision to litigate and the outcome of the trial. (See Fig. E.)

Figure E

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***137** If your client chooses to litigate, the defendant will move for summary judgment, with a 10% chance of winning. If summary judgment is denied, the same win/lose chance tree from Figure D follows the denial of summary judgment.

To calculate the expected value of this tree, the decision analyst starts at the right side. As discussed above, by multiplying the probability of winning by the damage award, multiplying the probability of defeat at trial by the payoff, and adding the two figures together, an expected value of \$400 is calculated and displayed next to the node "SJ denied." Thus, the expected value of the case upon denial of summary judgment is \$400.

The plaintiff's expected value of litigation must also take into account the possibility of losing on summary judgment. Thus, the expected value of litigation is calculated by multiplying the expected value associated with the denial of summary judgment, \$400, by the probability that summary judgment will be denied, 90 percent. This figure, \$360, is added to the product of the zero value of losing on summary judgment and the 10% probability of losing on summary judgment. The expected value of litigation is thus \$360. The \$40 difference between this expected value and the expected value in the simpler example reflects the risk that the plaintiff will lose on summary judgment. Since a \$500 settlement offer is preferable to a litigation alternative whose expected value is \$360, your client would be well-advised to settle the case. [FN35]

[FNd]. Awarded First Prize--Student Articles, CPR Institute for Dispute Resolution, New York, New York (1995).

[FN1]. The term "decision analysis" was originally used to refer specifically to the analysis of decision trees. In recent years, the term has been used more broadly to describe any of a number of techniques for thinking systematically about decisions. In this paper, the term refers to the traditional use of decision trees.

[FN2]. For an excellent discussion of where decision analysis fits in the spectrum of available methods for conducting evaluative mediation, see Marjorie C. Aaron, *The Value of Decision Analysis in Mediation Practice*, *Neg. J.* 123 33 (April 1995).

[FN3]. For a brief tutorial on using decision trees to model decisions, see Appendix A, *infra*.

[FN4]. See, e.g., Marc B. Victor, *The Proper Use of Decision Analysis to Assist Litigation Strategy*, 40 *Bus. Lawyer* 617 *passim* (1985) (responding to critical misconceptions of the use of decision analysis and suggesting that it can be a useful analytical tool to value complex litigation).

[FN5]. For example, a litigator can use sensitivity analysis to explore the question: "Shall I in-

cur \$30,000 in legal fees for my client in order to narrow down my estimate of the probability of winning summary judgment in this case?" If the analysis indicates that a change in the probability of winning summary judgment will yield a change in the expected value of litigation of only \$20,000, then the lawyer might choose to expend resources elsewhere. Applications such as this one, in which one party can use decision analysis to make partisan strategy decisions in the course of litigation, are beyond the scope of this paper. For an incisive summary of such partisan applications of decision analysis to litigation, see Morris Raker, *Software to Model the Uncertainties in Litigation*, in *Winning with Computers: Trial Practice in the Twenty-First Century*, Part II 175 (John C. Tredennick, Jr. ed., 1993). For an explanation of the use of sensitivity analysis, see *infra* note 12 and accompanying text.

[FN6]. See Roger Fisher et al., *Getting to YES: Negotiating Agreement Without Giving In* 97 106 (2d ed. 1991).

[FN7]. All diagrams in this paper were produced using Decision Analysis by TreeAge (DATA), a decision analysis software package available for Windows and Macintosh from TreeAge Software, Inc. of Williamstown, Massachusetts. Computer software can render the use of decision analysis much less daunting, because it provides an easy mechanism to draw, modify, and analyze the tree in a graphical and intuitive fashion.

[FN8]. See *McDonnell Douglas Corp. v. Green*, 411 U.S. 792, 799 802 (1973).

[FN9]. The reader who is skeptical of the utility of rough estimates must remember that 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 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 using techniques such as sensitivity analysis.

