

Introducing litigation risk analysis

Patent infringement litigation involves a large number of uncertainties. Alexander I Poltorak and Paul J Lerner reveal how to calculate the risk involved

Litigation in general, and particularly patent infringement litigation, involves an untold number of decisions. Settlement decisions, pretrial discovery decisions, trial strategy decisions and appeal decisions. Lawyers and business executives are constantly striving to make the "right" decisions. The process of making these decisions is rendered more difficult by the complexity of the problems being addressed and the uncertainties associated with their various constituent factors. The decision-making process may be facilitated, however, through the use of Litigation Risk Analysis.

Litigation is fraught with uncertainty, which is a condition or a state inherent in situations offering more than one possible outcome. Uncertainty also arises from the inherently probabilistic nature of some of the events affecting the ultimate outcome, as well as from the imperfect information available about certain facts and the concomitant need to make assumptions. Risk is the likelihood that the actual outcome will be unfavorable or undesired. Complexity results from uncertainty piled atop uncertainty. From a business decision-making point of view, litigation management is to a large degree a risk management problem.

Risk is most often difficult to precisely measure or assess. Commonly, it is described with generalities such as "a good chance", "probably", "in all likelihood", or (only slightly better) "more likely than not". Such terms are vague and uncertain, conveying different meaning to different people. More importantly, they cannot be combined to describe the risk presented by a situation involving more than one uncertainty. Such methods of description are obviously unsatisfactory.

Clearly, there is a need to rationalize complex problems, that is: to identify the constituent uncertainties (at least the most significant ones) of the problem and the relations therebetween; to assess the risks associated with these uncertainties and present them in a precise and mathematically sound manner; and to combine these constituent risks so as to determine the risk presented by the entire problem. This need is met by Litigation Risk Analysis, which is both a disciplined approach to the

analysis of problems involving uncertainty and a systematic method of dealing with complexity. Properly applied, it will lead to the identification of the "best" decision (which, as we will see, is not always the "right" decision). In addition, it will provide a basis for clear, precise communications.

Identification of Uncertainties and Drawing the Decision Tree

The first step in Litigation Risk Analysis, indeed in any risk analysis, is to identify and organize all (or at least the significant) uncertainties that comprise a problem. These uncertainties are then schematically arranged in consecutive order, starting with the present and progressing into the future, to produce a flowchart encompassing all of the uncertainties and all of the possible outcomes of the problem. The flowchart is then converted or reformatted as a "decision tree".¹ Each point of uncertainty causes the tree to branch, with one new branch being created for each possible outcome of the uncertain event. Each possible outcome of the problem is found at the tip of at least one branch. The process of preparing a flowchart and/or a decision tree can best be explained and understood with reference to the following example.

Decision tree example

The client company (the "Client") is one of a small number of firms in the business of producing a mineral product which is first fused in a kiln and then ground. An executive of the client company (the "Executive") has quit his job and immediately thereafter invented and subsequently patented an improved kiln. The client company claims ownership of this patent, but has taken no action with respect thereto.

¹ Some practitioners prefer to omit the flowchart and commence organization and representation of a problem as a decision tree.

Utilizing the invention, the Executive started a business that competes with the Client. The Client, wishing to upgrade its technology, retained a consultant (the "Consultant") to design improvements to its own kilns. The Client chose not to disclose the patent to the Consultant, who remained unaware of its existence. Based on the Consultant's design, the Client built new kilns, which bear a marked resemblance to those described and claimed in the patent. The Client also improved its grinding procedures. The Client's various changes have caused a marked improvement in the quality of its product, allowing it to dominate the market.

With his market share and price being steadily eroded, the Executive brought a lawsuit against the Client for patent infringement. The Executive claims that the alleged infringement is "willful" and seeks lost profits and treble damages.

The Client has responded to the suit by denying infringement and asserting that the patent is invalid. The Client further asserts its ownership of the patent, alleging that the Executive made the invention while in the Client's employ. Obtaining a stay of proceedings in the infringement action, the Client has petitioned for reexamination of the patent on the basis of prior art not considered during examination of the original patent application. This reexamination resulted in a final rejection of all of the claims-in-suit. An appeal of this rejection to the Patent Office Board of Appeals is now pending.

