accenturedigital

VISUAL ANALYTICS BEST PRACTICE CHECKLIST

QUESTIONS?

If you have any questions/suggestions regarding this deck, please email Sakib:

sakib.moghal@accenture.com

THE CHECKLIST

DO YOUR COLOURS WORK WELL TOGETHER?

Some colours work well together, others don't.

To help you to decide colours that look good together, use a basic colour wheel scheme. These are the 3 most common ones[1]:

Analogous
Same area of the colour wheel. Highlights similarity, creates feelings of harmony[2].

Complimentary
Opposite sides of the colour wheel. Highlights difference, creates feelings of tension[2].

Triadic
3 opposite ends of the colour wheel. Less harmony than analogous, more than complimentary.

A great tool for experimenting with these colour wheel schemes is Adobe Color CC.

Or, to just find great colour palettes that work together, you can use Color Hunt, Coolors or Canva.

WHAT DO YOUR COLOURS MEAN?

Colours have meaning.

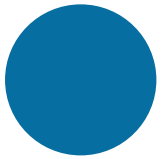
It's not an exact science (meanings vary by culture, context, etc.), but certain colours do generate certain meanings in many situations[3]. Below covers some basic associations with eight common colours[4, 5, 6].

Red
Passion, drama, strength, courage, love, *danger*.

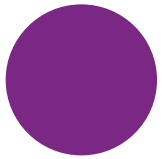
Orange
Excitement, warmth, enthusiasm, joy, extroversion.

Yellow
Sunshine, elation, happiness, *cowardice*.

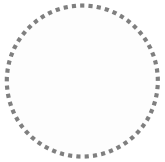
Green
Nature, healing, peace, relaxation, *greed*.



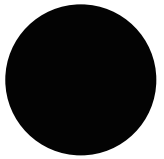
Blue
Calm, tranquility, trust, loyalty, integrity, *aloofness*.



Purple
Wealth, ambition, royalty, spirituality.



White
Perfection, purity, innocence, cleanliness.



Black
Death, power, grief, evil.

HOW HAVE YOU USED COLOUR IN YOUR DATA?

There are three ways you can use colour in your data[7]. Think about how each type may be used in your viz.

Distinguishing low-high values (darker colour = higher value)

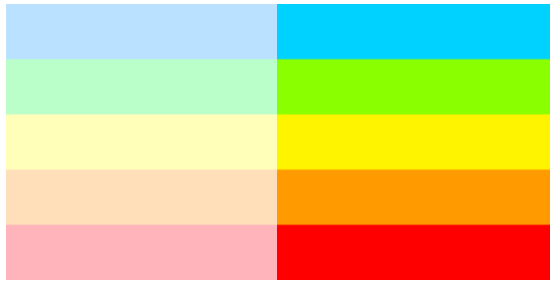
Distinguishing categories

Highlighting something (against gray, or against a complimentary colour)

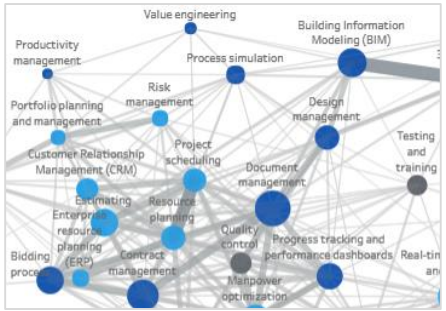
HAVE YOU USED COLOUR SPARINGLY?

Do not over-use colour. Each time you use a different colour, there should be a reason for it.
Do not exceed 8 colours in a dashboard[8] – but ideally, use no more than 2-3, and vary their lightness[9].

