Evidence, engineering and experts

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When safety and reliability problems end up in litigation, judges have to come to conclusions that turn on scientific facts and, sometimes divergent, engineering opinions. This talk reviews how the courts come to decisions on technical matters including some instructive cases that didn’t go to plan. In the end there are some takeaways about how to maintain organisational records of dependable design and production, and about professional conduct should you ever get involved in litigation.

Law and management

It might be odd to listen to a lawyer speaking at a Safety and Reliability Society seminar. However, the relationship between law and dependability engineering goes back a long way. One of the grandfathers of scientific management is Frederick Taylor. It was Taylor who first set out in terms that to improve dependability, productivity and effectiveness one must first understand the work process and then change it based on evidence. One of Taylor’s early supporters was lawyer Louis Brandeis. Brandeis was to go on to become a judge of the US Supreme Court. In the Eastern Rates Case of 1910, Brandeis championed the work of Taylor and there coined the phrase scientific management.1 As Brandeis put it, by adoption of scientific management:

> Errors are prevented instead of being corrected. The terrible waste of delays and accidents is avoided. Calculation is substituted for guess; demonstration for opinion.2

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2 Kraines, O (1960) “Brandeis’ philosophy of scientific management”, The Western Political Quarterly 13, 201
What is expert evidence?

As far as evidence is concerned, the courts are principally interested in what witnesses saw and heard, matters of fact. It is the court’s job to come to an opinion about what conclusions can legitimately be inferred from those facts. By the court here I mean the jury, where there is a jury trial, and in other cases the judge. The judge will be the sole trier of fact in the majority of criminal cases heard in the magistrates’ courts and in almost all civil matters.

There are really only two reasons why a court would demur from its own opinion to that of a witness. The first is where the witness is likely to fail adequately to convey the raw experience to the court. It is admissible for a witness to describe somebody as appearing drunk, even though that is only really an opinion.

The other situation is where the drawing of an opinion requires some specific expertise, the case of expert evidence. Engineering is a typical example. Expert evidence may be on a scholarly matter of science or technology, or on a matter of professional engineering practice.

Only an expert may give expert evidence. An expert is:

... a person with a high degree of skill and knowledge in a particular subject, who has relevant and up to date expertise with regard to issues in the case, and sufficient education and communication skills to produce a clear written report, and, if necessary, to provide helpful oral evidence to the court.

However, the courts are depressingly ignorant of engineering qualifications and can often be seduced by strings of letters if they can be persuaded that an individual has had contact with a relevant field.

The judiciary do not like expert evidence. It is widely blamed for extending delays and inflating legal costs. Judges have been particularly appalled by what they see as the rise of

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3 Civil Procedure: The White Book Service 2016, Sweet & Maxwell, 35.2.1
an expert witness “industry”. The use of expert evidence in the civil courts if governed by Part 35 of the Civil Procedure Rules.\(^4\) Rule 35.1 expresses the court’s duty to restrict expert evidence.

> Expert evidence shall be restricted to that which is reasonably required to resolve the proceedings.

Permission is required from the court for a party to rely on expert evidence and the court will enquire into the issues that the evidence will seek to address, the experience and qualification of the proposed expert and the likely costs.\(^5\) Permission is never given lightly and the burden falls on the person wishing to rely on it to persuade the court to admit it. The way the court is supposed to approach this is as follows.\(^6\)

1. Is expert evidence necessary to decide an issue? – then allow it.
2. If not, will it assist the judge in determining an issue – then consider the value of the claim and proportionality, the cost of the evidence and who will pay for it, and whether any delay will be caused or trial date lost.

However, it is still not always easy to predict how the court will address any particular situation. Nonetheless, the bias is against having expert evidence. In *Team Texas SAS v Wang*,\(^7\) a child had been injured in a car seat installed by the child’s father when it failed to restrain him in a road traffic accident. A procedural judge had given permission for evidence from an ergonomics expert as to the adequacy of the written instructions for the seat. That decision was appealed, even though it is enormously difficult to get an appeal judge to overturn a procedural decision. However, in this case the permission for expert evidence was set aside. The appeal judge held that the question was whether a reasonably intelligent person could follow the instructions and that the trial judge would not need expert assistance with that.

