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9:00 am-10:30 am

408 Using Decision-tree Analysis to Intelligently Manage Litigation

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Rowena Borenstein

Rowena Borenstein is the general counsel to Astellas Pharma Canada, Inc., a global affiliate of Astellas Pharma Inc., in Markham, Ontario. In addition to serving as a member of the Astellas Pharma Canada senior management team, Ms. Borenstein is responsible for servicing all of the day-to-day legal requirements of the company, including the drafting and negotiation of commercial agreements, the provision of regulatory advice relating to the pharmaceutical industry, intellectual property counsel, counsel on employment issues, and general corporate governance and advice. Ms. Borenstein also acts as the company's compliance officer and privacy officer.

Prior to joining Astellas Pharma Canada, Ms. Borenstein served the law firm of Ogilvy Renault as an associate. While at Ogilvy Renault, Ms. Borenstein was responsible for corporate and commercial intellectual property work and intellectual property litigation matters, focused in the pharmaceutical and life sciences industries.

Ms. Borenstein received a BS from McGill University in Montreal and is a graduate of Queen's University School of Law.

Brian R. Daley

Brian R. Daley is a partner with Ogilvy Renault in Montreal. Mr. Daley practices in all areas of intellectual property law, with a focus on patents, trade-marks, and litigation at the trial, appellate, and Supreme Court level. He has particular expertise in regulatory matters and litigation involving pharmaceutical patents.

Mr. Daley also advises clients on food and drug regulation in Canada, judicial review of matters under federal jurisdiction, all aspects of trade-marks, from application through litigation, various packaging and labeling matters, including proper use of trade-marks, and compliance with language legislation on the use of English and French.

Mr. Daley received a BEng from Memorial University, an MSc from Technical University of Nova Scotia, and a LLB from McGill University.

Jeffery Rennecker

Jeffrey Rennecker is senior corporate counsel at Pfizer, Inc. in New York, where he is involved in intellectual property enforcement matters on behalf of the company.

Mr. Rennecker received an LLM in Intellectual Property Law from George Washington University School of Law, and he is registered to practice before the US Patent and Trademark Office.

ACC Association of Corporate Counsel

Using Decision Tree Analysis to Effectively Manage Litigation

Overview

- What outside counsel offer
- What inside counsel want
- The words outside counsel use
- Decision tree analysis: a better alternative
- The client's world
- Benefits of analytical decision analysis
- Limitations

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What outside counsel offer

- Opinion
- Counsel
- Representation

What inside counsel want

- Opinion…they can understand
- Counsel….they can apply to complex problems
- Representation … responsive to business realities

What do these words mean?

Nobody really knows…

Range of results from an informal Ogilvy Renault survey:

	Perhaps as low as	Perhaps as high as
There is a good chance	20%	95%
In all likelihood	50%	100%
There is a definite possibility	1%	80%

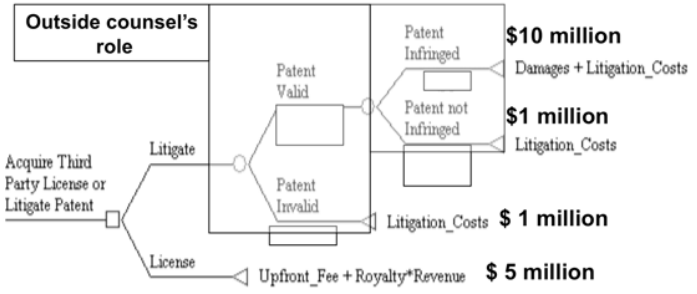
The words outside counsel use

- Good chance Better than even
- Reasonably good Fair
- Likely On balance
- Quite likely Probable
- Reasonably likely Possibility
- Unlikely possibility Definite

Inside counsel's world

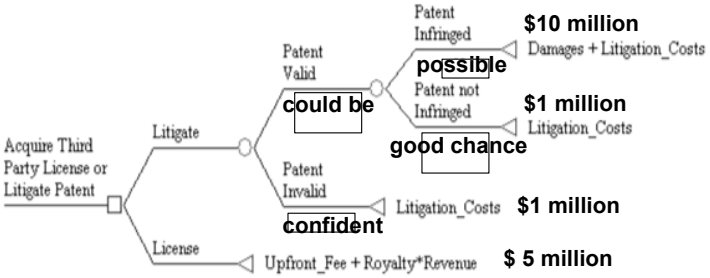
DECISION TREE MODEL

Defend a patent infringement action or take a license



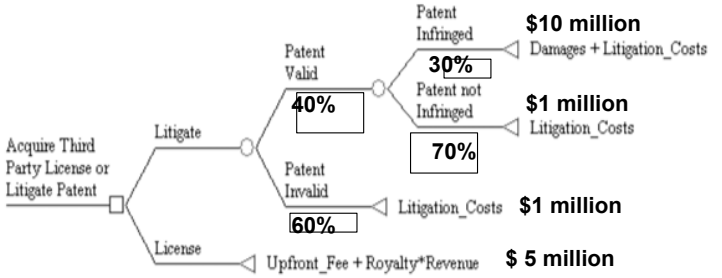
DECISION TREE MODEL

Using traditional words of opinion



DECISION TREE MODEL

Using probabilities

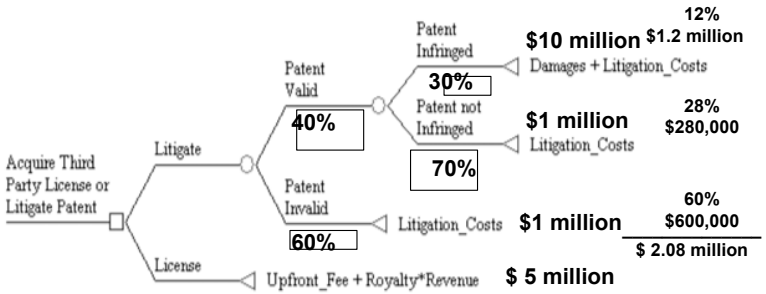


Use of decision-tree analysis: A better way:

- Perfect information is never available
- Outcomes are never certain
- Outcomes can be assigned probabilities based on observation and experience
- Outcomes can be compared using probability values
- Decisions should be made to maximize benefit and minimize loss