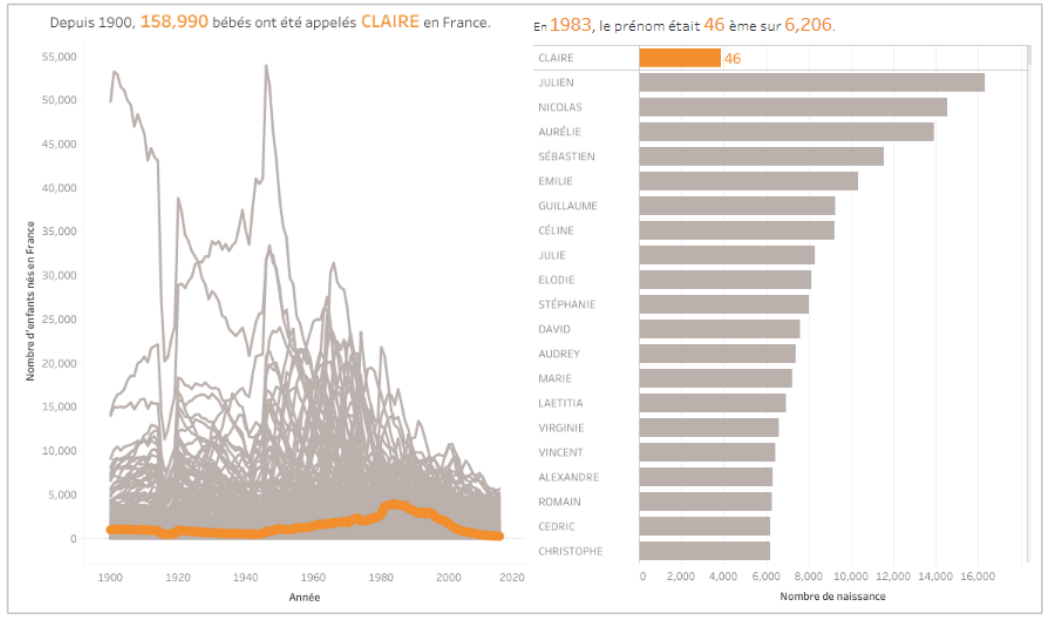
Generally, use softer colours (which are more pleasing to the eye).
You can then use a bold colour to draw attention to something.



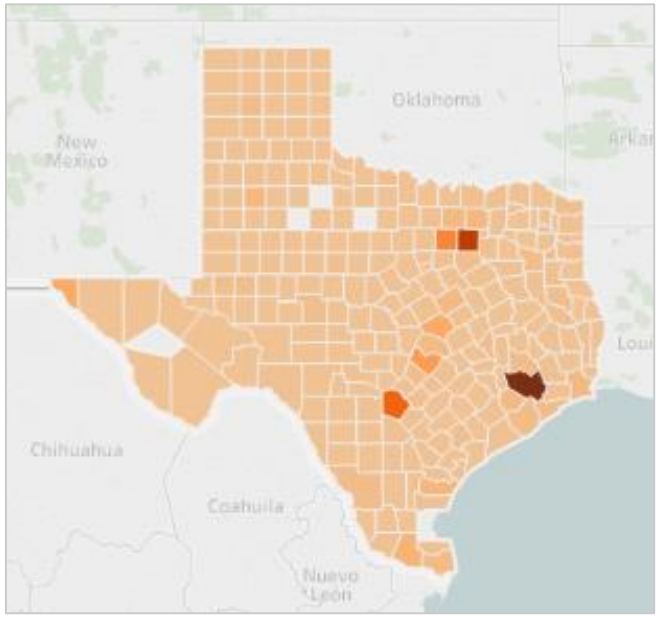
Harness the power of grey: it adds context to a viz without distracting the eye[10].



i.e. don't do this



Link



Link

Here are some examples of using colour sparingly and effectively – to highlight (left), and to show variance (right).

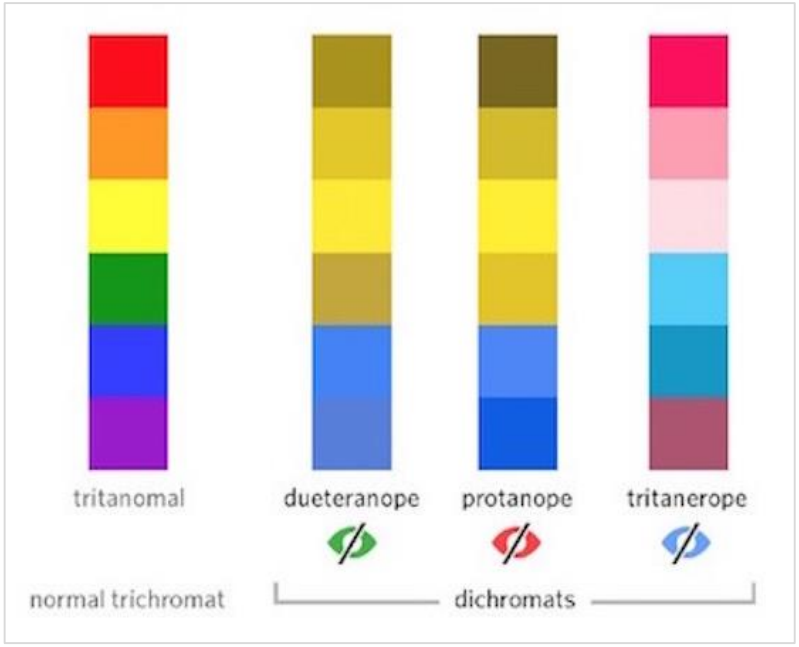
IS YOUR VIZ COLOURBLIND-FRIENDLY?

