Telling stories with data – Chris Paterson, KPMG – 5 Feb 2016

ACA Conference

SLIDE 1

I want to persuade you to mu viewpoint that if we, as consulting actuaries pay more attention, time and effort to communicating data effectively our advice would be clearer and easier to understand for our clients, clients employees or pension scheme beneficiaries, and our colleagues.

I'm going to try and convince you of this by covering three areas

1) I will talk about telling stories with data – what is it?
2) I will cover why it is it important for us?
3) Finally I will give some practical tips and examples of specific areas which you can use in your work

SLIDE 2

I've also called this talk "What they didn't tell you in CA3 / 201". These are the communications exams and I've referred to them as that is what this is really about – effective communication. The current CA3 syllabus aims to educate actuaries in two areas:

1) to be able to communicate actuarial ideas in language appropriate to the audience, for example without jargon, and
2) to be able to present with the aid of slides

Neither of these includes communication of data through visual displays such as graphs or charts and I think we can improve that

SLIDE 3

What do I mean by telling stories with data? I believe there are two parts to this.

SLIDE 4

The first part us communicating meaning effectively with data – getting insight and meaning and showing it to your audience. The example shown here is from the twitter feed of the Wall Street Journal data desk from a couple of weeks ago. It tells a simple story effectively. The graph on the right shows regimes with negative interest rates and then their interest rates became negative. The graph on the left shows the proportion of global GDP in those regimes so adds a context to the second. You can see that the author has highlighted the endpoint of the left graph as 23% of global GDP, making it the focal point of this mini-story.

SLIDE 5

The second part is the actual craft of telling stories – building narrative and structure – bringing together those insights into a whole. There is a lot of fascinating material available on which we can draw – how film narratives are built, presentation structure, mythology and stories passed down through generations.

However that is all I am going to say about that in this talk as whilst it is a fascinating area I think that the first part has more immediate relevance and practical use for consulting actuaries.

SLIDE 6

There is a great, eclectic and ever expanding body of work you can draw on to help you to tell stories with data. On this slide you can see: (Clockwise from top left)

- Infographics – a coffee table isn't complete without a colourful book of infographics which can be great fun, educational but also give ideas as to new ways to present data
- Geekier data presentation books – The example here is Edward Tufte, an American academic and author who has written four books on the visual presentation of data and information. He has some more eccentric views (such as Powerpoint is evil and in part responsible for the failure of one of the space shuttles!) but has contributed pioneering ideas such as maximising your data:ink ratio (making sure every pixel / drop of ink on the page communicates meaning), and the Sparkline graph, more of which later
- Data journalism – another great source of ideas – This is a Guardian headline and the Guardian was the first UK newspaper to have a dedicated data team. One brilliant example of their work was when they got the Wikileaks information. This was a vast deluge of data which they shared with the New York Times and Der Spiegel. The challenge here was to draw out stories from the data available. Instead of just doing this themselves they shared the data online so that people around the world could explore and visualise the data. This then led to a raft of data-driven visualisations and stories in the newspaper
- Academia and research. This picture is of the KPMG Global Data Observatory at Imperial College London where they can use this surrounding and enormous wall of screens, backed up by massive processing power, to visualise and get insights into big data which wasn't previously possible
- A bit more academia – this is Dr Petri Vitiello, a friend and colleague whose doctorate is in data visualisation – he is a doctor of storytelling with data

As well as this the area draws on other disciplines such as biology, psychology and behavioural science.

But why is this popular and developing quickly now? It's about data and it's about how we consume information.

SLIDE 7

On data – there is a lot, and increasing amount, increasing at an increasing rate:

This picture shows an artist's impression of the square kilometre array (SKA) telescope – it's an artist's impression as this is not yet built. Incredibly, when it is complete it will produce data in such quantities and at such a rate that we don't even yet have the technology to process store it.

But ultimately where this data has to be understood and used is by people, and we aren't evolving quickly enough to keep up with the rate at which the world of data is growing

SLIDE 8

On how we consume information

The rate at which we are able to understand, process and learn information is heavily influenced by our ability to quickly process the way the data comes to us. This is an example of a weather forecast – when you process the weather forecast you are familiar with the map and easily and quickly know where to find where you live. You are familiar with the symbols and what they each mean. You can therefore shortcut straight to the meaning of this as you don't need to process the "medium" – the map and symbols – as you are already familiar with them.

In the second diagram the weather forecast is presented as text which takes time to read through and find the bits you want to. You are spending "cognitive load" on processing the medium instead of getting straight through to the message or meaning. That is a key theme of my talk – if you can reduce the time people spend processing the medium, you will speed up comprehension and allow people to process the message or meaning more quickly and easily

SLIDE 9

These techniques aren't new. In fact there are some great examples from the 1800s. This map was produced by anaesthetist Dr John Snow (not the one from Game of Thrones or Channel Four News!) who decided to map cholera deaths as thick black lines onto a map of Soho during an outbreak in 1854. He found that there was a clustering of these lines around the water pump on Broad St. When he didn't understand why the large workhouse and brewery in the area were relatively unaffected he looked into it and found they had their own water supply. With this evidence he was able to convince he authorities to remove the handle from the Broad St water pump and save hundreds of lives. Some think he is the first real data journalist. He turned the data into a meaningful story

SLIDE 10

Now we know that telling stories with data is the process of communicating meaning and insight from analysis of data, we can move on to why this is relevant for actuaries.

SLIDE 11

As consulting actuaries, communicating meaning and insight from analysis of data is vital to our success – and I think our regulator and profession agrees.