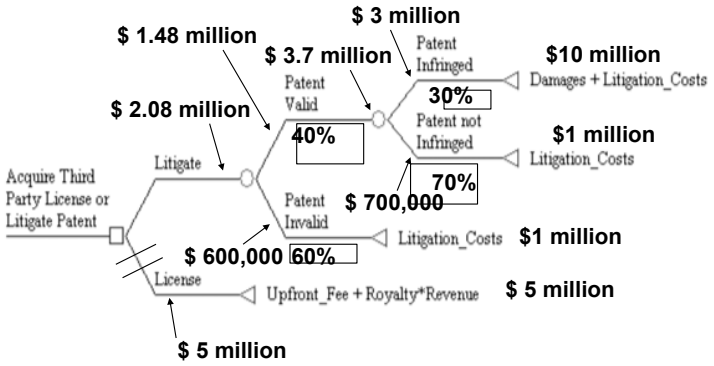
DECISION TREE MODEL

Using probabilities



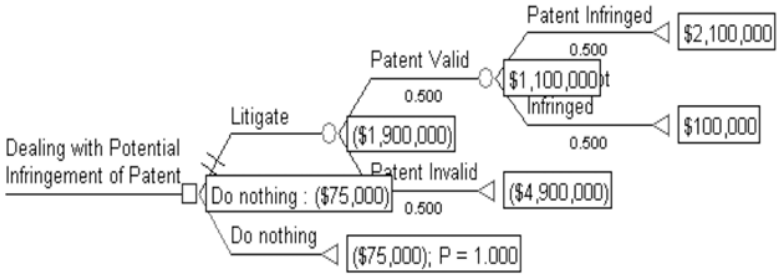
DECISION TREE MODEL

Using probabilities and probability values to minimize cost



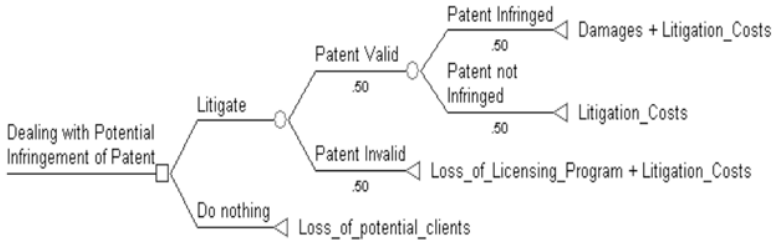
Turning the tables: The opponent's world DECISION TREE MODEL

•Identification of opponent's weakness(es)



Turning the tables: The opponent's world DECISION TREE MODEL

• Evaluation of opponent's options



Benefits of decision analysis

- Manageability of complex problems
- Business-friendly format
- To inside counsel benefit
- To outside counsel benefit

Managing complex problems

- Requires breaking down problem into its elemental issues and outcomes
- Each issue/outcome can be analyzed separately
- Impact of each issue/outcome on decision can be assessed
- No issue/outcome is lost or forgotten

Benefits to inside counsel

- Building tree model puts problem in perspective
- Integrates legal and business factor
- Involvement in building the decision tree model
- All outcomes best and worst are presented

Business friendly format

- Avoids unclear legal terminology
- Form and content understandable to a business decision maker

Benefits to inside counsel (cont'd)

- Settlement points can be identified
- Provides a negotiating tool (turn the table)

Benefits to outside counsel

- Brings added value to client
- Additional service to offer client
- Outside and inside counsel are involved in the process.

Limitations of decision analysis

- Does not predict a particular outcome
- Only suggestive of probable outcomes
- Cannot take into account risk aversion

Using Decision Tree Analysis to Effectively Manage Litigation

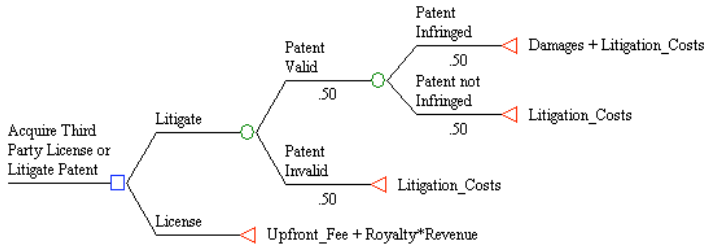
You got to know when to hold 'em, know when to fold 'em,
Know when to walk away and know when to run.
(Kenny Rogers, "The Gambler")

I. INTRODUCTION

Decision tree analysis is a useful tool to bridge the gap between litigation strategy, as envisioned by outside counsel, and business strategy, as envisioned by in-house counsel and management. It is a method of comparing different strategies, which in turn allows decision makers to make better decisions. The underlying theory of decision analysis is premised upon the following assumptions:

- Perfect information is never available
- Outcomes are never certain
- Outcomes can be assigned probabilities of occurring based on observation and experience
- Different outcomes can be compared by assigning each a probability value
- Decision makers always decide with the probability values in their favour

This paper provides an outline of decision analysis, including the underlying theory, decision tree models, examples of applied decision analysis, and the benefits available to the decision maker and the attorney-analyst. The visual tool used in decision analysis is the decision tree, an example of which is depicted below. As the panellists are frequently involved in intellectual property litigation, some of the examples will come from our experience. However, the principles apply to all types of litigation.



Decision tree analysis allows inside and outside counsel to work together to transform imprecise terms such as "good chance" or "reasonably likely2 into probabilities and

dollar values. Litigators care about legal issues, litigation strategy and winning, while in-house counsel and management care about costs, probability of success, the potential value of the litigation either in terms of potential benefit or potential loss, and whether settlement is feasible. Decision-tree analysis deconstructs a complex lawsuit into discrete steps and possible outcomes that can pave the way for appropriate decision-making

II. PROBABILITY: THE FOUNDATION OF DECISION ANALYSIS

A. The History of Probability

The concept of probability has application in almost everything we do, from selecting the route we will take to get to work, to determining litigation strategy. The beginning of probability theory, however, can be traced back through history to a single source: gambling.

References to games of chance can be found in classical Greek literature dating from the era of the Trojan wars, between the 13th and 12th century B.C., although evidence suggests games of chance were prevalent long before this in Egypt and other ancient cultures.[1] Throughout history games of chance, usually involving dice, stimulated questions and interest in the concept of probability. It was in this context that some of the most notable mathematical scholars developed the theories that remain the foundation of probability analysis today.[2]

Even though the possibility of outwitting your opponent in a good game of "rolling of the bones" was desirable, it took humans over a thousand years to truly understand key concepts of probability such as permutations and combinations.[3]

One of the first industries revolutionized by the application of probability theory was the insurance industry. While it is hard to imagine insurance companies offering life insurance policies and setting corresponding premiums without consulting life expectancy charts, probability data based on age and death was not available when the concept of insurance originated. Until the late 18th century, most annuity and insurance plans charged flat rates regardless of age, and instead of maximizing profits by insuring more persons as we do today, companies were forced to strictly limit the size of their membership.[4] Surprisingly, however, even when detailed life expectancy tables became available in the late 17th century, insurers did not embrace this technology, which had basically been custom made for their industry.[5] Even the most astute insurers of the day had difficulty believing that a shipwreck or accidental death was anything more than divine intervention and resisted the suggestion that such events could be tied to numbers and mathematical concepts.[6]

The first insurance company to use probability data did not come into existence until over 100 years after the first life expectancy chart had been generated, and even then it was opened and run by mathematician James Dodson, not an insurer.[7] Although successful, Dodson's probability based insurance was not imitated for nearly twenty years.[8] It appears embracing probability theory, although a long time coming, was not a bad move for the insurance industry; U.S. life and health insurance companies recorded profits of $8.7 billion in the first quarter of 2004.[9]

Not unlike the insurance industry of past centuries, the legal profession, even with our advanced knowledge of concepts and theories of probability, has been cautious in embracing and applying this approach to problem solving.