8% of men, and 0.4% of women, have some form of Colour Vision Deficiency[11]**.** There are three types:

- Protanopia: red-weak
- Deuteranopia: green-weak
- Tritanopia: blue-weak

Some rules of thumb to accommodate colour blindness:

- Avoid red-green (the most common form of colour-blindness). Go for blue-orange instead.
- Use icons, as well as colour, to distinguish elements if needed.
- Check your viz using a color-blind simulator (like this one here).



WHAT FONT ARE YOU USING?

The theory of fonts is vast[12] - but to play it safe in most situations:

In most business contexts, it's best to use a sans-serif font. They have better readability on screens[12], and carry the perception of being contemporary and modern[13]. Some sans-serif examples are below.

Helvetica	Calibri
Graphik	Arial

Use a maximum of two fonts, and ideally one. Alternate between headers and body using size/boldness.

Here's a header

This is some text

And here's a footnote

WHAT IS YOUR DATA-INK RATIO?

Data ink ratio = 'ink' used that directly encodes the data / total 'ink' used in the viz[14].

To build a clear viz, aim for a 1:1 ratio. What this ratio essentially says is, **aim for minimalism in your viz**. Simplified and uncluttered representations are easier for the mind to digest[9].

Aim for minimalism in your:

- Backgrounds
- Axes
- Borders
- Gridlines
- Colours
- Images
- Labelling

Be wary of chartjunk[14] – the elements of a viz that do not *directly* explain the data. Things like pictures, icons, or additional embellishment can be confusing.

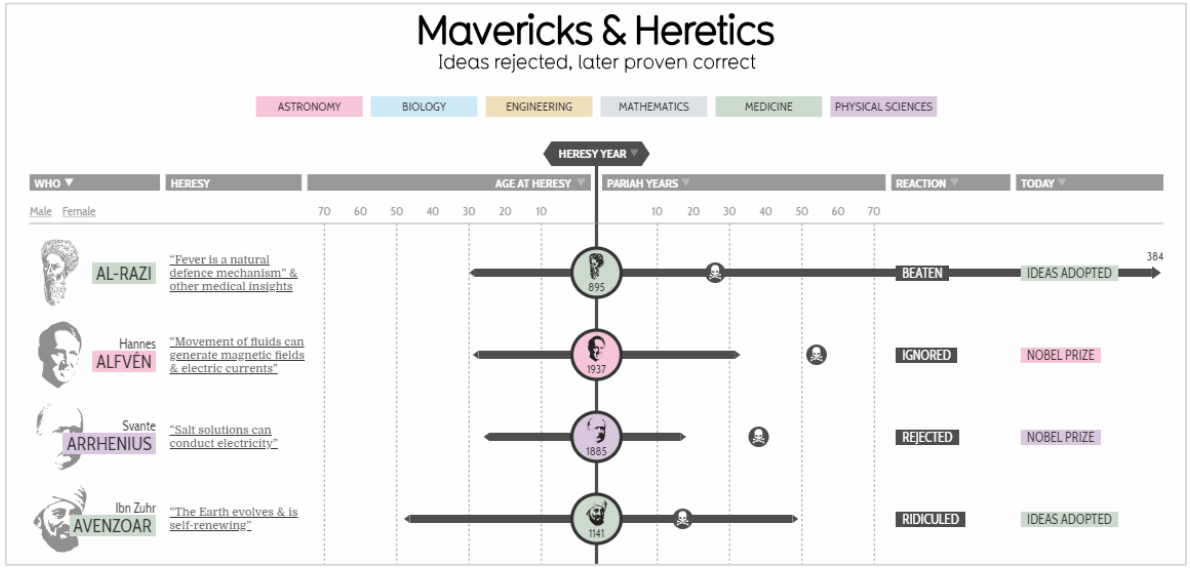
Ways to improve the data-ink ratio (this is a gif: view it in presentation mode)

WHAT IS YOUR DATA-INK RATIO? (CONT'D)