[FN10]. Assumptions used in formulating this tree are as follows: the probability of establishing a prima facie case and pretext are 80% and 67%, respectively; back pay (if awarded) would be \$100,000; the likelihoods of high, medium, low, or no front pay are 5%, 15%, 30%, and 50%, respectively; front pay may be \$100,000, \$250,000, or \$500,000; the probability of an emotional distress damages award is 90%, 70%, 50%, and 30%, respectively, corresponding to the likelihood of front pay (in recognition that the more a jury is willing to award in front pay, the more likely it is to award emotional distress damages); emotional distress damages (if awarded) can be proven to be \$25,000; Ms. Jones has offered to settle the case for \$130,000; and rejection of the offer and proceeding to trial would incur an additional \$30,000 in legal fees.

[FN11]. Risk preference curves can be applied to any decision tree to translate expected monetary value into risk-adjusted certainty equivalents. In the *Jones v. XYZ* case, application of a concave risk-aversion curve would widen the gap between settlement and litigation, making settlement even more attractive. In situations where litigation is preferable to settlement according to expected monetary value, a concave risk-aversion curve can cause settlement to be-

come more attractive than litigation. This result is consistent with most lawyers' experience that risk-averse parties are more likely than risk-neutral parties to enter into unfavorable settlements simply to avoid the risk of an adverse judgment.

[FN12]. Sensitivity analysis demonstrates the effect on the expected value of available options of varying a particular quantity relevant to the decision. It is performed by calculating the expected value of each option using different values for the quantity being examined, and then plotting those values on a graph. The horizontal axis of the graph reflects the quantity being varied, and the vertical axis reflects the expected value of the options. Each available decision option is represented by a line. By examining the relative positions of the lines, one can discern which option is preferable at any given value of the quantity at issue.

[FN13]. The use of decision analysis does not depend on the school of mediation theory to which the mediator subscribes. Broadly speaking, there are two poles--purely facilitative and purely evaluative--on the spectrum of mediation styles. The primary difference between points along this spectrum is the degree to which the mediator offers his own opinions with respect to the relative merits of the parties' underlying cases. While a decision tree can be used as a vehicle for communicating and justifying a case evaluation, it can also be used as a purely facilitative tool. Thus, non-evaluative mediators need not shy away from decision analysis for fear of losing their "neutrality."

[FN14]. The most frequently encountered barriers to settlement are: different predictions about trial outcomes, asymmetric information, emotional issues, different views of the facts, constituencies, agency problems, poor communication, reactive devaluation, linkage to other disputes, unfavorable combinations of risk and loss aversion, strategic behavior and posturing, and issues of principle. See generally Robert H. Mnookin & Lee Ross, *Introduction to Barriers to Conflict Resolution 2* (Kenneth Arrow et al. eds., 1995) (analyzing some of the most common barriers to settlement).

[FN15]. The mediator can also assist each party privately in formulating a decision tree which models that party's litigate/settle decision. Such "partisan" decision trees typically follow the model in Figure 1; the mediator can serve as a neutral sounding board and evaluator in assigning values to the branches of the tree. The mediator may elect to introduce the concept of decision analysis in separate private sessions with each party, building a simplified structure and eliciting probability estimates with respect to liability and levels of damage awards. The mediator can use the forum of a private session to question the lawyers on their respective probability estimates, noting the weaknesses in their respective cases and shaping a tree that is realistic.

Even when a mediator helps both sides to develop their respective trees, there may be substantial structural and numerical differences. One party may face decisions (such as whether to file particular motions or perform additional research) that the other party may not face or even know about. The mediator's ability to advise each party confidentially on the development of its tree is valuable in helping that party to assess its litigation alternative thoroughly. Such structural discrepancies, however, can impede the mediator's ability to build a "joint" tree applicable to both parties.

[FN16]. This benefit is most manifest when there are multiple legal questions in the case, be-

cause the analysis can reveal which issues are most crucial to reaching agreement. A dispute driven by a simple “yes/no” question is less amenable to settlement through modeling, because there is less to “narrow down” in the process.