B. Human Cognition

For most decisions, choices are made out of habit, experience, or tradition, rather than by analyzing problems using a step by step systematic process. The human brain by nature has limited capacity to solve even relatively simple decision problems and our short term memory has difficulty remembering anymore than 7 "chunks" of information at any given time.[10] Often referred to as our "working memory", our short term memory is where humans store new information while it is being mentally processed. Unfortunately, as many of us know, short term memory is not infallible. When numerous pieces of information are stored in short term memory, additional efforts must be made to retain each piece of information for more than 20 seconds.[11]

Merely remembering all of the important pieces of information which should be applied to solving a problem does not of course guarantee a decision maker will come to a logical or optimal decision. It may be acceptable to rely on the typical human approach of mentally juggling information for the relatively inconsequential choices we make everyday. However, decisions which could seriously impact a decision maker's business

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[1] Nickerson, R. (2004). *Cognition and Chance*. New Jersey: Lawrence Erlbaum Associates.

[2] Howie, D. (2002). *Interpreting Probability*. Cambridge: Cambridge University Press.

[3] Nickerson, *supra*.

[4] Gigerenzer et al., *supra*

[5] Howie, *supra*.

[6] Howie, *supra*.

[7] Gigerenzer et al., *supra*.

[8] Gigerenzer et al., *supra*.

[9] http://www.bizjournals.com/losangeles/stories/2004/09/20/daily31.html.

[10] The chunking principle was first recognized by Harvard psychologist George A. Miller who determined that a typical person's short term memory could only be expected to remember 7 numbers after a few minutes of being told. http://www.chambers.com.au/glossary/chunk.htm.

[11] Banikowski, A. and Teresa Mehring. *Focus on Exceptional Children*. Denver: Oct 1999. Vol.32, Iss. 2.

often involve a large range of factors both legal and factual for which the everyday human decision making process is overwhelmed.

Analytical tools such as decision analysis are helpful in dealing with complex factual and legal factors in business environments.

C. Probability: The Basics

The Unknown
As we know,
There are known knowns.
There are things we know we know.
We also know
There are known unknowns.
That is to say
We know there are some things
We do not know.
But there are also unknown unknowns,
The ones we don't know
We don't know.

—U.S. Secretary of Defense, Donald Rumsfeld,
Feb. 12, 2002, Department of Defense news briefing

While most events in life, business, and law are uncertain, their probability of occurrence can usually be effectively quantified.

Probability can be defined as the measure of how likely an event is to occur, or in more technical terms, the ratio of all ways in which an event may occur divided by all possible events.[12] Measured on a scale of 0 to 1, with 1 being absolute certainty, most would argue a probability of 1 is reserved for death and taxes.

The rules of probability allow for the calculation of the probability of one or a combination of events occurring, or the probability of one event occurring conditionally on the occurrence of other events (conditional probabilities). Measurement of the probability of an event can be based either upon objective frequency, generated using actual historical data, or subjective opinions, which can be obtained from experts in the relevant field.

[12] Bayesian Probabilities (http://gunston.doit.gmu.edu/healthscience/720/Probability.asp).

D. Applied Probability and Decision Analysis

Applied probability and decision analysis is all around us. However, we often fail to recognize the presence or impact probability based data has had, and continues to have, on our society. For example, as discussed above, the insurance industry was revolutionized by probability theory once resistance to its application was overcome[13]. Today, probabilistic analysis has even permeated our leisure activities, with researchers discovering that tennis players, whether consciously or not, employ Bayesian[14] statistics to determine how hard and fast a ball is going and where it is likely to go.[15] Business executives, nuclear safety experts and weather forecasters are all taught probability theories based on Bayesian logic to sharpen their intuitions.[16] Probability based analysis has even played a key role in the development of the legal system as we know it today, with early probability studies determining optimal jury sizes and voting procedures.[17]

Industries which currently utilize decision analysis techniques include banking (to make cost effective risk management decisions), manufacturing (to evaluate new product development, market entry and exit strategies and product improvement introduction), consulting (to create, analyse, choose and implement decision maker business strategies), medicine (determination of resource allocation and training to equip medical professionals with the ability to make optimal decisions under pressure and time restraints).

III. DECISION ANALYSIS

A. Application of Decision Analysis

Regardless of the industry setting or the specific circumstances giving rise to the requirement to make a strategic decision, the decision analysis process can be customized and used to assist in rationalizing the available options.

For example, consider a problem in which a decision maker must consider a business strategy requiring the assessment of one or more business and legal issues. While an attorney can provide legal advice in respect of the law, this alone may be insufficient to address the decision maker's needs. Decision analysis and its models allow for the

[13] Howie, *supra*.

[14] Bayesianism, or Bayes Logic, which was developed by British cleric Thomas Bayes in the late 18th century, is a branch of logic applied to decision making and inferential statistics which uses knowledge of prior events to predict future events.

[15] "Tennis players on the ball with maths". January 19, 2004. ABC Science Online. http://www.abc.net.au.

[16] Gigerenzer et al. (1989) The Empire of Chance. New York: Cambridge University Press.

[17] Howie, *supra*.

incorporation of both business and legal issues and can assist in determining the optimal course of action.

The making of any strategic decision requires a decision maker to identify and quantify all of the critical factors and uncertainties surrounding the specific issue or situation. Outside counsel's role is to identify and quantify the legal issues for incorporation and assessment in the decision analysis.

In a decision analysis model, possible outcomes may vary depending on the unique set of business options available to the key decision-makers. Some examples include:

- Obtaining a license to use patented technology from a third party or litigating under different scenarios;
- Accepting an offer of settlement or proceeding to trial;

B. Outside Counsel - Decision Maker/Inside Counsel Co-Operation

In cases involving legal analysis (for example, a potential infringement of intellectual property rights or the assessment of the validity of a patent) many of the qualitative inputs to the analysis, as well as the structure of the analysis, are supplied by the outside counsel who can give a breakdown of all the relevant legal questions that must be determined. In addition, outside counsel assigns quantitative inputs for each of the relevant legal questions based on a legal analysis and the attorney's experience and confidence in assessing the likely outcomes.

In order to complete the analysis, the decision maker/inside counsel must provide the attorney with the qualitative and quantitative inputs that frame the structure of the analysis, including the business factors that may affect the ultimate outcome. The decision maker also provides quantitative scientific input that assists the attorney in assessing the probabilities associated with particular variables, e.g. infringement, validity, regulatory approval, etc.