The Client has calculated that, if found guilty of patent infringement, a "reasonable royalty" for use of the patented kiln would be \$500K, while the Executive's "lost profits" would amount to \$10M. It is believed that the choice of the appropriate measure of damages will depend upon a finding as to whether the improvement in quality of the Client's product was the result of the change in the Client's kiln design, i.e. whether the output of the accused kilns is unique.

Finally, it is anticipated that in-house staff will handle all proceedings in this matter and, hence, no legal fees will be incurred.

The Client has requested a decision as to the settlement value of this case. As a first step in

reaching such a decision, a flowchart, as shown below, would be prepared.²

The decision tree identifies all of the identified uncertainties comprising the present problem and graphically illustrates the relations between them. All of the possible outcomes are listed in the column to the right of the tree. As yet, however, there has been no consideration of the risks engendered by these uncertainties. We cannot, therefore, determine the likelihood of any of these outcomes actually occurring.

Assessing the Risks

Having identified all of the uncertainties and, therefore, being aware of what can happen, we must now assess the risks associated therewith; which is to say we must determine the likelihood or probability of each of the possible outcomes actually occurring.

In general, attorneys are loath to assign probabilities to risks. This may be due to a perceived inability to make an accurate assessment or (more likely) a fear that the assessment may prove inaccurate and "come back to haunt". (One attorney noted that his malpractice insurance carrier would not permit him to offer percentage assessments of risk.) However difficult it may prove to be, there is, unfortunately, no alternative to obtaining risk assessments from the people most intimately involved and knowledgeable about the problem. Soliciting assessments from several individuals and assuring them that only the resulting average will be utilized can sometimes overcome this reluctance. (This approach has been compared to recruiting members for a firing squad by assuring them that one of them will have a blank cartridge in his rifle.)

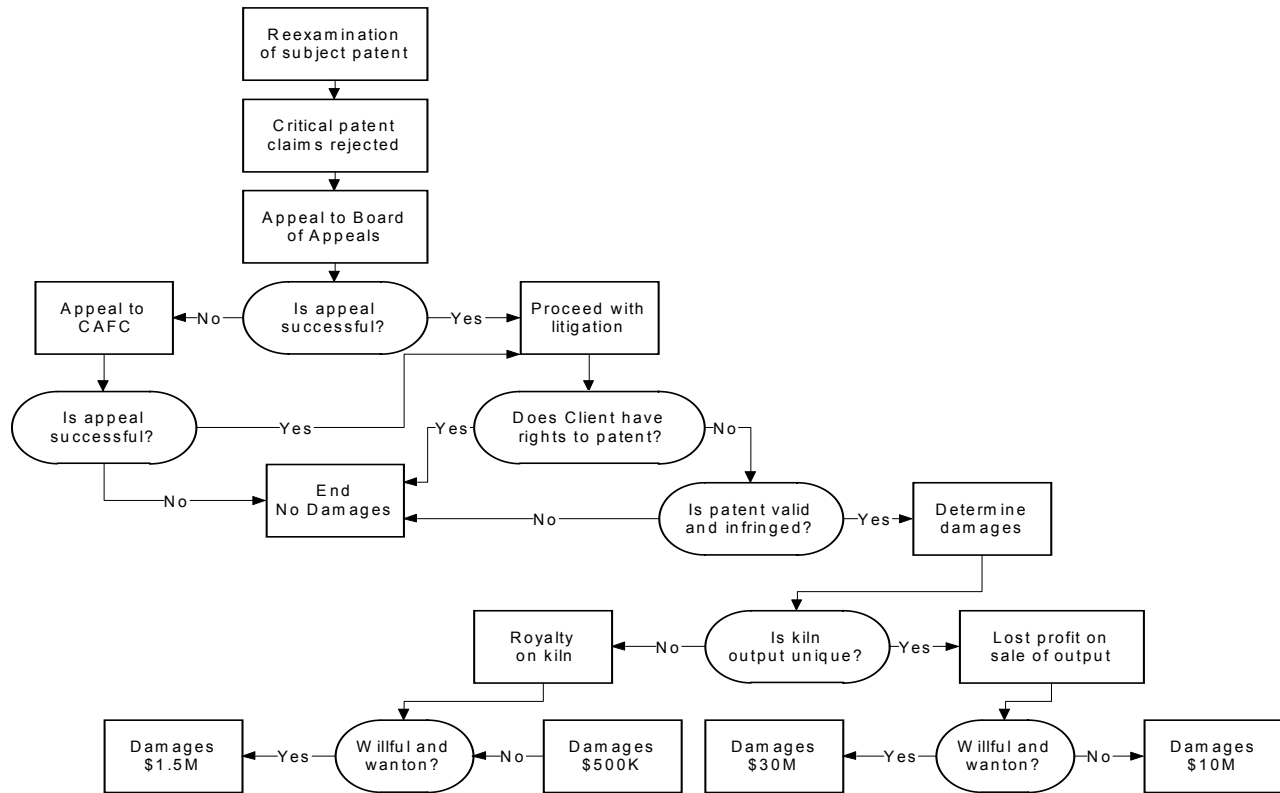
Shown in the second figure is the same problem analysis, presented in the form of a decision tree.