[FN17]. Information asymmetries may also hasten settlement, as when A possesses harmful information about its own case and agrees to settle at a figure more favorable to B than A would have accepted in the absence of the evidence. See George A. Akerlof, *The Market for Lemons: Qualitative Uncertainty and the Market Mechanism*, 84 *Q.J. Econ* 488, 495 (1970); Lucian A. Bebchuk, *Litigation and Settlement Under Imperfect Information*, 15 *Rand J. Econ.* 404, 408 (1984); Robert B. Wilson, *Strategic and Informational Barriers to Negotiation, in Barriers to Conflict Resolution*, *supra* note 14, at 113.

[FN18]. See Fisher et al., *supra* note 6, at 17 39 (exhorting parties to distinguish between tensions in their relationship and substantive disputes, and to address these two types of conflict separately).

[FN19]. See Frank E.A. Sander & Stephen B. Goldberg, *Fitting the Forum to the Fuss: A User-Friendly Guide to Selecting an ADR Procedure*, 10 *Neg. J.* 49, 56 (1994).

[FN20]. See *id.* at 57.

[FN21]. See generally Lawrence Susskind & Jeffrey Cruikshank, *Breaking the Impasse: Consensual Approaches to Resolving Public Disputes* (1987) (providing a guide to strategies for resolving public disputes consensually); Robert D. Wilson, *Diplomacy and Domestic Politics: The Logic of Two-Level Games*, in *Double-Edged Diplomacy: International Bargaining and Domestic Politics* (Peter B. Evans et al. eds., 1993) (exploring the effect of domestic constituencies on the dynamics of international negotiations).

[FN22]. See Robert H. Mnookin, *Why Negotiations Fail: An Exploration of Barriers to the Resolution of Conflict*, 8 *Ohio St. J. Disp. Resol.* 235, 242 43 (1993); Bruce L. Hay, *Optimal Contingent Fees in a World of Settlement* (October, 1995) (unpublished manuscript, on file with the Program in Law and Economics, Harvard Law School).

[FN23]. See Sander & Goldberg, *supra* note 19, at 54 56.

[FN24]. See Mnookin, *supra* note 22, at 246 47; Mnookin & Ross, *supra* note 14, at 15.

[FN25]. See Sander & Goldberg, *supra* note 19, at 57 58.

[FN26]. But see *id.* at 59 (describing the “jackpot syndrome” in which a plaintiff is driven to trial by the prospect of a huge payoff).

[FN27]. See Mnookin, *supra* note 22, at 243 46; Daniel Kahneman & Amos Tversky, *Conflict Resolution: A Cognitive Perspective*, in *Barriers to Conflict Resolution*, *supra* note 14, at 54 59.

[FN28]. See Mnookin, *supra* note 22, at 239 42.

[FN29]. See Sander & Goldberg, *supra* note 19, at 57.

[FN30]. See Eric D. Green et al., *Settling Large Case Litigation: An Alternate Approach*, 11 *Loy. L.A. L. Rev.* 493, 509 (1978).

[FN31]. These obstacles include: discomfort with mathematics, discomfort with computers, unwillingness to cede control to a model, unwillingness to share probability estimates with the mediator, failure to achieve buy-in, and reluctance to anchor expectations at an as-yet-undetermined figure.

[FN32]. See *supra* note 7.

[FN33]. See Kahneman & Tversky, *supra* note 27, at 57-59 (describing the influence of “reference points” on settlement values).

[FN34]. The same result can be reached by (1) multiplying the probability of victory, 0.4, by the payoff associated with one victory; (2) multiplying the probability of defeat, 0.6, by the payoff associated with one defeat; and (3) adding the two together, for an expected value of $\$400 + \$0 = \$400$.

[FN35]. For more background on decision analysis, see generally Howard Raiffa, *Decision Analysis: Introductory Lectures on Choices under Uncertainty* (1968) (developing decision analysis as a methodology for analyzing complex decisions under uncertainty).
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