C. Limitations of Decision Tree Analysis

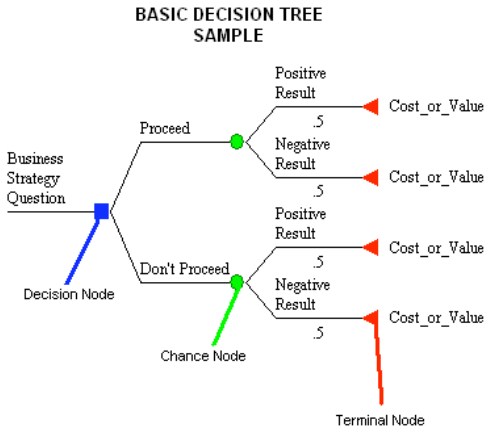
Decision tree analysis cannot take into account any risk aversion. This is important if the numbers suggest that the decision maker may face a risk of suffering a loss that the company cannot bear. Despite any expected benefits, that may be too great a risk to take.

Decision tree analysis does not predict a particular outcome. It merely suggests the probability of a particular outcome occurring based on inside counsel's and outside counsel's assessment of the probability of individual events leading to one or more particular outcomes. Therefore, both the outside counsel and decision maker/inside counsel must recognize decision tree analysis as a tool for assisting in assessment of complex legal and factual problems, not as a guarantee of any one particular outcome.

D. The Decision Tree

The main analytical tool of a decision analysis is the decision tree. A tree is composed of branches connected by nodes, with each branch representing a choice. There are three types of nodes: decision nodes, chance nodes and end nodes. Each end node has associated with it an amount representing the value or cost of that particular outcome. The path from the base of the tree to the ends of each branch represents a possible outcome. Taken together, the end nodes represent all possible eventualities of a case.

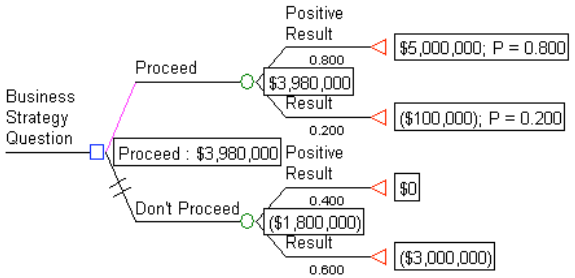
A sample tree illustrating each of the different types of nodes and the branches is set forth below:



Each of the end or terminal nodes is located at the end of a branch and has a chance node to the left at the other end. The branch has a probability number indicated in brackets. This indicates the probability that the event associated with that branch will occur. The sum of the probability numbers associated with a given chance node is 1.0 (100%). The economic value associated with each chance node is the weighted sum of the economic values associated with each of the branches emanating from the chance node. The economic value of each branch will be the product of the value/cost of the outcome and the probability of its occurrence.

The dollar value associated with a particular choice will often depend on issues which are not yet determined. The idea is to determine which issues can affect the dollar value of a given choice and what the chances are of each issue being decided each way.

The basic example below shows the generated probabilistic value associated with each possible outcome identified by the decision maker.



This example illustrates that the probabilistic value of "Proceeding" with the relevant course of action is $3,980,000. The alternative course of action, "Don't Proceed", has a probabilistic value being a loss of $1,800,000. Thus the model suggests to the decision maker that "Proceeding" is the preferable option.

In reality, the outcomes flowing from the decision to "Proceed" will either be a benefit of $5,000,000 with an 80% probability, or a loss of $100,000 with a 20% probability. The probabilistic value of "Proceeding" is calculated as follows:

$$\$3,980,000 = \$5,000,000*0.8+(-\$100,000*0.2)$$

E. Creating a Decision Tree

In order to generate a decision tree, the following essential components of the tree must be determined:

- Range of Decisions
- Influential Factors
- Possible Outcomes (usually financial)

The range of decisions should encompass all possible choices that are before the decision maker/inside counsel, whether seemingly beneficial or detrimental on first impression and are represented by branches in the tree. Influential factors should include all factual and legal uncertainties which may impact upon the scenario being considered in the decision analysis. These factors are represented by chance nodes. As with the range of decisions, possible outcomes should include all potential finalities regardless of the decision maker's initial thoughts or biases. A decision tree which only considers the decisions favoured by the decision maker or outcomes based on presumptions not otherwise considered by the decision analysis will be of minimal value to both the outside counsel and the decision maker/inside counsel.

Once these three essential components of the decision tree are defined by collaborative efforts of the outside counsel and decision maker/inside counsel, a preliminary tree showing the possible decisions, areas of uncertainty, and contemplated outcomes can be generated. While this visual representation of a complicated business scenario and the related brainstorming exercise are helpful in their own right, the true benefits of decision analysis and decision trees are realized once actual probability values are assigned to the areas of uncertainty, the chance nodes.

F. Assigning Probability

Decision analysis software simplifies the assignment of probabilities to uncertain factors by dividing the uncertainties in a complex problem into discrete influential factors.

Conventional expressions of legal opinions can provide decision makers/inside counsel with a less than clear, and potentially confusing, legal picture. Terms such as "reasonable", "good chance", "highly likely", "most reasonable", and even "probable" are not standard measurements or established values. These expressions may be interpreted differently by different people.

When analyzing problems and drafting legal opinions, attorneys are, in fact, assigning a probability to the situation. "Reasonableness", "highly likely" and "good chance" are, although subjective, still quasi-quantitative terms. The premise of decision analysis is that quantitative probabilities be assigned to the uncertainties in the model.

Decision tree analysis makes it easier to deal with probability values; first, through the breakdown of the legal uncertainties relevant to discrete factual and legal issues and second, by assisting with a visual tool to assign probabilities.

Consider a situation where patent validity is in question, with the possible grounds of invalidity being anticipation, obviousness and ambiguity. While it would be difficult to consider all of these issues at once and report a percentage probability of success, when each issue is considered individually, an attorney can weigh each allegation and assign specific probabilities to each one. For example, 10%, 20% and 30% probabilities assigned respectively to anticipation, obviousness and ambiguity.

G. Model Calculations – Determining Weighted Values

Once values and probabilities have been assigned to the decision tree components, the probability of each outcome must be determined. This is accomplished by multiplying the successive probabilities from the decision node of the tree through each chance node to the particular outcome. Each outcome is given a weighted value corresponding to the financial value of the outcome multiplied by its probability. The probability values are then calculated from each outcome branch back through the tree to the decision node. Working back towards the decision node, the probabilistic value at each chance node is calculated to be the sum of the probabilistic values of the branches multiplied by the probability value assigned to each branch.

This process is repeated for all paths of the decision analysis tree and yields the weighted value/cost of a particular decision. The expected cost is a weighted average only and does not represent a particular outcome.

Weighted values and their averaging is not a guarantee of success, but rather allows the decision maker to "play the odds" properly. Decision analysis uses weighted averaging to measure the economic consequences of possible legal outcomes. The economic value of an action or strategy can be calculated using presumptions as to what the associated costs would be. Branches denoting each possible approach are all connected to the decision node. The optimal decision in each case is the approach which offers the most favourable benefit generally expressed in economic terms.