From the first two quotes the bits I want to highlight are the parts about making things comprehensible, and communicating actuarial ideas to non-specialists. The third "quote" is a reminder that we aren't always that great at communicating!

SLIDE 12

In the world of pensions the more recent changes mean that we are spending more time thinking about how to communicate to members of schemes. Autoenrolment (as represented by Workie) and pensions freedom and choice (the Lamborghini) mean that individuals are taking on more complex decisions and risks than ever and our client work involves helping to communicate to them.

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I think there is an opportunity to lead as a profession – we have the complex data and analysis to explain. Being able to communicate the meaning in the data in a visual way could be something else actuaries can be famous for doing well.

SLIDE 14

Now that we know what it is and why it is relevant, how do you actually do this in your job?

SLIDE 15

I've set out five principles to telling stories with data which are clear, easy to understand and draw out the meaning.

The first part should be something you do anyway, however in this case it informs the rest of the choices to make

Then you need to choose your display carefully – to suit the data, audience and the message

Reducing clutter and arranging graphics to be easy on the eye is next. Visual hierarchy means giving the eye help in knowing what to look at first.

Adding emphasis will clearly show the areas where you want to draw out meaning

Finally, you won't get this right first time – you need to test what you have done out on your colleagues to understand if it is working. Try a few different things.

SLIDE 16

Bar charts – horizontal, vertical, stacked and 100% stacked – are great for being able to compare numbers, to really see the difference.

Line graphs, Slope charts and Sparklines are great for showing how data has changed over time. You may not be familiar with:

- Slope charts – great for just showing a simple change such as pension scheme valuation financial assumptions at consecutive valuations
- Sparklines – a term coined by Edward Tufte and these are useful for showing trends in, for example share prices, in a very small display. They are often used in share price tables in newspapers.

Scatter plots are useful when you want to actually show that there is real variation in the data points.

When you just have one or two numbers to show you can just write them out with no need for a chart!

Pie charts deserve special attention

SLIDE 17

The wisdom of Google is that pie charts are bad! I kind of agree as they are very difficult to read when you are looking for differences between segment sizes – the human eye and brain is just not very good at this. It is the same for "Donut" charts – or as the two together are known: the dessert charts. 3D pie charts, or in fact most 3D charts, are worse as they distort the display so it is harder to read the data

SLIDE 18

The chart in the top left is actually just a default Excel 2003 chart and is full of clutter – visual elements which add no information and only serve to distract:

- The grey background
- The black lines around the chart area, whole thing, key and each bar
- The axes

The chart on the bottom right is the default Excel 2013 chart and this is great news as the clutter has almost gone so the new tool / technology really helps us here. This chart allows you to focus solely on the data with little distraction.

SLIDE 19

Here is an example situation: You are advising a scheme on some benefit changes and you have three options on the table. Your colleague presents you with the graph on the top left showing the results to present to the client. This is difficult to use. I don't know what to look at first, and I find it hard to compare the values and see what is really going on.

The re-designed graphic on the bottom left shows one example of how this could be done better:

1) The three different things being shown on the chart have been decoupled: the overall funding position, impact on deficit of benefit changes, and impact on future service cost of benefit changes
2) Clutter has gone
3) The colour scheme has been simplified and the scenarios have been marked by a different colour each
4) The chart been arranged to have an order for the eye, from the current position at the top, to deficit impact, to future service cost impact
5) The numbers have been shown clearly

This isn't necessarily the best answer but it is certainly a better one, more clearly showing the data

SLIDE 20

The next step is to complete the story. We have added emphasis to highlight the option which meets the client's priorities using four different techniques:

1) Colour – using a contrasting colour (orange) to highlight all of the relevant parts
2) Font – using a bold black font for emphasis
3) Alignment – all the parts of option B are horizontally aligned to make it clear they are linked
4) Reducing visual hierarchy of other elements – e.g. the axis labels being made grey

SLIDE 21

The final principle is testing and experimenting and the example here is communicating uncertainty. We are lucky in the UK to have a professor for the public understanding of risk – Sire David Spiegelhalter. He has taken the time to write a paper in the journal Science on visualising uncertainty. Highlights of his conclusions are:

- Use principles of good data visualisation (similar to the five principles here)
- Give the audience multiple different displays of the uncertainty so they can find the one(s) which work best for them.

These examples are from the Bank of England's inflation report and give three different ways to show uncertainty in GDP projections. These are for a sophisticated audience. When communicating uncertainty to the man in the street, research shows that using and visualising natural numbers is effective – e.g. "2 people in 100" rather than "2% probability".

SLIDE 22

You are now a data story ninja – you are displaying all of your data in a clear uncluttered display which the audience can easily understand and see the story. What is next?

Interactive displays where people can explore and find the story are growing in popularity and this web page shows life expectancy across the world over the last 50 years or so

SLIDE 23

Having clicked on “Sub-Saharan Africa” you can now see where this group of countries sits in the world. The large curve at the bottom right looks interesting so we can put the mouse pointer over it to find out more.

SLIDE 24

This shows it is Rwanda and the dip is the 1994 Genocide. The story I prefer to see in this is the remarkable recovery right back into the group of Sub-Saharan Africa countries.

SLIDE 25

So what?

Well I like this examiner’s report quote. If you tell good stories with your data actually you don’t have to be as slow or as careful as your display will do the job for you.

There is some science, and some art to creating visual representations of stories from data which enable the audience to understand the meaning more quickly and easily.

We as consulting actuaries can do this better by paying more attention, spending more time, and putting in more effort to this aspect of our work.

… I think it’s worth it.