



Selected Papers of Internet Research 16:
The 16th Annual Meeting of the
Association of Internet Researchers
Phoenix, AZ, USA / 21-24 October 2015

HOW CONVENTIONS MAKE VISUALISATIONS (AND THEIR DATA) SEEM OBJECTIVE

Helen Kennedy
University of Sheffield, UK

Rosemary Lucy Hill
University of Leeds, UK

Abstract

This paper highlights the work that conventions do in making visualisations seem objective. This focus on visualisation conventions is important in order to make sense of the apparent contradiction between critics' assertions that visualisations serve as mechanisms of control and designers' assertions of their desire to 'do good with data' (Periscopic, nd). We focus on two conventions here. First, the use two-dimensional viewpoints, such as front-on views in graphs or top-down views in maps and pie charts, which encode objectivity because the 'distortions that usually come with perspective' are 'neutralised' (2006, p.149). Second, the inclusion of data sources in visualisations, which call upon the viewer to see visualisations as objective and based on 'facts'. Thus designers make choices about the data visualisations that they produce, but their choices are constrained by semiotic resources and other conventions that are available to them. We argue that visualisers are not in league with 'them' to bamboozle 'us', as one participant in our focus groups with visualisation consumers claimed. Rather, they do their best to 'do good with data' with available conventions. Thinking in this way advances understanding of the ways in which visualisations come into being, the conventions on which visualisers draw to produce them, and how these conventions imbue visualisations with particular qualities.

Introduction

Visualisations, we might argue, are imaginings of data; their production involves imagining data in certain ways. Just as the map is not the territory (Korzybski (1948)), the visualisation is not the data. Indeed, some visualisation designers argue that a core skill needed to make sense of data visualisations is the ability to understand that in a visualisation, some things have been transformed into other things (research

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interviews). Yet belief in the power of visualisations to promote greater understanding of data (for example in Zambrano and Engelhardt, 2008) and the argument that we need more, better data visualisations (2008) suggest that visualisations are tools for showing data or windows onto data, rather than ‘purposeful acts’ (Ruppert, 2014) that mediate and produce data in particular ways. To understand the performativity of data visualisations, it is important to make visible how visualisations come into being, the conventions on which visualisers draw to produce them, and how these conventions imbue visualisations with particular qualities.

Visualisation as purposeful act

As some commentators argue, turning data into a visualisation is not an automated process (Amoore, 2009). A visualisation is the result of numerous decisions involving a range of people (those who want the visualisation to be made, those making it, and others in between). Yet the resulting visualisation often ‘pretends to be coherent and tidy’ (Ruppert, 2014): visualisations have been critiqued as necessarily reductive, and the loss of complexity that is an inevitable part of the visualisation production process has been mourned. These arguments have been made about visualisation and power:

- Discussing the rise of maps, graphs, pie charts and infographic illustrations in newspapers, Barnhurst (1994) argues that charts are able to ‘influence the perception of how the world works’ (1994, p.79). Chart-making depends on the notion that ‘there can be a one-to-one correspondence between the measurements of the real world and their graphic representation’ (1994, p.81): the power of charts lies in the belief that they are accurate because they report numbers, which in turn are assumed to be neutral.
- Monmonier (1996) argues that maps can be used to tell ‘lies’, in that cartographic information can be represented in multiple ways for different audiences and purposes. Trifonoff observes ‘any map is just one of many maps that could have been made’ (1996, p.36), so maps, particular types of visualisations, are aggregations of choices.
- Valarakis (2014) argues that visualisations can be potent rhetorical devices harnessed for political ends. Similarly, Dick (2014) examines the use of infographics and visualisations by the UK newspaper *The Daily Express* to convey a particular anti-union ideology.

