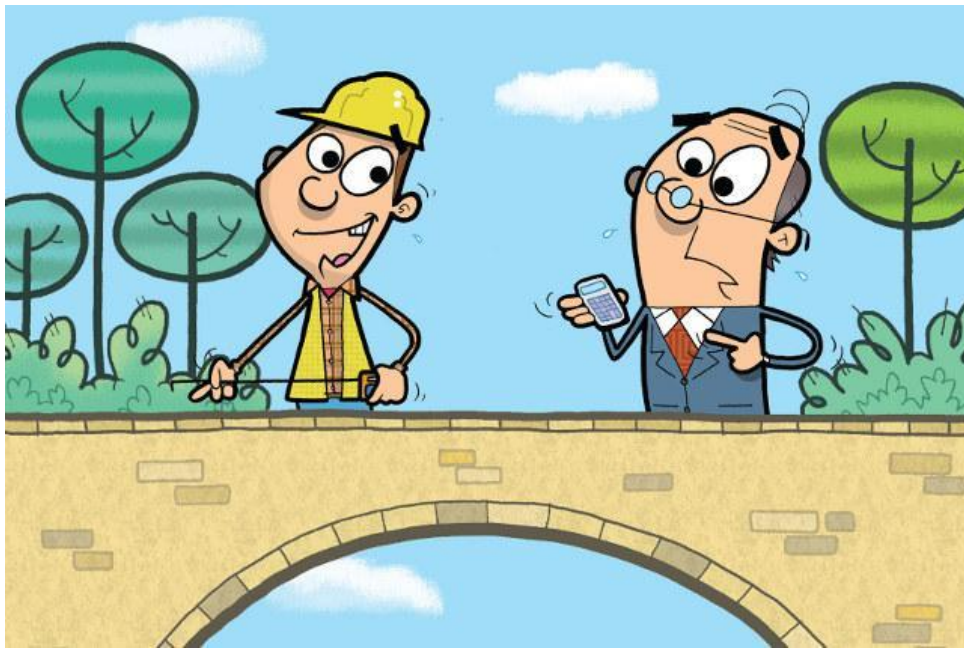


# Engineer and Technology Magazine

## Comment: accountants could benefit from thinking like engineers

13 October 2014

By Professor Michael Mainelli



Applying technical ideas of uncertainty to financial measurements would bring them closer to how things work in the real world.

Ask an engineer a simple question – "how much clearance is under that bridge?" for example – and he or she asks: "To how many decimal places?"

Engineering discipline ingrains basic concepts of accuracy and precision into engineers. Accuracy – how closely a stated value is to the actual value. Precision – how likely repeated measurements will produce the same results.

A measurement system can be accurate but not precise, precise but not accurate, neither, or both. If your laser range-finder contains a systematic error, then increasing sample size by measuring the bridge's height above the water more often increases precision but not accuracy. If your laser range-finder is very accurate but your bridge's height fluctuates, today's spurious accuracy may not be a good guide to height.

One of the more humorous ways this concept was explored was a famous MIT 'hack' to measure the length of the Massachusetts Avenue Bridge between Boston and Cambridge in October 1958. MIT freshman Oliver Smoot lay down again and again along the bridge,

while his companions marked his position. When he tired he was carried from spot to spot until the bridge was measured in 'smoots'.

One smoot is equal to Smoot's height (5ft 7in, or roughly 1.70m). The bridge's length was 364.4 smoots (620.1m) plus or minus one ear, with the "plus or minus" expressing the uncertainty of the measurement. Google Calculator provides smoots as a unit of measure equalling 5.58333333ft, a conversion which itself provides another problem in decimal precision.

Engineers view measurement as a process that produces a range. They express a measurement as  $X$ , with a surrounding interval. There is a big difference between point estimation and interval estimation. Auditors provide point estimates, while engineers provide intervals. For example, engineers report  $X \pm Y$  for a measurement, or interval estimates for an assembly-line sample and state how confident they are in that the actual value resides in the interval. Statistical terms, such as mean, mode, median, deviation or skew, are common to describe a measurement distribution's 'look and feel'. The key point is that engineers are trying to express characteristics of a distribution, not a single point.

In 'The Price of Fish: A New Approach to Wicked Economics and Better Decisions', Ian Harris and I introduce Confidence Accounting, a term for using distributions rather than discrete values in accounting that was coined by Long Finance proponents in a shift to interval estimates and confidence levels.

In a world of Confidence Accounting, results of audits would be presentations of distributions for major entries in the profit and loss, balance sheet and cashflow statements. The value of patents might be stated as an interval, £100,000,000  $\pm$  95,000,000, recognising a wide range of interesting technologies and their inherent uncertainties.

Next to each value would be the confidence level that another audit would produce a value within that range. Finally, there would be a picture to show the shape of things. Benefits of Confidence Accounting include a fairer representation of results, reduced footnotes, measurable audit quality and a mitigation of mark-to-market fluctuations.

Confidence Accounting has gained the support of the Association of Chartered Certified Accountants, the Chartered Institute for Securities & Investment, and leading thinkers from the Bank of England to the International Accounting Standards Board.

If engineers could help accountants restructure their profession around more scientific measurement techniques, perhaps we could work even better together.

*Michael Mainelli is emeritus professor of commerce at Gresham College, executive chairman of Z/Yen Group, and principal advisor to Long Finance. 'The Price of Fish: A New Approach to Wicked Economics and Better Decisions' is available in paperback (Nicholas Brealey, £12.99).*