



Litigation Analytics - A Modern Paradigm for Better Resolving Litigation Involving Technical Issues

Why is Analytics Important in Litigation Technical Investigations?

Analytics is a hot topic today in business and the news and many people are likely familiar with use of analytics to predict consumer preferences. The legal community may also be familiar with analytics applications to predict the outcome of current cases from historic data.

Analytics can also have an extremely valuable role in litigation-related technical investigations but use of analytics in technical investigations is different from its uses to predict case outcomes and consumer preferences. Analytics is also not the type of analysis of inspection observations and test results that is often performed in technical investigation; analytics goes well beyond this.

Analytics is used in technical investigations in a way that is broader and more integrated with fundamental scientific principles. Similar to predicting case outcomes and consumer preferences, data mining in technical investigations, using statistics and artificial intelligence, identifies empirical trends in data from a failure or accident that provides insight as to what happened, but beyond this, technical investigations also use data modeling based on fundamental scientific principles and data generated by academia and industry to (1) fill gaps in the limited data available from a failure or accident, (2) validate test methods and results, and (3) uniquely provide insight as to what scientific principles were violated and why they were violated.

The rules of evidence typically require use of the scientific method as the standard for technical investigations and analytics is a key aspect of the practice of science today as demonstrated by Virginia Tech's College of Science having made analytics an overarching theme of its graduate degree programs. A recent message from the Dean of Virginia Tech's College of Science stated "At the Virginia Tech College of Science, we have reimaged scientific research.... We are focused not on data itself, but amplifying the relevance of that data with analysis, modeling, and interpretation." (Va. Tech Science, Fall 2019).

This approach to technical investigations powered by science and analytics has been practiced by Dr. Fildes throughout his career, and he now also collaborates with a team with decades of experience leading scientific and licensed engineering firms with hundreds of scientists and engineers who have conducted thousands of litigation-related technical investigations to advance this approach to the use of analytics, which we call *Litigation Analytics*, for the legal community and for businesses.

What Problems Does *Litigation Analytics* Solve for Litigators?

Litigation today involves increasingly complex and multidisciplinary issues where the key issues underlying the accident or failure are not at all obvious, yet litigators who need a technical expert still tend to immediately call a domain expert. This focuses the investigation on a narrow technical scope that may not address the underlying key technical



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issues. Industry faces the same problem litigators do in that industry has to evaluate numerous sources of technical insights, innovations, and developments. Industry takes a broader approach that combines science and analytics. Using this approach solves many important challenges that litigators face:

- Makes testimony in high-stakes cases involving complex, multidisciplinary technical issues easier to understand and compelling. For example, Dr. Fildes used *Litigation Analytics* in a class-action case to clearly establish that the chemically based installation of a widely used building product was not the cause a residual odor, but rather that the chemical composition was the cause.
- Uniquely addresses situations where the failure or accident site no longer exists for inspection and testing. For example, Dr. Fildes used *Litigation Analytics* to establish the properties of a product not made since the 1970s resulting in settlement of several cases, and in another case, where Dr. Fildes, who was the only expert witness for the defense, established that an alleged violation of a construction code did not result in the very public failure of a building material which led to a jury verdict for the defense.
- Provides a reliable approach to resolve cases early. For example, Dr. Fildes used *Litigation Analytics* to establish the properties of a material, over the course of several years, whose composition varies by season and by environmental impacts, which led to the other side seeking settlement of the case based on Dr. Fildes' report prior to his deposition.
- Identifies the key issues early in a case, prevent duplication of existing knowledge, and identify exactly what testing is needed and provide estimates of what the results should be. For example, Dr. Fildes used *Litigation Analytics* to establish that corrosion in an industrial reactor was not due to material selection but rather due to the manner in which the industrial chemical process was conducted, resulting in a request for settlement by the other party upon completion of Dr. Fildes' deposition. Several other experts had not considered the issues Dr. Fildes did, resulting in their testing being ambiguous as to the cause of the corrosion.
- Offers patent attorneys a reliable way to estimate how a device or process as claimed in a patent, but not reduced to practice, would work by combining relevant available data with fundamental scientific principles. For example, Dr. Fildes used *Litigation Analytics* to establish how a patented but not reduced to practice medical device would perform so that it could be compared to how a patented and reduced to practice device performed.
- Offers corporate counsel and insurers a proven way to cut costs while improving outcomes in managing the litigation they are paying for. The data mining and modeling approach inherent in *Litigation Analytics* offers corporate counsel and insurers a unique and powerful way to consolidate numerous seemingly different



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cases into far fewer silos that share common bases of key technical issues. The benefits of this are huge as Whirlpool Corporation has shown. Defining the silos based on technical key issues means that most of the key issues are defined once and can be researched to develop more insight as to why these failures or accidents happen. New cases start much higher on the learning curve, cutting time, cost, and producing better outcomes. Litigators can focus on the few key technical areas that underlie the numerous failures and accidents, and fewer experts will be needed, simplifying case management.