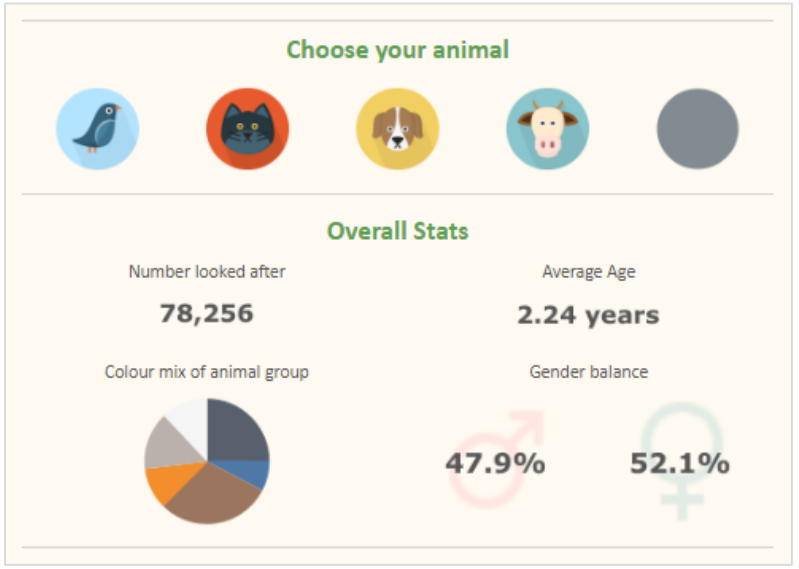
But, *some* 'chartjunk' (i.e. design embellishment) if done elegantly, beautifully, and in a way that does not obscure the data – can be useful.

- 'Chartjunk' can improve a person's memory of the data[8, 9, 15, 16].
- 'Chartjunk', when done well, makes a chart more beautiful. And therefore, more *engaging*[17, 18].

"*Boredom is as much a threat in visual design as it is elsewhere in art and communication. The mind and eye demand stimulation and surprise.*" – Donis A. Dondis



Link



Link

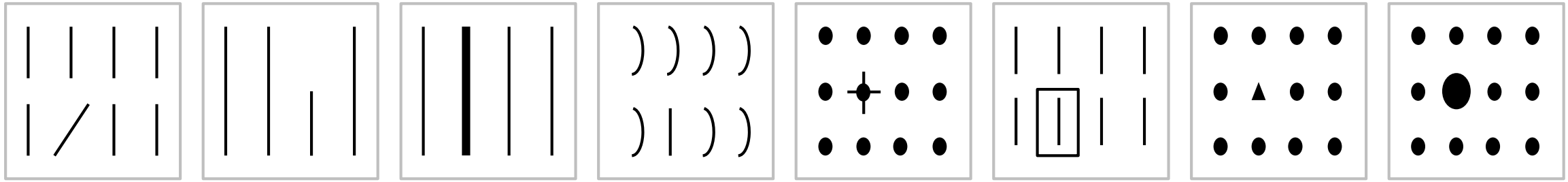
Examples of where embellishment, which may worsen the data-ink ratio, can increase a viz's beauty.

HAVE YOU HIGHLIGHTED WHAT'S IMPORTANT?

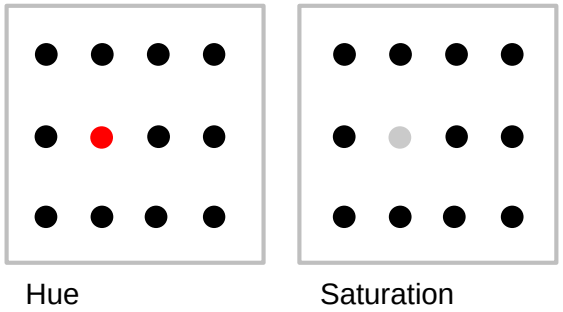
Pre-attentive attributes are the elements that our brain immediately and sub-consciously notices and attaches meaning to[9, 19]. **We can use these to draw the viewer's attention to something in a visualisation**.

We can break these attributes down into four categories[20]:

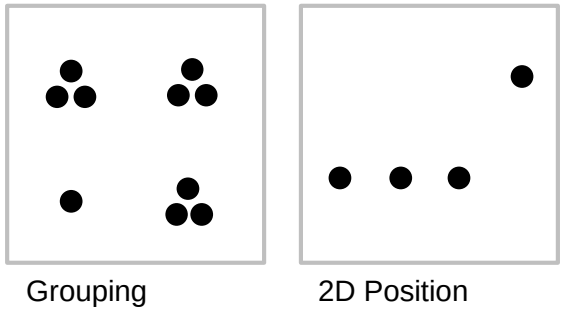
Form



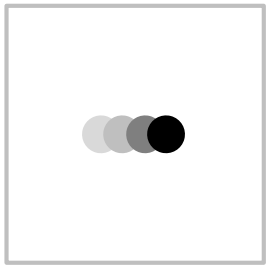
Colour



Spatial position



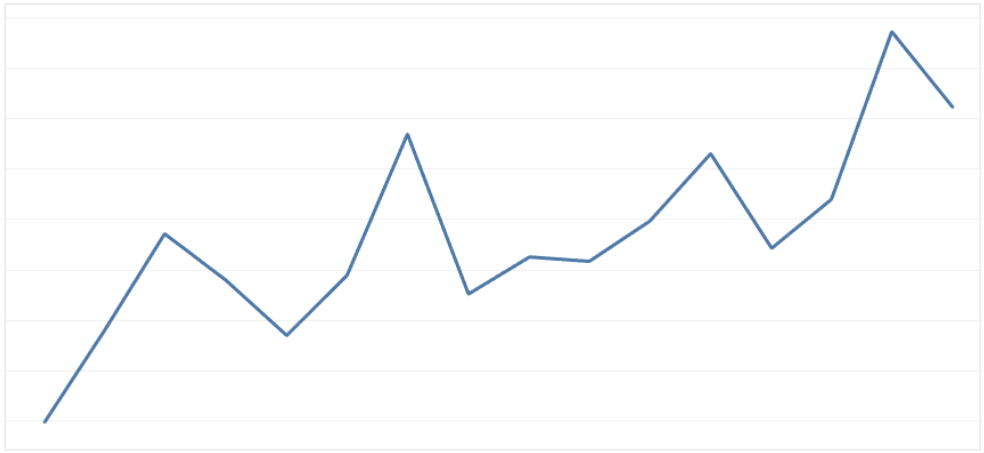
Movement



WHAT IS THE SHAPE OF YOUR CHART?

Skewed chart shapes can visually skew the data[14, 21]. Be mindful of this.

This applies mostly to line charts, but can also impact others.



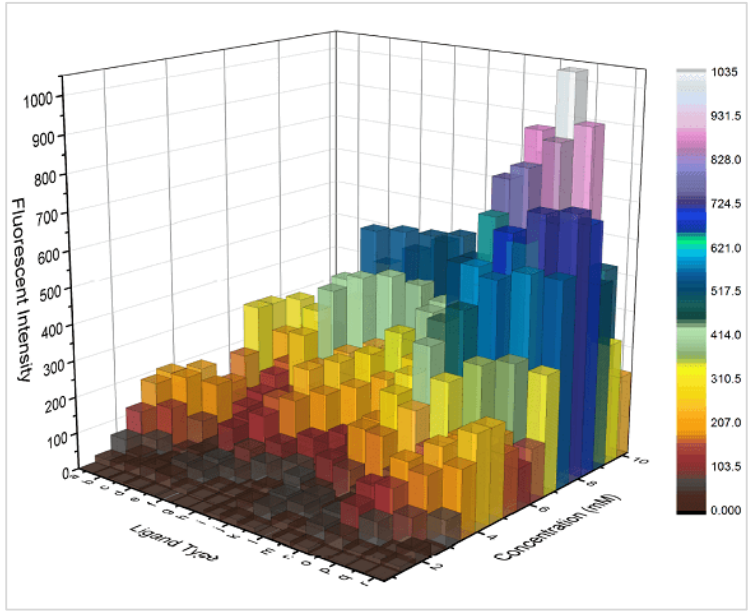
Both show the same data. Which chart looks more erratic?

IS YOUR VIZ 3D?

Then please get rid of it.

There is rarely a good reason to use 3D[22].

If you're trying to visualise multiple dimensions, it's better to use multiple charts. One method is known as small multiples[14].



	Child is affectionate and tender with parent	Child bounces back when things don't go his or her way	Child smiles and laughs a lot	Child shows interest and curiosity in learning new things
Overall	93%	79%	98%	96%
Gender				
Male	92%	78%	98%	95%
Female	95%	80%	98%	96%
Race and Hispanic Origin				
Non-Hispanic White	95%	84%	97%	97%
Non-Hispanic Black	91%	70%	98%	92%
Hispanic	94%	76%	96%	94%
Other	92%	45%	98%	95%
Poverty Level				
Poverty Level and Below	89%	69%	96%	92%
101 to 200% of Poverty Level	93%	78%	97%	96%
Above 200% of the Poverty Level	96%	85%	99%	98%
Parental Education				
Less than a High School Degree	89%	67%	96%	89%
High School Degree	91%	74%	97%	95%
More than a High School Degree	95%	83%	98%	97%

The left is a difficult-to-read 3D bar chart. The right is an easy-to-digest example of small multiples for bar charts.