H. Computer assistance

Computer software programs assist in decision analysis as tools to exploit the theory. Because the decision tree can become quite large rather quickly, the number of calculations that may be desirable can also become difficult to manage. In addition, the number of iterations involved in working through the analysis with different scenarios makes the problem even more unwieldy. Software provides the decision maker and the attorney with the flexibility to change the structure of the tree or the value of any quantitative input at any time. No redrawing of charts or recalculation of figures by hand is required.

Some of the software programs designed for decision analysis include:

TreeAge Pro by TreeAge Software, Inc.

Criterium DecisionPlus by Infoharvest Inc.

Crystal Ball 7 Professional Edition by Decisioneering Inc.

Decision Tools Suite by Palisade Corporation

RISKview by Palisade Corporation

IV. Benefits of Decision Analysis

A. Manageability of Complex Problems

As the factual complexity of a situation increases, it becomes more challenging for the decision maker/inside counsel to balance the importance and impact of all the relevant factors. An analytical tool such as decision tree analysis allows a large number of influential factors to be retained within the model. When attempting to determine the optimal way to proceed in situations involving both complex legal and business issues, any method of more clearly illustrating the problems, uncertainties, risks and possible outcomes is beneficial.

B. Business-Friendly Format

Decision tree analysis models present legal opinions in a format familiar to business minded individuals. Terms such as "likely", "probably", "possible", "potentially", and "suggests that", although commonly found in legal opinions, are not particularly useful to those seeking direction and solutions to their business problems. Illustrative decision tree analysis models provide accurate, visual representations of the relevant legal and factual issues.

C. Benefits to the Decision maker/Inside Counsel

Decision analysis invites the decision maker and the attorney to work cooperatively in structuring the model and making quantitative assessments. The sensitivity of any quantitative assessment of any particular factor on the decision choices can be readily determined through iteration of different scenarios and assumptions. This assists in identifying areas of greater importance to the outcome. The importance of these areas could be missed without performing the analysis. This determination then helps the outside counsel and the decision maker/inside counsel decide where extra effort should be placed and where resources should be allocated.

The analysis can also be used for negotiations with third parties. It suggests to the decision maker the level at which it makes economic sense to enter into a deal or settle a dispute and it further allows the decision maker to show to the opponent the exact basis for this position. The analysis can serve to encourage cooperation in negotiation because it is difficult to disagree with the structure of the analysis. The only dispute should be over the quantitative inputs.

The analysis also clearly anticipates the possibility that the worst case scenario could happen, and provides the decision maker with a quantitative assessment of the likelihood of it happening and the associated costs.

Decision analysis involving legal issues bridges the gap in language between the legal opinion and the decision maker's perception of the legal issues, in order to assist in strategic decision-making by taking into account the business and legal issues.

D. Benefits to Outside Counsel

The exercise of having to identify the range of decision options, the possible outcomes and most particularly the significant factors, is particularly useful. It brings rigour to the identification of factual and legal issues and permits them to be dealt with and analyzed discretely. This avoids the common problem of confusion which arises when at the same time trying to resolve an issue such as infringement raising a question of construction and validity which may also turn on a question of construction. Decision analysis requires that each of these issues be carried out separately and their impact in the overall analysis can be likewise dealt with separately.

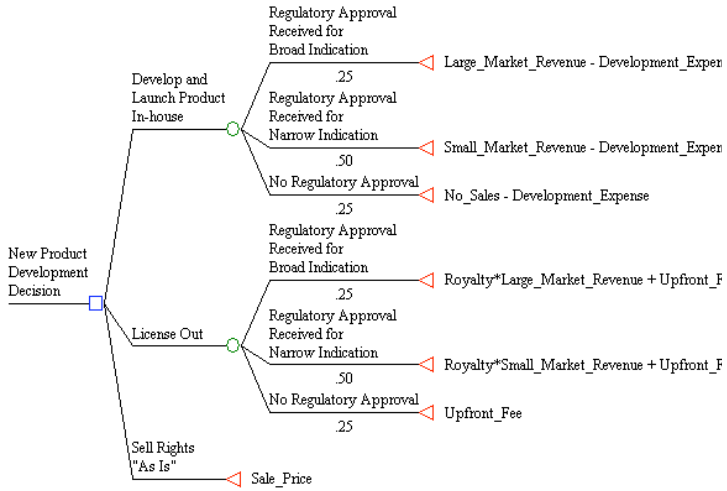
Outside counsel can then identify those factors which have a greater impact on the potential outcomes than others. Experience has proven that factors which intuitively would seem to be the most significant are sometimes overshadowed by other factors which at first impression were not thought to be very determinative. This permits outside counsel to direct appropriate resources to the analysis of the most relevant factors which may involve legal research and marshalling of expert opinion.

Finally, the fact that outside counsel can present to the decision maker/inside counsel an analysis in terms with which business people are comfortable allows outside counsel to bring added value to the exercise.

V. Examples of Applied Decision Analysis[18]

A. Example 1:New Product Development Decision

The decision maker is evaluating new product technology, in its very early stages. An offer has been received from a third party to purchase all rights in the new technology "as-is". The decision maker must decide whether to sell the intellectual property rights, whether to license the technology to third parties in order to minimize risk, or whether to retain the technology and develop and launch a product. The outcomes in each of the latter two cases will be affected by the regulatory approvals received for the developed product.



Once the decision tree structure has been finalized, taking into account all of the variables and issues inherent in the business decision-making process, each individual outcome stemming from a chance node will have a probability assigned to it. Finally, the value of each outcome is calculated using formulae and projected market data.

The structure of the tree can be expanded to accommodate the complexity of the actual problem. The more detailed the analysis, the more confidence can be had in the results. For example, the "License Out" branch could be expanded to account for the differences in contracting with an exclusive licensee or multiple non-exclusive licensees. The

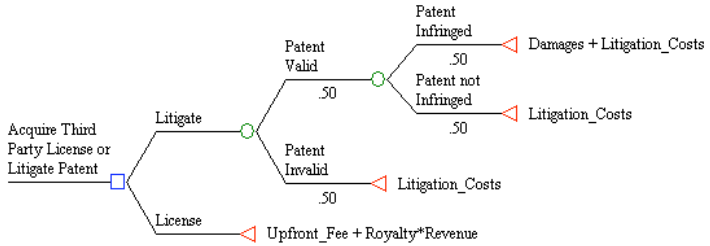
[18] The examples provided in this paper were generated using TreeAge Pro Software by TreeAge Software, Inc.

"Development Expense" variable could be calculated as a function of time, which might more accurately reflect the decision maker's risk exposure.