Visualisation designers’ desire to ‘do good’

Whilst it is undoubtedly true that some visualisations are designed promote a particular position, this does not reflect the intentions of many visualisation designers. The visualisation practitioners we interviewed believe they can ‘do good with data’ (Perisopic, 2014; and see also Few, 2008). This is the strapline of one US-based visualisation agency, and it is an idea that can be traced back to the work of the Neuraths in the mid 19th century and their development of a graphical language called Isotype, a visual way of representing quantitative information via icons (Zambrano and Engelhardt, 2008). This belief in visualisation’s capacities is brought up-to-date in

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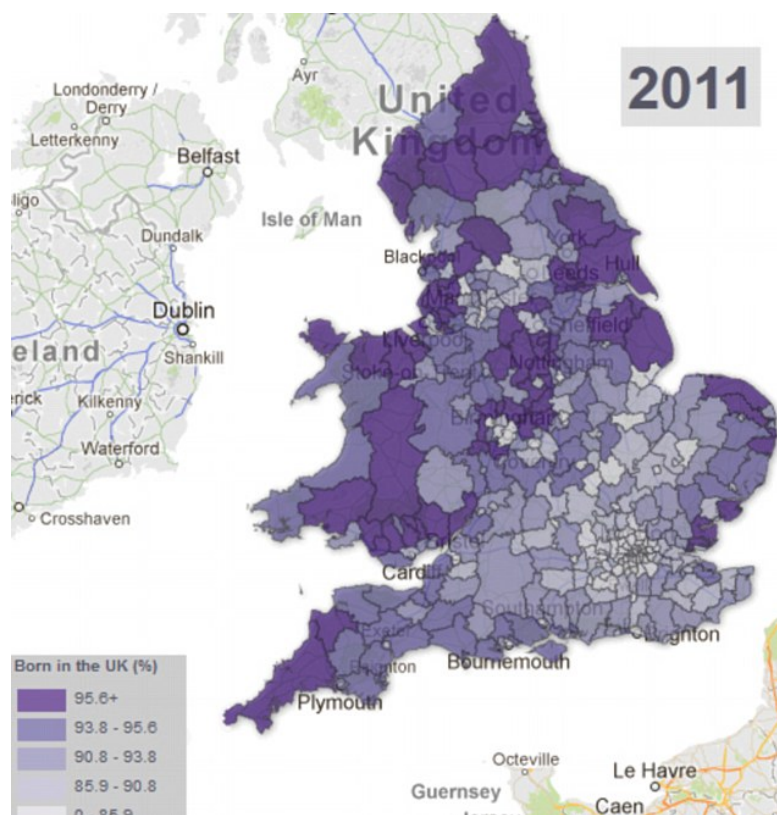
contemporary projects like the Roslings' GapMinder (<http://www.gapminder.org/world>), 'a modern "museum" on the Internet' aiming to promote global sustainable development by visualising related statistics, or in Stefanie Posavec's Air Transformed (<http://www.stefanieposavec.co.uk/airtransformed>), visualisations of air quality data for the Better With Data Society.

Our interviews with visualisation designers suggest that in their work, they aim to be true to the datasets they work with and lament the ways in which intermediaries can sometimes curtail the visualisation process. So how does what visualisers say about their professional practice square with concerns about the performativity of visualisations and their use as mechanisms of control? How can we think about visualisations, their tidiness and aura of truthfulness, without thinking that 'they' are trying to pull the wool over 'our' eyes? One answer can be found in close examination of the conventions and semiotic resources available to visualisers. We make sense of the contradiction outlined here by arguing that visualisation designers necessarily draw on a limited range of conventions, some of which contribute towards visualisations' objective aura and imbue them with the kinds of powers noted by critical commentators.

Visualisation conventions

The semiotic resources utilised in the production of visualisations (as described, for example, by Hullman and Diakopoulos (2011)) perform rhetorical work: they play a *persuasive* role. Conventions, such as the use of geometrical shapes and a tendency to clean, uncluttered layouts, work towards obfuscating the 'messiness' of data processes including visualisation. Here we focus on two examples of conventions – two-dimensional viewpoints and references to data sources – which play an important role in communicating facticity and imbuing visualisations with scientific objectivity and transparency.