IS YOUR VIZ LABELLED PROPERLY?

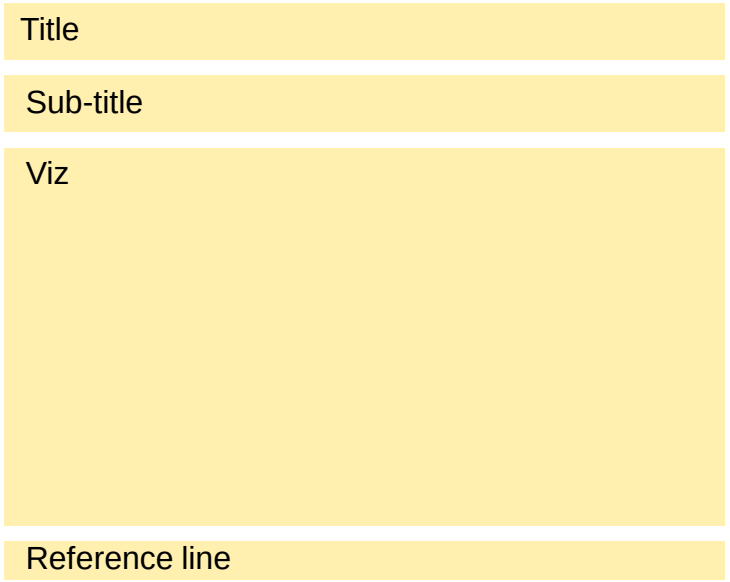
A user should be able to understand the point of your viz without you sitting with them and explaining it.
Making sure your viz has proper labels will help to achieve this.

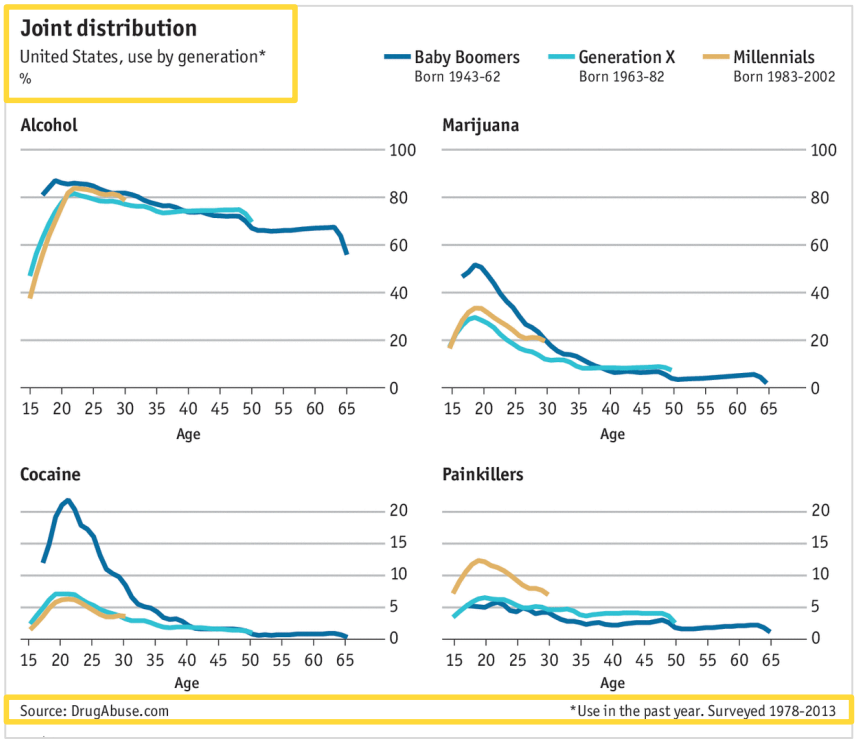
Check whether your viz needs a:

