Visual abstractions

How to present data

by Manuel Leuthold

How did we visualise data and information in the past? How can we use the human perception to provide better visuals? What different types of data exists? Where is the connection between stories and data?

History of data visualisation

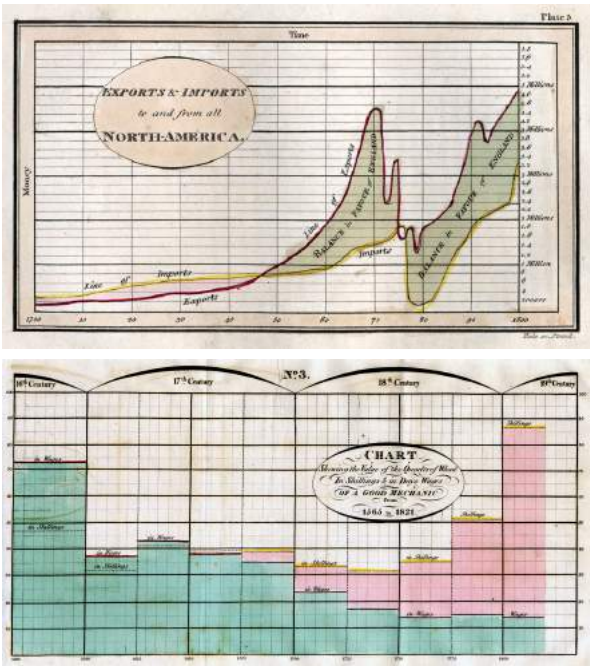
Visual representation is an elementary part of human learning and understanding, mankind has used visualisations to instruct, convey meaning and tell stories ever since.

First of all we must understand that there are two main different types of how to represent data in a visual way:

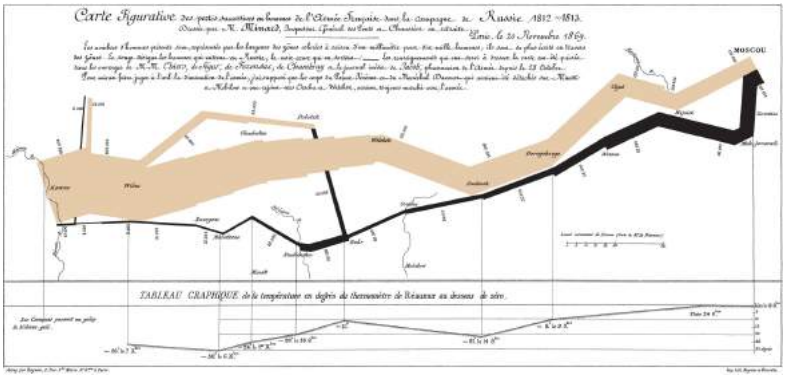
The first type is **Presentation**, which uses data visuals to communicate. Therefore, there is always a presenter and audience in this type of visualisation. The second type is called **Visualisation**, which is newer than the presentation type. The idea here is to use visuals to improve thinking, moreover the experience is active and involves people trying to answer questions.

A key point in the history of visualisation is the introduction of statistical presentation such as the pie chart, by Scottish engineer William Playfair. He published a book in 1786 called the Commercial and Political Atlas which used graphical representations of data to describe England's balance of trade. *(Picture 1)* Many of Playfair's innovative data visualisations are still in use today.

Not so late after, statistical graphics were being used for presentation, the most famous example of a data presentation comes from Charles Minard, a French civil engineer who used visualisation to capture the story of Napoleon's march and subsequent retreat on Moscow. *(Picture 2)* A lightly shaded bar illustrates the size of the advancing army. The bar's thickness steadily declines as the army makes its way toward Moscow. Below, a black bar shows the army's decline in strength as it retreats from Moscow. At the bottom of the graphic is a line which tracks the outside temperature, which was terribly damaging to the size of the ranks. The shaded and black bars finally meet



Picture 1



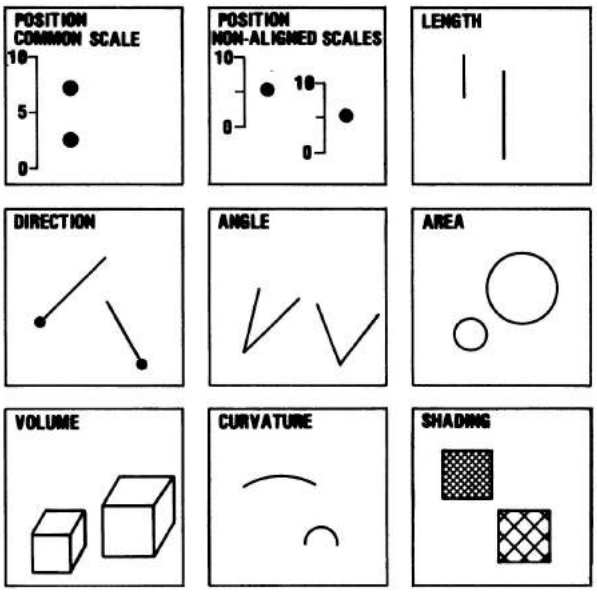
Picture 2

back at the beginning of the march and the viewer can clearly see how a once large force was reduced to a handful of troops. In this fashion, a simple chart has told a very powerful story.

With the appearance of computers, the progress of visualisation and presentation quicken, as software could automatically design graphical presentations. This was a breakthrough as it showed that we, as humans are knowledgeable enough on how to design effective visuals of data that we could use computers to help with the design task.