A better approach (although much more cumbersome and time consuming) is the so-called "Delphi Oracle" which involves soliciting opinions (in this case risk assessments) from a number of individuals.³ After all of the participants have

² The top or first three boxes are included merely to place the problem in its historical context. As past events, they could have been omitted.

For the sake of simplicity, the uncertainties of patent validity and infringement have been combined.

³ The various participants are most commonly kept separated and anonymous to prevent status, authority, or other intimidating influences from prejudicing their views.



submitted an assessment, those who have submitted the most extreme opinions (in our case, the highest and lowest risk assessments) are informed of the opinions of the others and offered an opportunity to reconsider⁴ their own opinions. If they decline this opportunity, they are required to state their reasons for maintaining their extreme position. These reasons are then conveyed to the other participants who are then offered the opportunity to reconsider their opinions. If they decline to alter their opinions, they must respond to the reasons provided by the extremists. Any reasons so provided are then conveyed to the extremists, who are once again presented with the choice of revising⁵ their opinion or defending it. Generally, after two or three such iterations, something approaching consensus is reached.

Continuing with our example, the risks therein were assessed as follows:

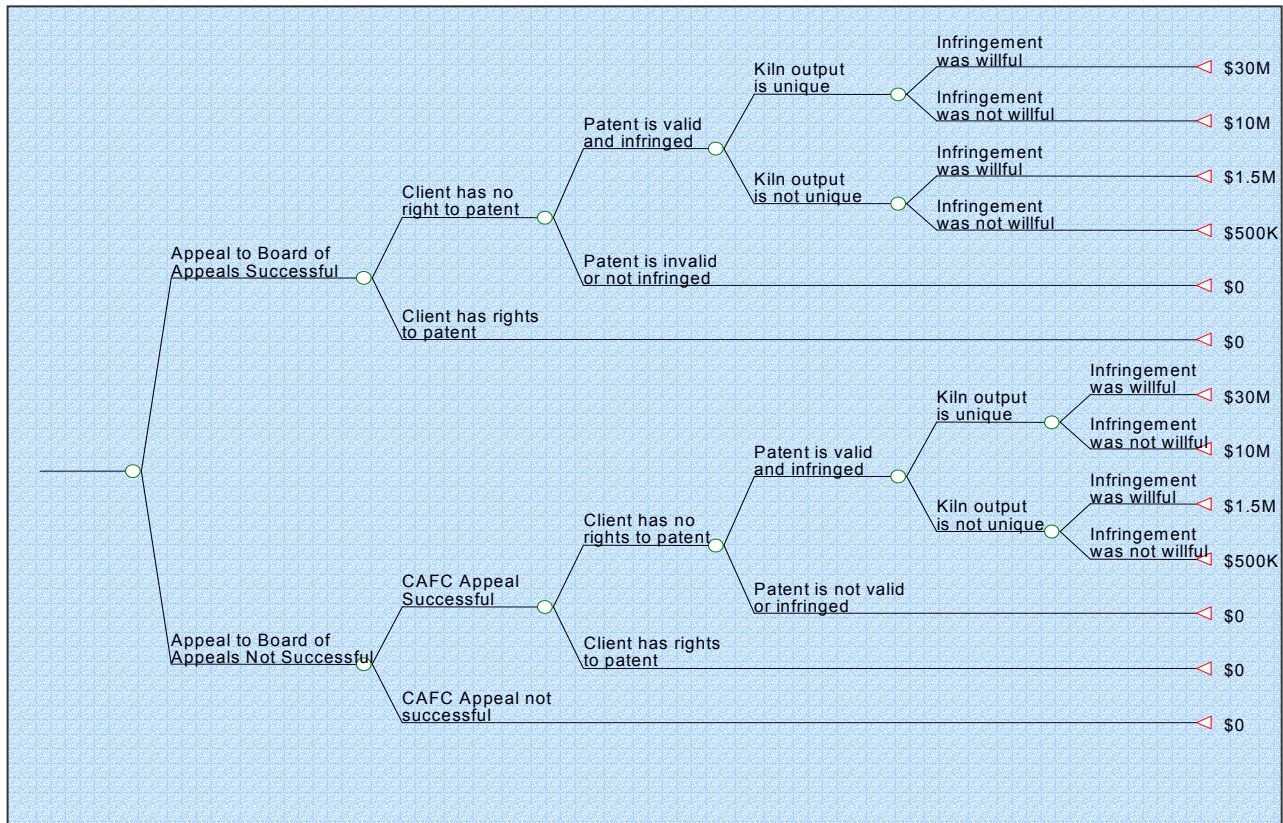
1. Probability that the Patent Office Board of Appeals will reverse the Patent Examiner’s

rejection of the critical reexamined claims - 30%;

2. Probability that the CAFC would reverse a decision of the Board of Appeals affirming the claims’ rejection - 30%;