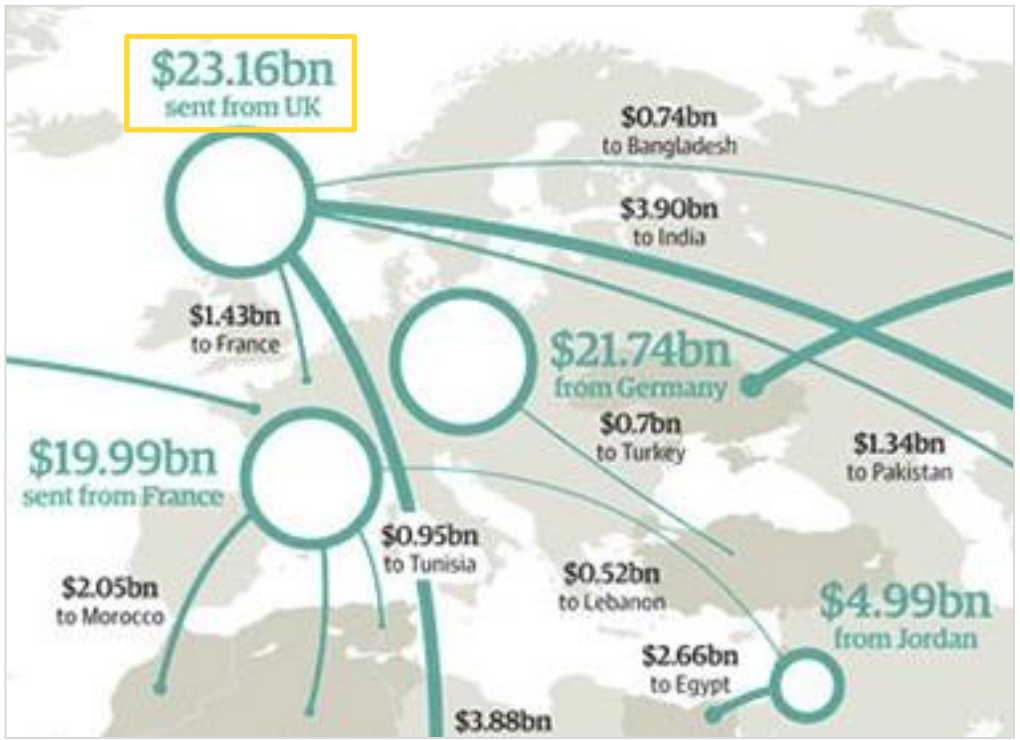
- Title
- Sub-title
- Reference line (for the source data)
- Direct labels on the viz, to aid clarity

A suggested template is shown on the right[8].

Labelling may not always be necessary,
but *make sure you check*.







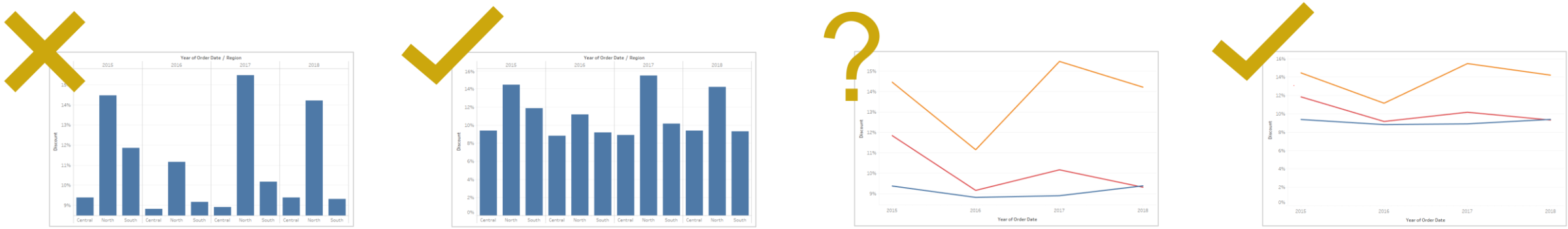
Good examples of viz labelling. Left: title, sub-title and reference line. Right: directly labelling the viz itself.

ARE YOUR AXES ENCODED PROPERLY?

Improperly encoded axes can misrepresent the data to your audience. This is deceptive, so avoid it[8, 23].

Rules of thumb:

- **Always** start the y-axis of your bar graphs and box plots at 0.
- For line graphs and scatter plots, if your y-axis does not start at 0, make sure this is **clearly indicated**.



These charts all show the same data. The y-axis has just been fixed, and un-fixed, at 0. Can you see how it distorts the representation of the data?

Tick and Cross icon by Mert Güler, and question mark with help by SAS37 ICON from the Noun Project.

ARE ALL YOUR VIZ ELEMENTS WELL-ALIGNED?