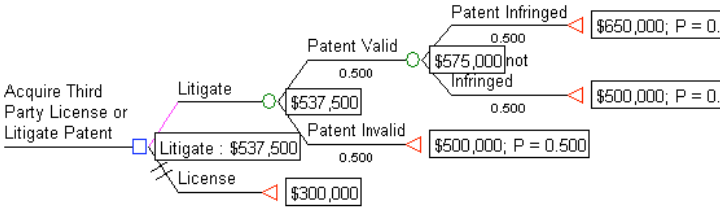
B. Example 2: Litigation Risk Analysis

A second example illustrates the use of decision analysis to analyze a more traditional legal problem. In this example, the decision maker is developing a new technology. A third party is claiming that use of the technology will require a license under its patent rights. The business person must evaluate the cost of the license versus the cost of litigation, taking into account the likelihood of success on issues such as validity and infringement, and make an economically justified decision to either litigate or acquire a license.

As with the previous example, the actual issues involved in a litigation scenario may be much more complex, and the decision tree would be structured accordingly.

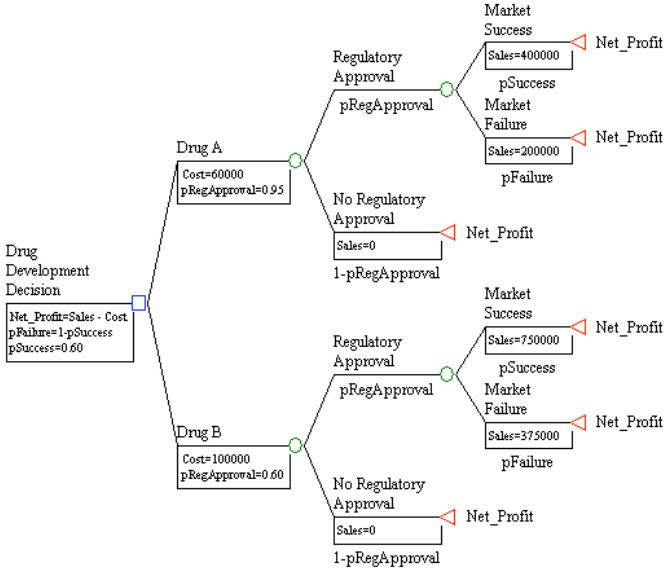


Once estimated or known values are added to the decision tree, the decision analysis model can be calculated and the probabilistic values associated with each outcome can be compared.



C. Example 3: R & D Decision Analysis

A third example illustrates a decision tree developed for choosing between two candidate drugs for product development. The calculated tree is also depicted. Note the use of the "generic" variables Sales and Cost, which are used in the payoff formula to calculate Net Profit. Each is then assigned a different value for Drug A and B at the root node of each subtree. Variables defined at the root of the master subtree are not duplicated in the subtrees. In this example, the variable "pSuccess" (which indicates the likelihood of the developed product establishing a large market share is identical for both Drug A and Drug B, but "pRegApproval" (which indicates the likelihood of each drug receiving regulatory approval) takes on different values.



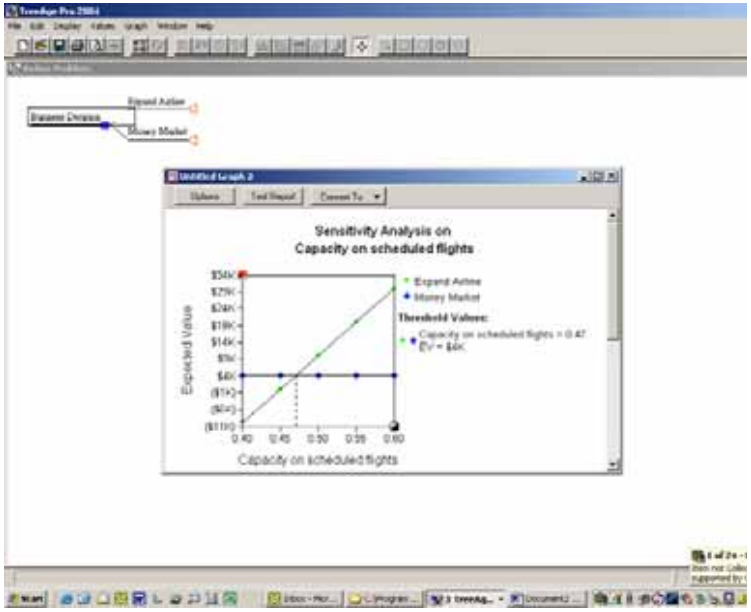
Once all of the formulae and variables have been identified and quantified, the calculated tree reveals the probabilistic economic value of each of the options.

VI. ADVANCED DECISION ANALYSIS TOOLS

A. Sensitivity Analysis

Sensitivity analysis allows for the assessment of how variations of one or more uncertain values in the decision analysis model will affect the possible outcomes. For example, a change in royalty rates, predicted damages or interest rates could all have either a much greater or significantly less impact on values that one might expect, yet this is not easily visualized outside of the decision analysis model.

Outcomes of sensitivity analysis can show a decision maker how a small change in one variable can have a large impact on outcome values, or alternatively, how a large change may have very little impact on possible outcomes. Therefore, sensitivity analysis allows for identification of the most volatile variables and areas of uncertainty. More energy can then be focused on these areas of uncertainty, rather than those which have been shown to have minimal impact on the situation.



B. Nested Trees

When numerous factors, uncertainties, and possible outcomes are relevant in an analysis, the corresponding decision tree can become too complex to be effectively considered together in one tree. In order to deal with a complex analysis, distinct sections of a complex decision tree can be separated out, creating a main tree with an underlying series of separate but dynamically linked trees, referred to as "nested trees".

While the main tree will continues to represent the decision analysis from the original decision node to the possible outcome nodes, the nested trees represent the analysis for specific uncertainties such as obviousness, anticipation, and ambiguity in the context of a patent infringement action. With each nested tree dealing with only one issue, different attorneys can be assigned to the analysis of specific issues, thereby focussing attorney resources and expertise.

In software-based decision tree models, nested trees are connected to the main tree allowing changes in the nested trees to be reflected in the main tree.

C. Multiple Perspectives

A useful application of decision analysis is to build similar decision trees from the perspectives of both the plaintiff and defendant in litigation, or parties adverse in interest in a negotiation of a commercial agreement.

The significant factors and the basic design of the tree should be the same irrespective of the perspective. Additionally, the probabilities assigned to uncertainties such as validity and infringement can be the same. It is the outcomes that may vary significantly. This is due to the fact that the commercial interests of the plaintiff and defendant and their business perspective is often quite different. Attached in Appendix A are two decision trees prepared to analyse potential litigation involving three of the plaintiff's patents. The plaintiff and defendant were in negotiation with a view to settle. The possible outcomes for each party and the consequences to each of winning and losing were quite different. Accordingly, it was readily observable that the decision thresholds for each of the parties were different. This provided useful information for the negotiation.