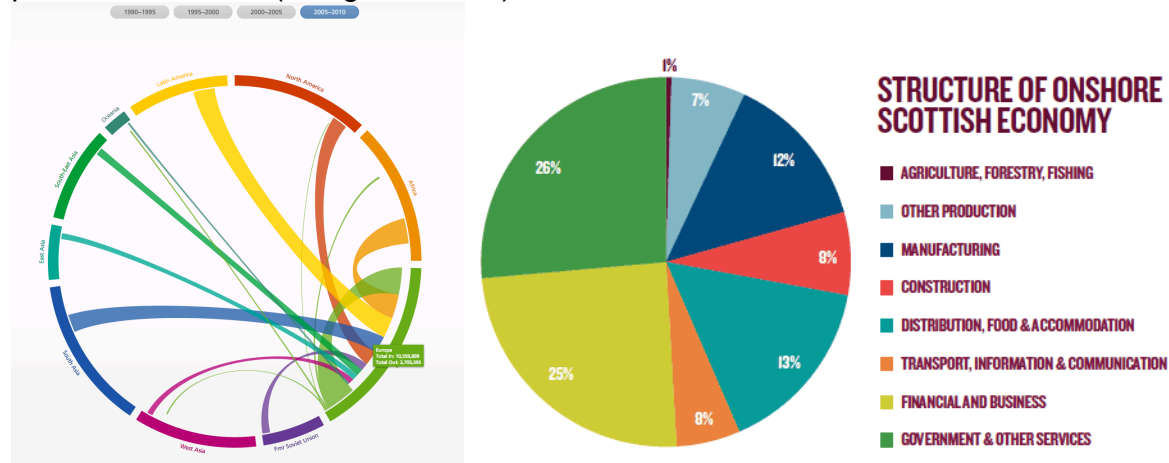
Two-dimensional viewpoints



It is common for visualisations to use two-dimensional viewpoints, either through a front-on view, as in graphs that use an x/y axis, or a top-down view, as in maps and pie charts. In this example of a map of non-UK born citizens by the ONS (Office for National Statistics), we hover above England and Wales and are able to see the whole nation. Maps use specific projections which introduce perspective, yet this is not commonly known or seen. For example, the size

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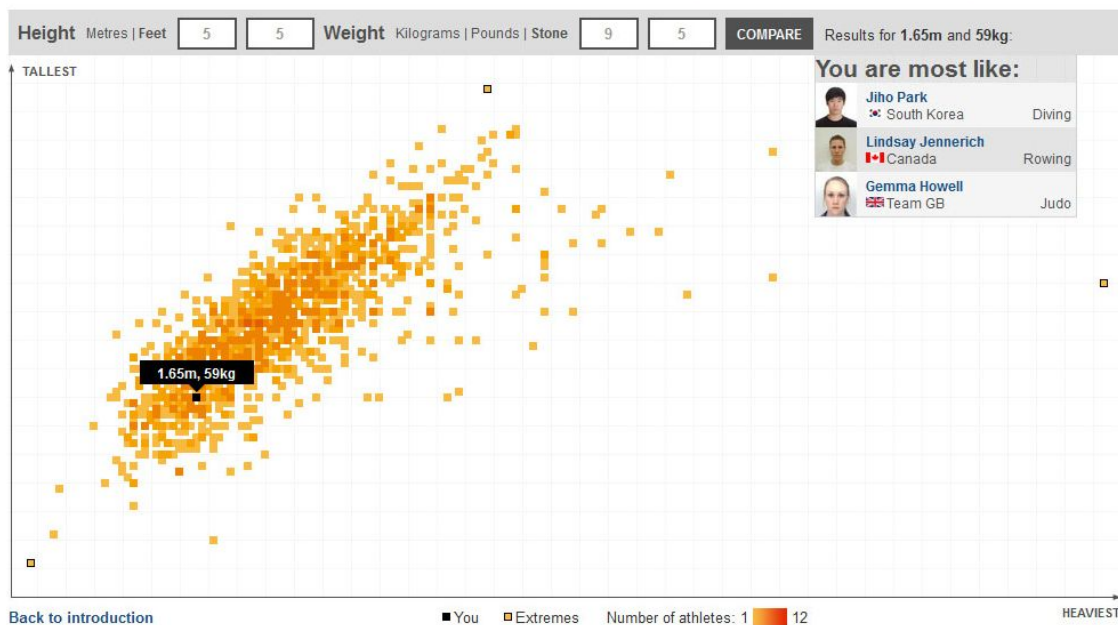
of Africa is very different between the Mercator and Peters projections. The Mercator projection produces the western world view that emphasises the powerful Imperial position of the UK (Hodgson, 1963).