How is *Litigation Analytics* Different from a Conventional Investigation?

Accidents and failures happen because the laws of science are violated. Violations of codes and standards does not necessarily cause an accident or failure. Analytics can be practiced by engineers, scientists, and other technical people, but in any case, they will have solid training and experience in the sciences that underlie the incident under investigation. In many cases experts may have training and experience in chemistry and physics because these two disciplines underlie many of the engineering disciplines.

In addition to taking a broad view of a failure or accident while being sufficiently knowledgeable and skilled to apply the requisite domain knowledge, analytics requires experts to be far more experienced with searching for and identifying relevant scientific and engineering studies that exist in the vast amount of data available today. This is a skill in itself and one in which many experts lack sufficient depth. The challenge is partly in finding sources of data, but also in being able to recognize that data is relevant because most available data was not developed for establishing the cause and origin of failures and accidents, nor was this data developed for the situation under investigation. This is why data modeling based on relevant, well-established fundamental scientific principles is another defining feature of how a litigation investigation powered by science and analytics differs from a conventional investigation. Data modeling based on fundamental scientific principles adapts the available data to the situation being investigated and supplies additional data to fill gaps that will always exist in the available data.

Industry publishes much technical data for marketing and regulatory purposes and academia publishes much applied research, and some of this data can often be used to estimate properties that define a box, usually a very small box, that establishes the range of possibilities for the cause and origin of a failure or accident. This data and its analysis also establish estimates of what results testing should produce and significantly limits unsupported creative interpretation of testing and the events surrounding the failure or accident. This phase of an investigation should occur as early as possible, certainly before testing so that the insight developed can be used to resolve cases early and to properly guide detailed inspections and testing if the case proceeds through discovery. In reality, this phase of the investigation and the extent to which it should be conducted never occurs in too many cases.



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This is why it is so important that experts have solid training and experience in the chemistry and physics that underlies many of the engineering disciplines. Experts using analytics work from a much larger base of information, much of it initially appearing to be irrelevant or unusable, and they have skills and experience to use advanced statistics and artificial intelligence to analyze (or mine) this data to extract the insight it holds for the specific situation under investigation, and to combine this data with well-established, fundamental scientific and engineering principles to adapt this data to the situation under investigation and to use this data in applicable models to fill in gaps in the data that exists.

What Types of Cases Benefit Most from Use of *Litigation Analytics*?

Litigation Analytics is of most value in cases that will be won or lost based on the work and testimony of scientific, engineering, and technical expert witnesses and with any of the following characteristics: (1) high stakes and higher loss risk, (2) where there is a strong desire to achieve early resolution through mediation or other means, (3) that involve several possible and/or multidisciplinary scientific, engineering, or technical issues, (4) where the exact scientific, engineering, or technical discipline needed is unclear, or where there is a need for two or more experts in different disciplines, (5) where the failure or accident site no longer exists to be inspected or tested, or where a system evolves over time, (6) when extensive (synonymous with expensive and time consuming) scientific or engineering testing is thought to be needed, and (7) in cases that may need compelling testimony on scientific, engineering, or technical issues that are not readily understood by untrained people.

What Are Some Examples of Cases That Benefit from Use of *Litigation Analytics*?

Accidents and product failures happen not because engineering procedures, codes, and standards are violated but because the underlying scientific principles are violated. *Litigation Analytics* benefits those cases where the underlying scientific principles have to be investigated to establish the cause and origin. These underlying scientific principles come from chemistry and physics, which provide the basis for materials science, corrosion, materials compatibility, the strength of materials, friction and wear, materials processing, chemical processing, electric power generation, water treatment, natural gas processing and transmission, and many other areas. Specific examples are as follows.

Building and roadway construction that involve advanced materials such as composites, Exterior Insulation and Finish Systems (EIFS), spray foams, chip sealing of roads, and polymer concretes because selection of these types of materials has to be an integral part of the design process and the installation of these materials often involves integrating fabrication of the material on-site during installation, which puts a chemical process, often complex and/or multistep, in the hands of untrained people in uncontrolled conditions.



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Cases involving composites in applications other than building and civil construction, such as aircraft and vehicles, do not typically involve fabrication of the material in the field, but do involve a more complex integrated design process and a fabrication process that often involves multiple staged chemical transformation.