VII. CONCLUDING COMMENTS

One of the biggest benefits of decision-tree analysis is that it forces inside and outside counsel to reduce complex litigation to discrete quantifiable issues and to assign monetary values to different outcomes. For this reason, it makes sense to include decision-tree analysis early in the litigation process. The decision-tree can be updated as the case progresses.

Decision trees also avoid the misunderstandings that result from the use of imprecise terms. Decision trees help everyone involved to understand possible outcomes based on factors and probabilities that both inside and outside counsel have agreed on. It also reduces the impact of emotion on decision-making. Decision-tree analysis is not infallible and does not predict outcomes. However, it does provide decision makers/inside counsel with a rational and justifiable basis for making business decisions in a litigation context.

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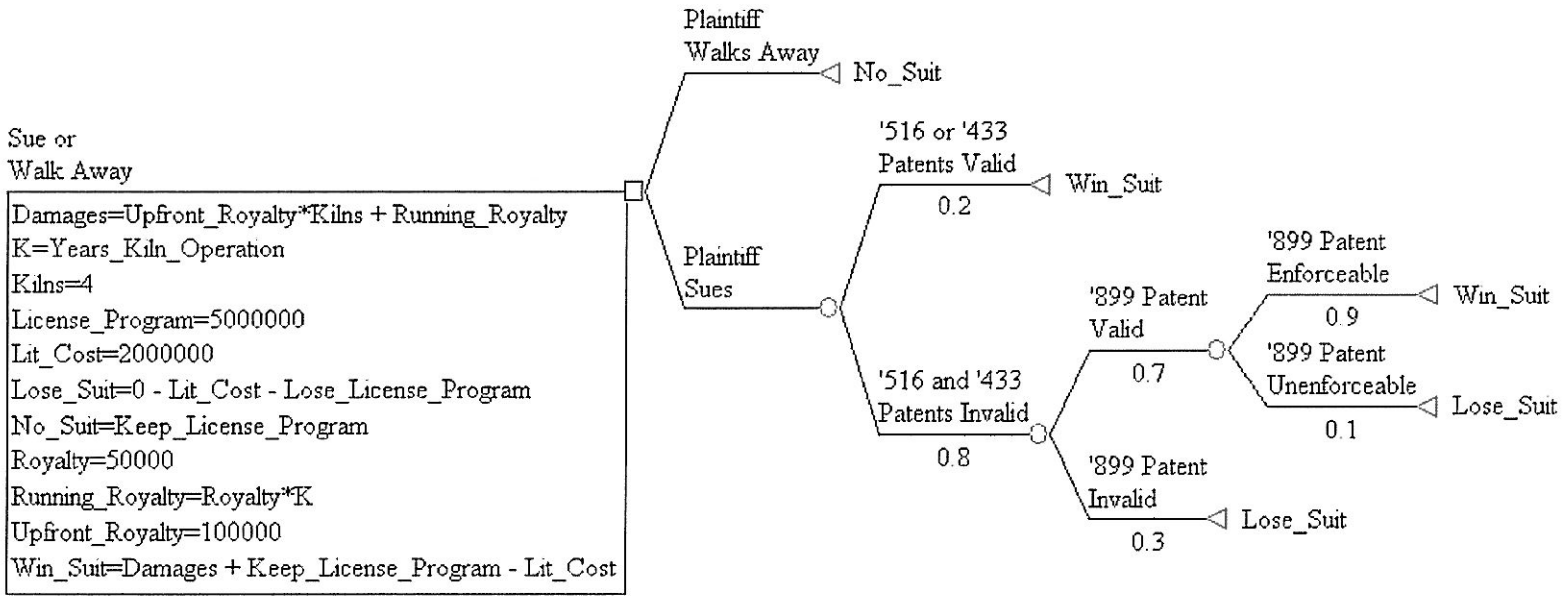
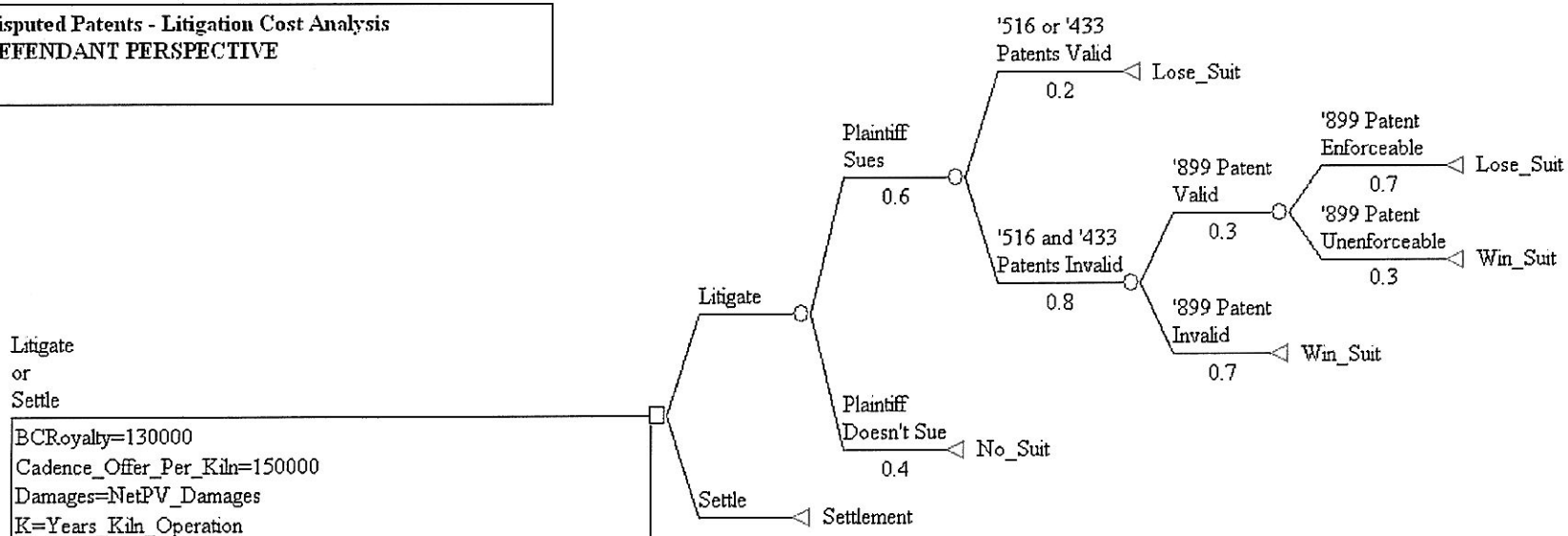
Disputed Patents - Litigation Risk Analysis
PLAINTIFF PERSPECTIVE