Chord diagrams such as the Global Flow of People (by Nikola Sander, Guy J. Abel & Ramon Bauer (<http://www.global-migration.info/>), pie charts and radial charts similarly encode this objective view.

Your Olympic athlete body match

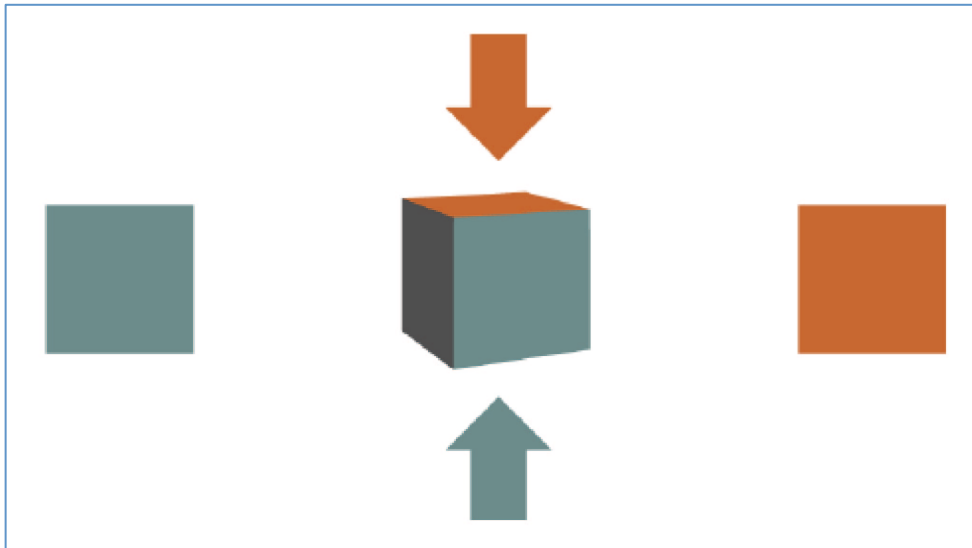
Olympic athletes come in all shapes and sizes, from the lithe limbs of Japan's Asuka Teramoto to the gargantuan frame of China's Zhaoxu Zhang. But how do you measure up in comparison? Try our app below and find out. Why not then share your results with your friends?



In another example, a BBC scatter graph showing the heights and weights of Olympic athletes, we look at the data from a front-on position as if we view it from the sidelines. Where a top-down view appears objective because it shows everything at once without an angle, the front on view adds 'attitudinal meaning' (152) as if we stand to one side looking on.