3. Probability that the Client is found, by the Court, to have rights to the patent in suit - 10%;
4. Probability that the reexamined patent is found by the Court to be both valid and infringed - 80%;
5. Probability that the Court determines that the patented kiln caused the increase in quality of the Client’s product - 80%; and
6. Probability that, if found guilty of infringement, the Court will determine the infringement to have been “willful and wanton” - 50%.

Having obtained these risk assessments, we are now ready to complete our example Litigation Risk Analysis.

⁴ Polite word meaning “change”.
⁵ Another polite word meaning “change”.



Putting It All Together

Once the risks inherent in a problem have been assessed, they are entered on the previously prepared decision tree. In the figure below, the risk assessments, in the form of probabilities, have been entered on the decision tree.

Once the analysis is complete, it should be subjected to a “sanity test”, i.e. is the result so outrageous as to suggest that it is likely to be erroneous? (Hint: if the result seems unreasonable, but the sum of the possible outcomes is 1.0, the error is likely in the model; either the flowchart is wrong or an error was made in converting it into a decision tree.)

Once reasonably confident that the risk analysis is “sane”, it may be enlightening to determine the criticality of the various uncertainties that comprise the problem. This is done by altering the assessment of the risk associated with the uncertainty, and observing the impact on the sum of the Expected Values.⁶

Such sensitivity analysis may disclose the importance of a seemingly minor issue or,

conversely, may reveal that a supposedly key issue is actually of relatively little significance.