ASSUMPTIONS

(1) No infringement on Patents '965, '594, and '774.
(2) Infringement on Patents '516, '433 and '899, but no treble damages.
(3) Damages equivalent to projected license fee (Upfront Royalty of $100,000 per kiln plus Running Royalties of $50,000 per kiln per year).
(4) Model based on 5 years of over-all operation (3 years to trial and 2 years thereafter).
(5) 2 Kilns assumed in operation in year 1, and an additional 2 Kilns in year 2.
(6) Pre-judgment interest not calculated, nor is money discounted to present value.
(7) License Program valued at $5,000,000

Disputed Patents - Litigation Cost Analysis
DEFENDANT PERSPECTIVE



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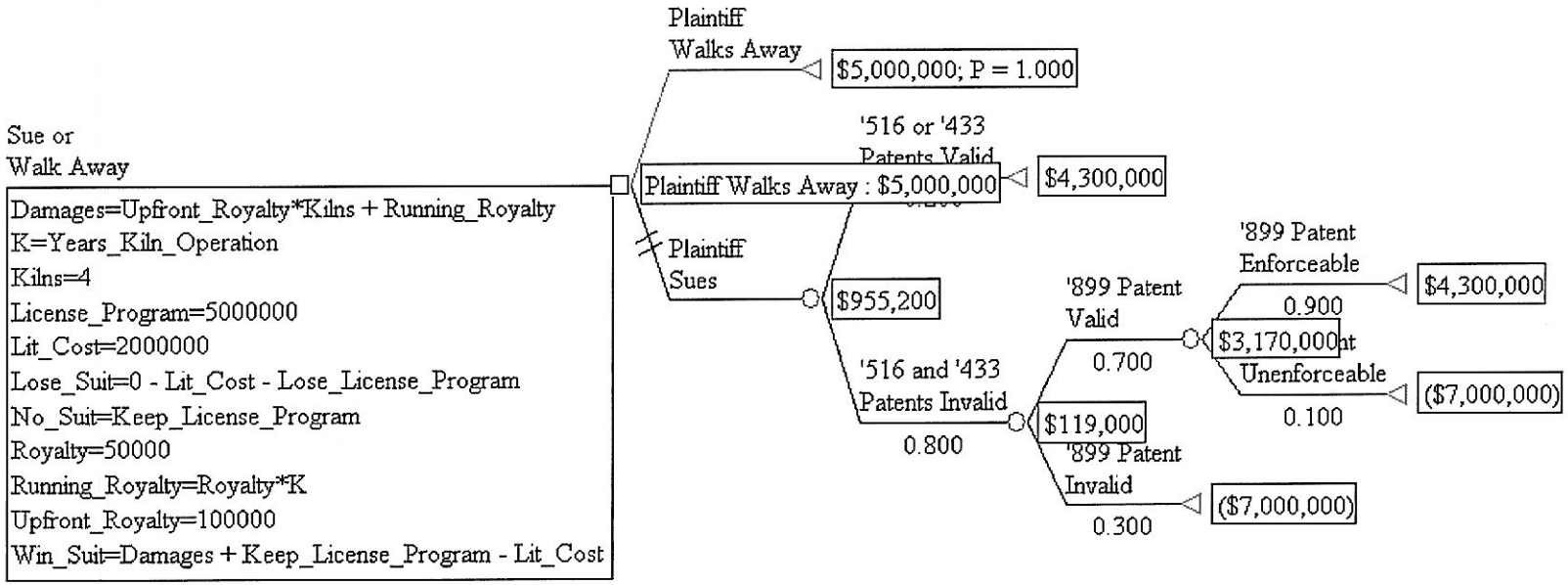
(3) Damages equivalent to projected license fee (Upfront Royalty of $100,000 per kiln plus Running Royalties of $50,000 per kiln per year).
(4) Model based on 5 years of over-all operation (3 years to trial and 2 years thereafter).
(5) 2 Kilns assumed in operation in year 1, 4 in year 2, 5 in year 3, and 7 in year 4.
(6) Damages and Settlement license fee payments discounted to net present value @ 7%.
(7) Damages include pre-judgment simple interest @ 5%.
(8) BC royalty fees estimated at $130,000 per year.

Disputed Patents - Litigation Risk Analysis
PLAINTIFF PERSPECTIVE



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Disputed Patents - Litigation Cost Analysis
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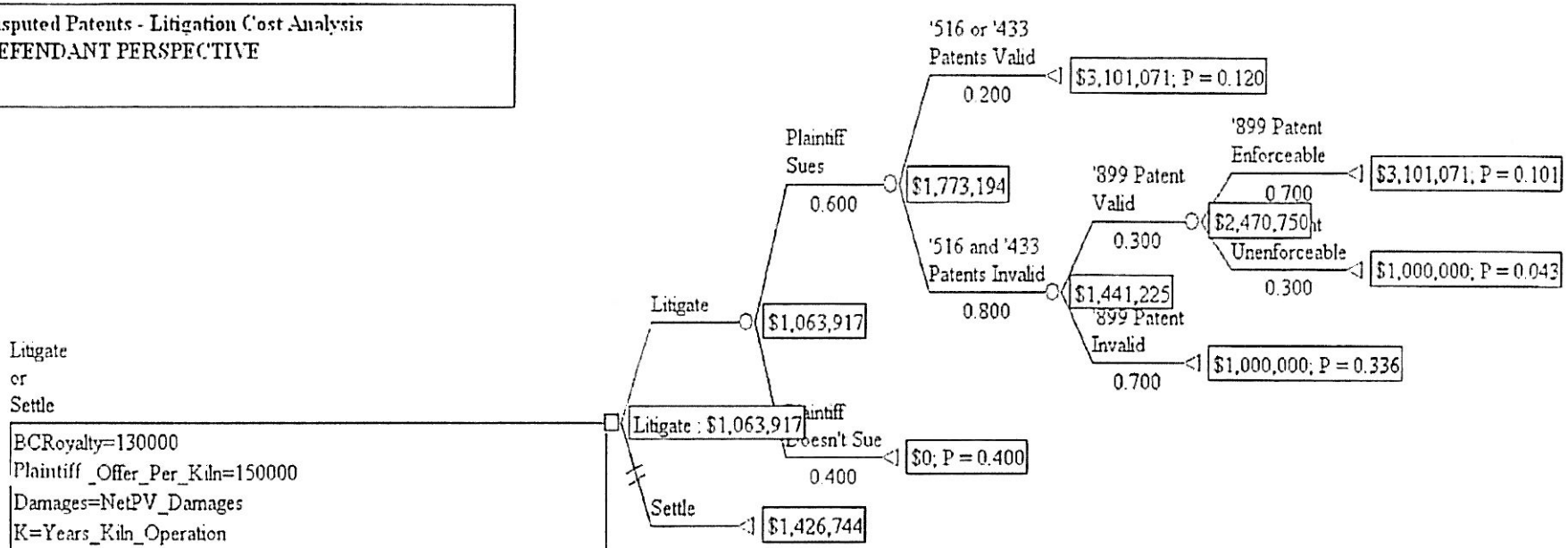

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