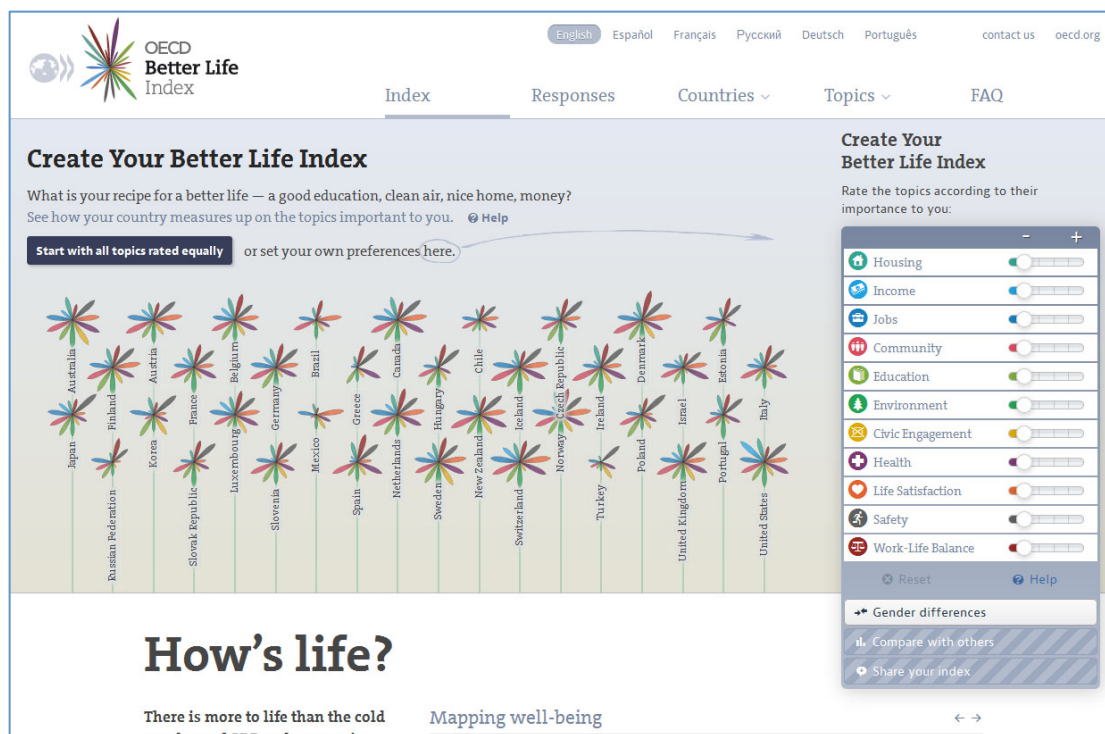
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The use of 3D elements is generally frowned upon amongst data visualisers for good reason, because it is difficult to read the values being shown (Carswell et al., 1991; Siegrist, 1996; Few, 2005). The professional dismissal of 3D graphs prioritises the convention for 2D, but Kress and van Leeuwen argue that using a front-on or a top-down view hides perspective. It encodes objectivity because the 'distortions that usually come with perspective' are 'neutralized' (2006, p.149). Although such views look objective, they actually embody a perspective, or a 'god-like view' (2006, p.149).



Data sources

Visualisations usually include a link to an often downloadable dataset, or a note saying where the data have come from.



In this visualisation about the quality of life in different European countries, The Better Life Index, the data source appears at the bottom – a conventional location – and the links takes the viewer to the data in chart form, which can then be downloaded in a number of formats.

The inclusion of data sources in visualisations calls upon the viewer to see visualisations as based on ‘facts’. Their inclusion suggests that we can examine the raw data, check the veracity of the visualisation, and be sure that the designer has not led us astray. The inclusion of the data source also tells us that the designer feels confident that s/he has been honest in representing the data, so we may feel we have no need to check.

Conclusion

- The resources and conventions available to visualisers have a long history and a long association with objectivity: Manovich (2011) locates conventions within the Enlightenment project of pursuing rational knowledge about an external world. Given longstanding critique, by feminist epistemologists amongst others, about the assumed objectivity of knowledge, we might ask why these are still the primary resources available for visualisation, when visualisers are well aware of the non-objectivity of the data visualisations that they produce?
- Contemporary debates about the non-objectivity of data tend to focus on data themselves, as seen in Bowker and those who draw on his notion that ‘raw data is [...] an oxymoron’ (2005, p.184). However, we also need to take into account that data’s ‘visual manifestations are themselves informed by judgement, discernment

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and choice' (Ambrosio, 2015, p.137). In other words, visualisation conventions play a role in ascribing power to data.

- We found that designers make choices about the data visualisations that they make, but their choices are constrained by semiotic resources and other conventions that are available to them. Visualisers are not in league with 'them' to bamboozle 'us', as one participant in our focus groups with visualisation consumers claimed. Rather, they do their best to 'do good with data' with available conventions. Thinking in this way leads to more sophisticated understanding of the work of digital designers who play a role in imagining data, but who are not all-powerful.

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