\(^5\) Rule 35.4
\(^6\) *British Airways plc v Spencer* [2015] EWHC 2477 (Ch)
\(^7\) [2015] EHC 1909 (QB)
Expert evidence, in any event, only provides guidelines within which facts are to be decided by the judge.\(^8\) In a road traffic accident, whatever the opposing accident reconstruction experts say, the speed of a vehicle is a matter for the judge to decide. Not all judges will come to the same conclusion on any given evidence. There is a “generous ambit within which reasonable disagreement [between judges] is possible”.\(^9\)

**Duties of experts**

An expert’s duty is to the court. That duty overrides any obligation to the party retaining them.\(^10\) During the industrial revolution, expert witnesses acquired a murky reputation for corruption and it took the law many decades to bring the matter under control.\(^11\) Experts who are not fully independent of one of the parties, for example where they are an employee, are not necessarily excluded as they should understand their duty to the court.\(^12\) However, the case law on this is inconsistent and it is difficult to predict how a court will handle any particular situation. Matters are particularly complex when a party’s engineer, called to give evidence of fact, applies matters of engineering expertise in his evidence. That can sometimes be legitimate and the situation was allowed in the Wembley Stadium litigation.\(^13\) The courts’ guidance is as follows.\(^14\)

Experts must provide opinions that are independent, regardless of the pressures of litigation. A useful test of ‘independence’ is that the expert would express the same opinion if given the same instructions by another party. Experts should not take it upon themselves to promote the point of view of the party instructing them or engage in the role of advocates or mediators.

That statement highlights the importance of the terms on which the expert is instructed. Getting the instructions right can be a key tactic in litigation.

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\(^8\) *Miller v C and G Coach Services Ltd* [2005] EWCA Civ 442

\(^9\) *G v G (Minors: Custody Appeal)* [1985] 1 WLR 647

\(^10\) Rule 35.3


\(^12\) *Admiral Management Services Ltd v Para-Protect Europe Ltd*, The Times March 26, 2002

\(^13\) *Multiplex v Cleveland Bridge* [2008] EWHC 2220 (TCC)

\(^14\) *Guidance for the instruction of experts to give evidence in civil claims 2014*, para.11
There are exacting requirements on the contents of an expert’s report. One of the most important of these is that the expert report must:

... where there is a range of opinion on the matters dealt with in the report —
(a) summarise the range of opinions; and
(b) give reasons for the expert’s own opinion.

Where experts fail to comply with their duty to the court they may find their evidence excluded, themselves reported to their professional body, or even subject to a professional negligence claim by their client.

**How evidence is given**

The general rule is that expert evidence is given in a written report. The starting point is for one report by one expert instructed by one party. Courts will need additional persuasion to allow the opposing party their own expert in rebuttal. The expert’s duty is supposed to be to the court, not his party. The courts do have the power to direct that evidence is provided by a single joint expert (“SJE”). That leaves the parties the challenge of agreeing who the SJE should be though the court has the power to impose one if no agreement can be reached.

The first point of call for the opposing party to challenge expert evidence will be by way of written questions stipulated under the rules. The party gets one opportunity to do this and this can be a critical point of litigation. Well posed questions to the expert have the power to bring the whole litigation to a close when a party realises that its case is not going to hold up in court. Even where the court has not given permission for an opposing expert, it is important to make sure that there is sufficient knowledge behind the questions, both of the

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15 Rule 35.10; Practice Direction to Part 35 para.3; Guidance for the instruction of experts to give evidence in civil claims 2014, para.48-60
16 Practice Direction to Part 35, para.3.2(6)
17 Stevens v Gullis & Pile [1999] BLR 394
18 Pearce v Ove Arup Partnership Ltd (Copying) (2002) 25(2) IPD 25011
20 Rule 35.5
21 Rule 35.7
22 Rule 35.6; Practice Direction to Part 35, para.6.1-6.2
subject matter and or litigation tactics. This is an area where in-house experts can be of great use.

Sometimes, unsatisfactory answers to the written questions can be the catalyst for a court to give permission for an opposing expert. Where there are experts on opposing sides the court invariably orders a discussion between them followed by a joint written report. The joint report sets out where the experts agree and where they disagree along with the reasons for the disagreement.

It is really a last resort for the court, which it will fight robustly, to allow the experts to give oral expert evidence and be cross-examined at trial. The experts usually give their evidence in turn but a recent innovation adopted from the Australian courts, is “hot-tubbing”. Here, the experts are sworn under oath at the same time and give their evidence concurrently. The evidence then takes the form of an open discussion between the experts, the judge and the advocates.

A few notorious cases are illustrative of some of the real world issues with expert evidence.

**Reynolds v CSN**

In the late 1970s, the Société Canadienne de Métaux Reynolds ran a farm producing aluminium by electrolysis in Canada. A strike led to a number of the electrolytic cells being shut down for an extended period. Reynolds believed that those cells that had been shut down had ultimately enjoyed shorter lives than those that had been able to continue in production. Reynolds sued the union for damage to the cells allegedly caused by the strike.