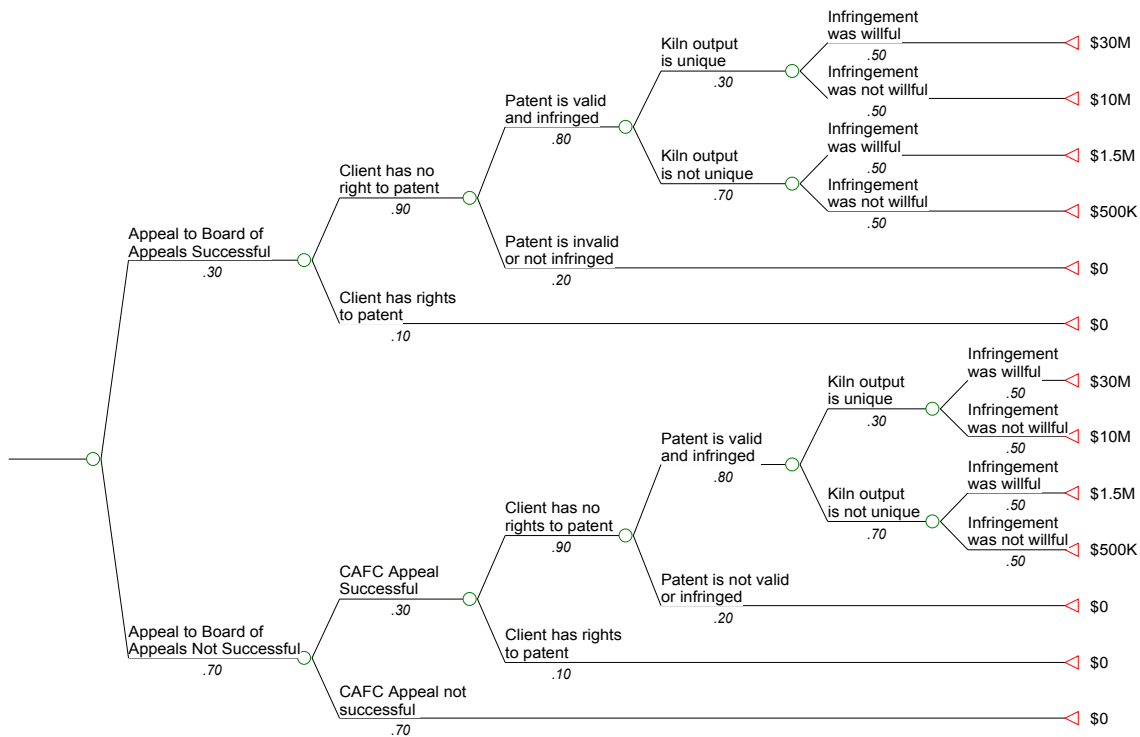
Finally, the analysis should be examined to determine whether it contradicts any “conventional wisdom” or other widely accepted views. For instance, in our example, despite the rather pessimistic views regarding the Executive’s chances of securing allowance of the critical patent claims, we learn that, in fact, he has a 51% probability of success.⁷ It is “more likely than not”, barring settlement, that the Client will have to face him at trial.

Dealing With Complexity and Moving Into the Modern Age

As mentioned at the beginning of this article, patent infringement litigation presents an exceedingly large number of risks, some of which are common to all litigation, while others are peculiar to patent matters. The patent-specific issues relate to

⁶ This procedure is known as “sensitivity analysis”.

⁷ This is comprised of a 30% probability that the Board of Appeals will reverse the Patent Examiner, and a 21% probability (.70 x .30 = .21) that an appeal will be taken to the CAFC, and decided in favor of the Executive.



the questions of patent validity, patent

enforceability and patent infringement, and to damages calculation. These questions, and some of the sub-issues of which they are comprised, are set forth below.

PROBABILITY TABLE

Possible Outcome \$m	Probability	Expected Value \$m
\$ 30.0	3.24%	\$.97
\$ 10.0	3.24%	\$.32
\$ 1.5	7.56%	\$.11
\$ 0.5	7.56%	\$.04
\$ 0	5.40%	\$ 0
\$ 0	3.00%	\$ 0
\$ 30.0	2.27%	\$.68
\$ 10.0	2.27%	\$.23
\$ 1.5	5.29%	\$.08
\$ 0.5	5.29%	\$.03
\$ 0	3.78%	\$ 0
\$ 0	2.10%	\$ 0
\$ 0	49.0%	\$ 0
Total	100%	\$2.46M

How likely is it that the patent will be found to be:

- Invalid due to (a) prior art; (b) lack of enablement or (c) inequitable conduct.
- Unenforceable due to (a) ownership issues or (b) patent misuse.
- Not infringed as to (a) Claim 1, (b) Claim 2 or (c) Claim X.