Human perception

If the sum of all this history has taught us one thing, it's that human perception is powerful. But we can help our perception by visual techniques. A very traditional technique called "pop-outs" is just one of the ways that the visualisation of data makes it easier to comprehend large data sets and make sense of the findings. A study by two statistical scientists at AT&T Bell Laboratories, William S. Cleveland and Robert McGill, showed that Position is the most effective way to evaluate a quantitative value. Followed by other factors such as length, direction, angle and area. *(Picture 3)*



Picture 3

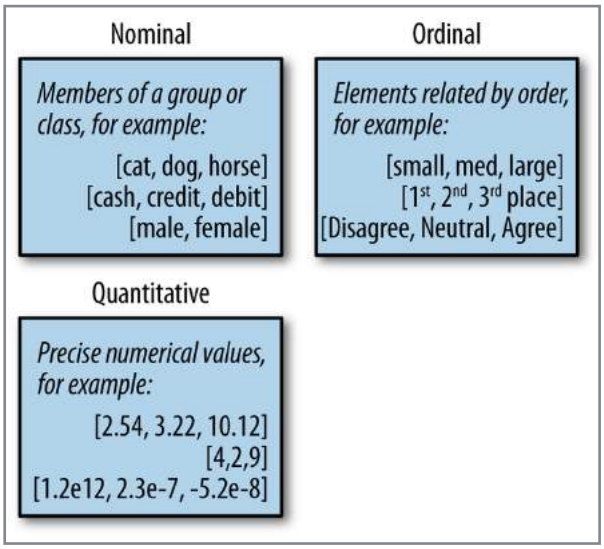
Types of data

There are three main types of data existing, it's important to know the difference of these to be able to choose the right and most effective visual technique for each: Nominal, Ordinal and Quantitative Data.

Nominal Data: The name Nominal comes from the latin word nomen, meaning name. Nominal data are items which are differentiated by a simple naming system. The only thing a nominal scale does is to say that items being measured have something in common. Nominal items are usually categorical, in that they belong to a definable category.

Ordinal data: Items in an ordinal scale are set into some kind of order by their position on the scale. They followed a sequence such as with the days of week.

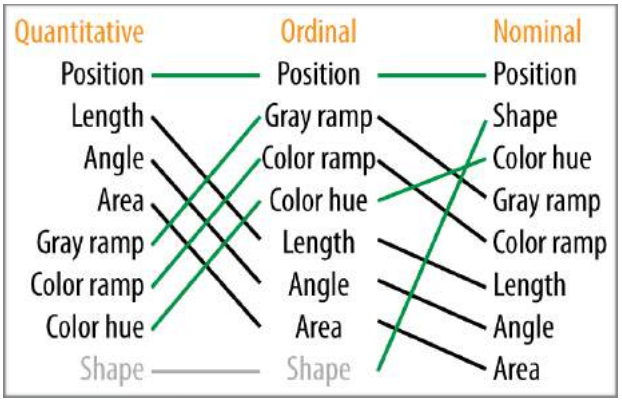
Quantitative data: Deals with numbers and things that can be measured, this could include length, time or temperature. *(Picture 4)*



Picture 4

Different types of data means there are different ways of viewing each of the those in an effective way. *(Picture 5)*

For example, using Position as the graphical representation is the most effective for all of the three data types. Other graphical options such as Area (Size) is effective for some but not others. Area works best for Quantitative data because it can represent an accurate way of its value. Changing the graphical representation to Color reverses these findings. Color is least effective for Quantitative data because it would be very difficult to provide enough in colors to accurately represent the entire data set. However, color works best for Nominal data when each data point can be assigned with a distinct, unique color.



Picture 5

Composition and interactivity

Clearly, composition is key to developing good data visuals, important key words are: Gestalt view, interactive sorting, interactive filtering and interactive links.

Gestalt view: This is a composition where the most significant data points can be quickly seen without need to go back and forth with the eyes.

Interactivity in general is a very effective way to deal with multi-dimensional problems.

Interactive sorting: Gives the user the possibility to sort the data by a criteria such as time or a value.

Interactive filtering: Means allowing the user to view only the sets of data he's concerned with or interested in. Filtering is a very powerful way of dealing with multi-dimensional data, but it has its weaknesses. For example, isolating certain data sets can make it difficult or impossible to see the relationships between them.

Interactive links: Use of interactive links means provide further information via drop-down or widget when clicking on them. An example could be Google Maps which provides tones of additional data hidden behind links in form of places and areas. When clicking on them, more data and views are provided. Interactive Links, therefore, represent an extremely powerful way of dealing with multi-dimensional data sets.

Using data to tell stories

Stories bring life to data and facts. They can help you make sense and order out of a disparate collection of facts. They make it easier to remember key points and can paint a vivid picture of what the future can look like. Stories also create interactivity—people put themselves into stories and can relate to the situation. Therefore provide a story around the data you want to convey.

Lessons learned

We can make Effective use of our visuals by the use of human perception. This includes the properly use of graphical elements, to provide white space in visualisations and to avoid unnecessary material and disorder.

We should always try to tell stories with our data and visuals. Then stories bring life to data and facts and it helps the audience to relate to the situation by putting themselves into the stories.

Views can be playful. Interactive views that people can play with are very engaging. Interactive elements allow your audience to manipulate the data, ask and answer questions, and arrive at findings on their own.

References

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