Cases involving corrosion, material degradation, and failure of protective coatings can be more complex than they seem because these failures do not result solely from selection of a material, but also involve the actual chemical environment in which the failure occurred, which can be different in actuality than what the chemical environment should have been or appears to have been. This is also the case for medical implants and medical joint implants, and medical joint implants also have the added complexity of friction and wear caused by surface roughness and chemical affinity between mating surfaces.

Cases involving chemical processes, which also includes water treatment, wastewater treatment, and natural gas processing and transmission, tend to be multidisciplinary involving chemical reactivity, phase transformations, and multiphase flow.

Cases involving the failure of sensors and/or process controllers can also be multidisciplinary involving surface chemistry, semiconductor physics, statistics, and artificial intelligence.

Cases involving environmental issues and possible toxic exposure can be multidisciplinary involving chemical reactivity and transport, particulate generation and transport, spectroscopic measurement technology, and phase transformations and chemical volatility.

Intellectual Property disputes involving products and processes also benefit from Litigation Analytics. Litigation Analytics provides a powerful tool to firmly establish, based on sound scientific principles, how products and processes actually work without having to build a subject product or process. People who are not technically trained will be far more able to find the results of this approach understandable and compelling.

How Does *Litigation Analytics* Help Resolve Cases Early?

Mediation and other early resolutions processes cannot be treated as deals to be made because U.S. Supreme Court rulings cite the reliability of expert investigations as a central tenant for admissibility of expert testimony, so this should also be a central tenant of early resolution processes. Since a large portion of costs and the time involved in litigation is in the discovery phase, achieving early resolution and substantially reducing costs requires short-circuiting the discovery phase. Settling a case requires establishing a reasonable basis for understanding the key technical issues involved, who is likely to prevail, and what it will take and cost to prevail, which is what the discovery phase does. Analytics provides a reliable basis to resolve a case without completing the discovery phase.

Analytics involves data mining and modeling. Accidents and product/structure failures do not happen in a lab under controlled conditions and the watchful eye of measurement



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instrumentation, and although there is often data, it is limited in its scope and amount, and limited in its applicability since it is often contaminated with uncertainty and unrelated factors. Also, experts are often not involved until well after an incident when the site or equipment may no longer exist. Data mining uses specialized, sophisticated software to visualize and identify patterns in the data that is available, and advanced statistical and artificial intelligence techniques to identify relationships and differences in the data and to test their significance. Although data mining is powerful in the insight it can produce, it is common for significant gaps to exist in the data. Modeling addresses this issue by using scientific principles and the known properties of materials to estimate the data needed to fill the gaps. These estimates are tested by also estimating data that exists.

Is Testing Needed?

Testing may be needed for cases that go to trial, but *Litigation Analytics* can provide a reliable and compelling basis by itself for mediation and other means to resolve a case early. When cases are not resolved early and proceed to trial, testing is often challenging and can produce confusing results because it is hard accurately include all aspects of a situation in a simulated test and testing under field conditions may require an unpractical number of tests to achieve sufficient variation and replication for accurate statistical analysis. When testing is needed, *Litigation Analytics* provides estimates of what the test results should be, which helps to validate the test results. Test results by themselves do not provide insight into what scientific principle controlled the result that was achieved, but *Litigation Analytics* provides exactly this insight, which makes testing far more insightful, far less confusing, and far easier to understand and compelling for people not trained in science and technology.

What Outcomes Can I Expect from Use of *Litigation Analytics*?

The kinds of outcomes you can expect come from actual cases where *Litigation Analytics* has been used.

In a corrosion case involving chemical process equipment several metallurgical experts for both sides agreed as to the nature of the corrosion, but none had taken a broader perspective to question if corrosion should have happened under the condition that should have existed if the chemical process was operated as stated. This broader investigation completely changed the outcome of the case to the plaintiff asking for settlement of the case.

In what appeared to be a straightforward environmental case involving particulate matter where the typical investigation would involve air monitoring which can be difficult to conduct without unrelated interferences due to the numerous sources of particulate matter, a broader investigation established that the materials that was claimed to be the source of particulate in this case formed a hard mass under most conditions that could not have produced particulate matter.



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A case involving a chemical process was originally approached in the conventional manner by conducting a chemical analysis. A chemical analysis may often be straightforward, but sample collection may not be, and in this case one side raised questions about the representativeness of chemical analysis. A broader investigation modeled the chemical process and predicted what the chemical analysis results should be, which confirmed that the chemical analysis was representative.

In a case involving delamination of a composite structure due to alleged thermal degradation, the conventional approach used a finite element analysis to support a delamination theory. A broader investigation used a combination of thermal measurements and modeling to demonstrate that the temperature could never have been hot enough to degrade the composite because of the thermal mass of the part and the limited heat content of the heat source, which showed that the hypothesis supported by the finite element analysis could not have occurred due to thermal degradation.