The infringement analysis should preferably be performed for each claim of the asserted patents (at the very least, the independent claims). Once this analysis is completed, further questions may be asked:

- What is the probability that a motion seeking a preliminary injunction will be granted?
- What is the probability that a motion for summary judgment of invalidity, unenforceability, non-infringement or infringement will be granted?
- After a decision for the plaintiff, will the damages be assessed based on lost profits or reasonable royalties?

- Will infringement be found to have been “wanton”, i.e. will multiple damages be awarded?
- Will the case be deemed “exceptional”, i.e. will attorney’s fees be awarded?

The level of complexity of patent infringement litigation has been vastly increased by the requirement of a so-called Markman hearing which, in effect, adds another layer of litigation – a trial before the trial – to the resolution of a patent infringement case.

By this time, the keen observer will have noted that each uncertainty added to a decision tree results in a substantial increase in the number of tree branches. Indeed, a single uncertainty (with only two possible outcomes) added at the roots of the tree will double the number of branches in the completed tree. It will be appreciated, therefore, that as an analysis of a problem becomes more detailed, the resultant decision tree spreads even further, becoming cumbersome, if not impossible, to manually handle. Combining closely related or intertwined uncertainties may sometimes ameliorate this problem. Thus, in our example, patent validity and infringement were combined. In real-life, this analysis would be an oversimplification. However, combining as a single uncertainty, the validity of all claims in a patent (based on the notion that all claims stand or fall together), or even so the validity of several patents within a portfolio of patents, may be a reasonable simplification. Indeed, if an assessment of the risk of patent validity is impossible (or inconvenient) to obtain, historical data may be substituted. For example, juries have historically held patents valid 67% of the time, and judges, in bench trials, have held them valid 57% of the time.⁸

It should also be noted that, despite the considerable effort required, the risk assessments in the example were developed as a single number. Obviously, a range of probabilities, rather than a single number, is more likely to be correct and less troublesome to obtain. Although mathematical formulae exist allowing for the use of ranges rather than discrete assessments of risk, such approaches are exceedingly complex and unsuitable for use by the practitioner. Fortunately, this problem is neatly

solved by what is known as Monte Carlo simulation.

Simply stated, Monte Carlo simulation utilizes random numbers to determine the actual outcome of the various uncertainties comprising a problem. Each complete simulation represents one possible outcome of the problem. The simulation is repeated many times to create a statistical analysis of all possible outcomes of a problem. Thus, unlike the simple analysis of our example (which produced a single number representing the expected value of all possible outcomes), Monte Carlo simulation yields a distribution of all possible outcomes with their corresponding probability of occurrence. Rather than purporting to tell what will happen, Monte Carlo simulation specifies how likely any possible outcome actually is. Such a simulation also offers a fine opportunity to perform a sensitivity analysis.

As might be expected, various computer software packages are available which both assist in the creation of decision trees and facilitate the simple or Monte Carlo analysis thereof. For decision tree analysis, the authors highly recommend the Data 3.5 software from TreeAge Software, Inc., which was used for this article. This software is available with a handy user guide from Litigation Risk Analysis, Inc.

Managing Risk

To a large degree, making decisions about litigation is about managing risk. In this context, Litigation Risk Analysis becomes indispensable, and offers a vehicle for the logical and impartial assessment of the risks inherent in litigation, especially patent infringement litigation. Monte Carlo simulation may be employed where necessitated by the complexity of the problem being addressed, or in an effort to gain a greater degree of accuracy. Sensitivity analysis can provide further insights into the relative significance of the various uncertainties comprising a problem. Properly applied (don’t forget that “sanity test”), Litigation Risk Analysis is a powerful decision-making tool, providing clear, quantitative answers to some of litigation’s most complex and perplexing questions.

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⁸ See, Empirical Evidence on the Validity of Litigated Patents by John R. Allison and Mark A. Limley, 26 AIPLA Quarterly J. 185 (1998); a free copy may be downloaded at <http://papers.ssrn.com/>.