The particular statistical difficulty of this case was that many of the cells were still in operation so the cell life data was right-censored. Reynolds’ own engineer, it appears in

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23 Rule 35.12; Practice Direction to Part 35, para.9.1-9.8
24 Practice Direction to Part 35 para.11
good faith, compared the shut-down cells with the remainder by plotting the failure times using plotting positions on normal probability paper. The engineer compared the failure distribution of the shut-down cells against the others and concluded that the shut-down cells had, on average, shorter lives.

At this the defendant trade union decided that they needed their own expert and retained a statistician. The statistician threw up his hands in horror at the normal plotting and declared that the respective survivor functions would have to be inferred by a non-parametric approach using the Kaplan-Meier Product Limit Estimator (“the PLE”). He calculated away and concluded that there was no evidence of shorter lives for the shut-down cells.

The claimant aluminium producer then persuaded the judge, in the interests of equality of arms, to let them have their own statistical expert. The claimant’s statistical expert concurred that the PLE was the right approach. However, when he performed the calculation he obtained different values in the tail of the PLE and saw evidence of shortened life in the shut-down cells. Various text books were exchanged and examined by the statistical experts but no consensus emerged as to how to calculate the PLE.

At trial, the judge found that it was the engineer who worked with the cells and had the subject matter knowledge. His opinion was to be preferred over the bafflingly inconsistent calculations of the statisticians.

The Baltimore case
Thereza Imanishi-Kari was a postdoctoral researcher in molecular biology at the Massachusetts Institute of Technology. In 1986 a co-worker raised inconsistencies in Imanishi-Kari’s earlier published work that escalated into allegations that she had fabricated results to validate publicly funded research. Over the following decade, the allegations grew in seriousness, involving the US Congress, the Office of Scientific Integrity and the FBI. Statistical experts gave their opinion that Imanishi-Kari’s results showed variation inconsistent with how she said she had set up her experiments. Experts in document examination investigated UV-plotter traces in Imanishi-Kari’s notebook and concluded that the paper’s age was inconsistent with the annotated dates.
Imanishi-Kari was ultimately exonerated by a departmental appeal board constituted of an eminent molecular biologist and two lawyers. The board heard cross-examination of the relevant experts including those in statistics and document examination. It was that cross-examination that exposed the expert evidence as flawed and the allegations as without foundation.26

**O J Simpson**

The following is a transcript of an interchange between defence attorney Robert Blasier and FBI Special Agent Roger Martz on July 26, 1995, in the courtroom of the OJ Simpson trial. Martz was being cross-examined as to the size of a swatch required for accurate blood-typing using the reagent EDTA.

Q: Can you calculate the area of a circle with a five-millimeter diameter?
A: I mean I could. I don’t...math I don’t ... I don’t know right now what it is.
Q: Well, what is the formula for the area of a circle?
A: Pi-r-squared
Q: What is pi?
A: Boy, you are really testing me. 2.12... 2.17...
Judge: How about 3.1214?
Q: Isn’t pi kind of essential to being a scientist, knowing what it is?
A: I haven’t used pi since I guess I was in high school.
Q: Let’s try 3.12.
A: Is that what it is? There is an easier way to do...
Q: Let’s try 3.14. And what is the radius?
A: It would be half the diameter: 2.5
Q: 2.5 squared, right?
A: Right.
Q: Your honor, may we borrow a calculator?
[pause]
Q: Can you use a calculator?

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A: Yes, I think.
Q: Tell me what pi times 2.5 squared is.
A: 19
Q: Do you want to write down 19? Square millimeters, right? The area. What is one tenth of that?
A: 1.9
Q: You miscalculated by a factor of two, the size, the minimum size of a swatch you needed to detect EDTA didn't you?
A: I don't know that I did or not. I calculated a little differently. I didn't use this.
Q: Well, does the area change by the different method of calculation?
A: Well, this is all estimations based on my eyeball. I didn't use any scientific math to determine it.

Takeaways
You never know when your decisions will be picked over by somebody you don’t know. I fear that, in the contemporary world, if it isn’t written down, it didn’t happen. Judges will always prefer any contemporaneous record over “I’m sure that I remember ...”. Those contemporaneous records are what an expert will have to work on.

Where technologies and systems are novel, risk assessment needs to be robust. There may be other opinions. These need to be reviewed during risk assessment and managed. In particular, never leave your risk assessment as a finished piece of work. Continue to collect data from risk areas and review it against your assumptions. Deliberately not looking so as not to be embarrassed is what the courts call Nelsonian knowledge. Be prepared to revisit discarded theories is the data points that way. Any expert examination for a court will be exacting.

Disclaimer
This paper is for general education only and not to be taken as legal advice as to any specific matter.

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