What is Dr. John Fildes' Background and Experience in Analytics and *Litigation Analytics*?

Dr. Fildes has extensive experience with analytics and with leading scientific and engineering firms that conducted thousands of technical investigations for litigation matters as well as conducting many high stakes, complex, multi-disciplinary R&D and litigation-related investigations where analytics was central to successful outcomes.

Analytics was central to Dr. Fildes' PhD. dissertation research. Because of his analytics background, Borg-Warner hired Dr. Fildes into their corporate research center to introduce analytics into their empirical research approach. Throughout his career leading over \$27.5 million of R&D projects funded by Government agencies, industrial consortia, and leading companies, Dr. Fildes has advanced the application of analytics such as the use of advanced statistics and artificial intelligence to identify the state of chemical processes. Dr. Fildes has also used analytics, data mining and data modeling based on sound scientific principles, extensively in high-stakes litigation-related investigations to achieve superior outcomes including providing trial testimony. For example, Dr. Fildes' use of analytics has contributed to complex cases reaching settlement on the basis of his report, sometimes without a deposition and even in cases where the failure was no longer able to be inspected or tested.

Dr. Fildes also conducted industry assessments and state of the art technology studies and in other activities sponsored by leading organizations such as the Gas Research Institute, the National Materials Advisory Board of the National Academies, the Army and the Navy, the Defense Advanced Research Projects Agency, the Great Lakes Composites Consortium, and the Manufacturing Information and Analysis Center.

Having led a licensed engineering firm conducting thousands of litigation-related investigations and starting and growing another licensed engineering firm conducting hundreds of litigation-related investigations, Dr. Fildes has unique expertise in conducting



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investigations and in applying modern analytics in litigation-related investigations to achieve superior outcomes at lower cost.

Can You Summarize *Litigation Analytics* and Its Benefits?

The following table succinctly summarizes *Litigation Analytics* and its benefits.



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Litigation Analytics is an innovation that empowers you to understand the key technical issues in a case and pick the ideal expert. This provides your clients with:

- ✓ *The quickest and best possible outcome.*
- ✓ *A unique opportunity to pursue early resolution (prior to expensive testing) based on knowing 60% to 80% of what might ultimately be uncovered.*
- ✓ *Superior technical insight for even the most complex and multidisciplinary issues.*
- ✓ *A reliable basis for expert testimony that uniquely meets rules for admissibility established by the Supreme Court.*
- ✓ *A strategic advantage with corporate clients since Litigation Analytics uses the contemporary industrial R&D model that they already appreciate improves outcomes and lowers costs through use of all existing knowledge and elimination of duplication, especially unnecessary and potentially confusing testing.*
- ✓ *Realistic estimates of costs for expert technical investigations.*

(1) Define the Technical Issues – A gatekeeper broadly grounded in physics, chemistry, design, and business operations gathers insightful information prior related cases, trade association publications, patents, manufacturer’s marketing materials and reports, and Internet blogs and forums to establish the key technical issues that will determine the outcome of the case.

(2) Establish What is Known About the Technical Issues - Contemporary analytics is used to apply the information from step 1 to the situation under investigation. Data mining uncovers key trends and relationships, and data modeling fills in missing data. Industry publishes product data and universities conduct applied research, so relevant data likely exists that can provide up to 60% to 80% of the insight as to what happened in an accident or product failure.

Litigation Analytics uses information research coupled with top-notch data mining and data modeling based on sound scientific principles early in cases to establish the key MAKE OR BREAK technical issues and everything known about them. Our Litigation Analytics process brings litigators the techniques that have revolutionized industrial R&D, providing the better outcomes and lower costs that industry has achieved in overcoming similar technical investigation challenges.

The first two steps of the Litigation Analytics Process do not require an inspection and can be sufficient to provide a way to settle a case early because these two steps can provide a reliable identification of the cause and origin of accidents and product failures. These two steps also provide a reliable basis to assess the strength of one’s position in a case and to make good decisions about how to proceed.

(3) Reliably Define Inspection and Testing Needs – If the case is not settled early, this analytics-based process ensures that existing knowledge will not be recreated, and that reliable inspection and test plans are established, which cuts costs, ensures that testing does not produce a confusing outcome, and ensures that the investigation covers all key issues.

(4) Coordinate, Oversee, and Effectively Communicate - *Litigation Analytics* ensures that the overarching technical concepts are effectively framed and communicated, and eases report preparation. The investigation’s outcome and its presentation are clear and compelling.