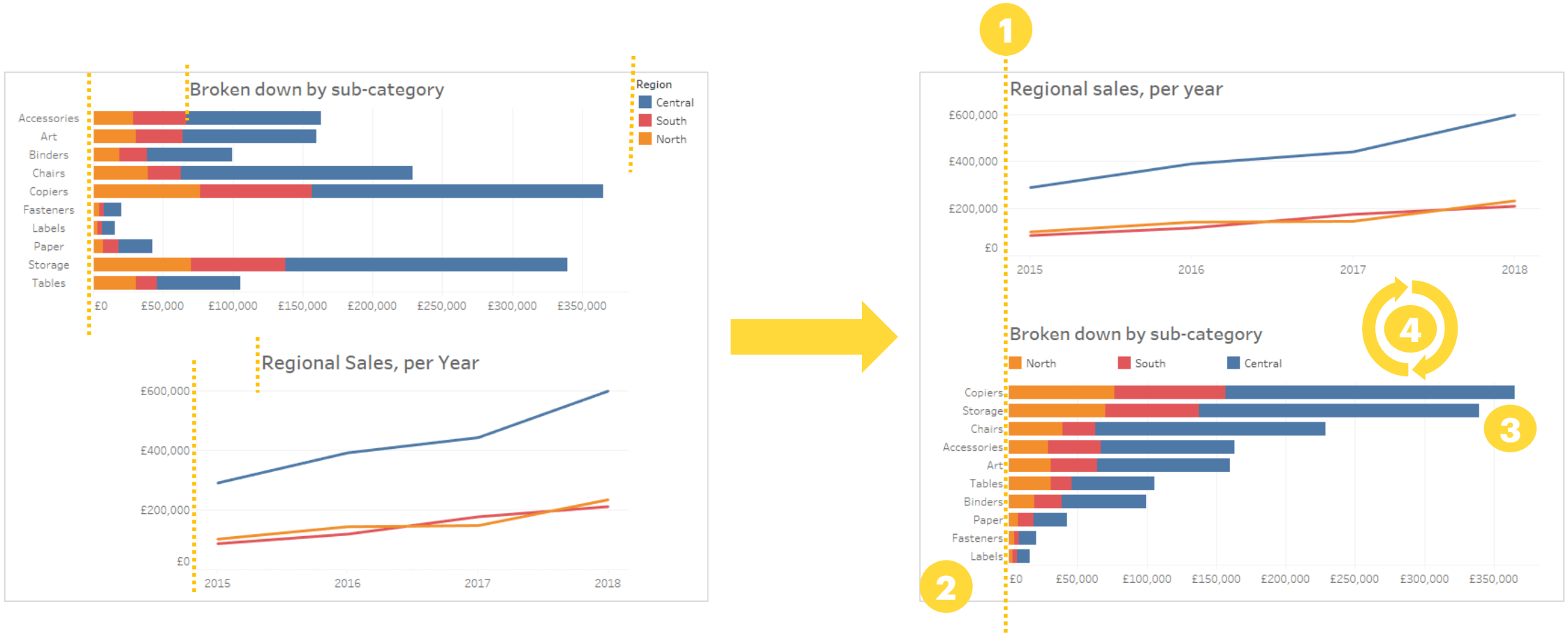
Well-aligned viz elements minimize eye travel, which makes your viz easier to digest[24].

Rules of thumb:

- Use as few alignment points as possible (example on the next slide)[24].
- For a bar chart, consider sorting the bars from largest to smallest.

- If aligning text in a table[25]:
  - Text: align left.
  - Numbers: align right. If there are decimal points, align them in the same place.
  - Only centrally-align elements if they have the *same number* of characters.

Aaron Bergman	2015	134.83
	2016	96.12
	2017	49.31
	2018	842.63
Aaron Hawkins	2015	-26.83
	2017	35.19
	2018	973.23
Aaron Smayling	2015	-232.66
	2016	11.79
	2017	175.14
	2018	467.66



Four changes have been made here. The viz elements have been aligned along a single line (1), the labels in the bar chart have been right-aligned (2), the bar chart has been sorted from largest to smallest (3), and the charts have been swapped, so the high-level chart is seen first, and then the low-level (4). Can you see how all of this has made the viz easier to read?

HAVE YOU SHOWN FIRST THINGS FIRST?

Organise your viz so the user's eye is encouraged to travel where you want it to.

Points to bear in mind when positioning elements on your viz:

- Generally, a user's eye first travels to **pre-attentive attributes**[9]. Things that stand out (through size, shape, colour or movement) are looked at first.
- If nothing obvious stands out, then users may scan a viz in an **'F' pattern** (or an inverted 'F' pattern, if they are from a right-to-left reading culture)[25].

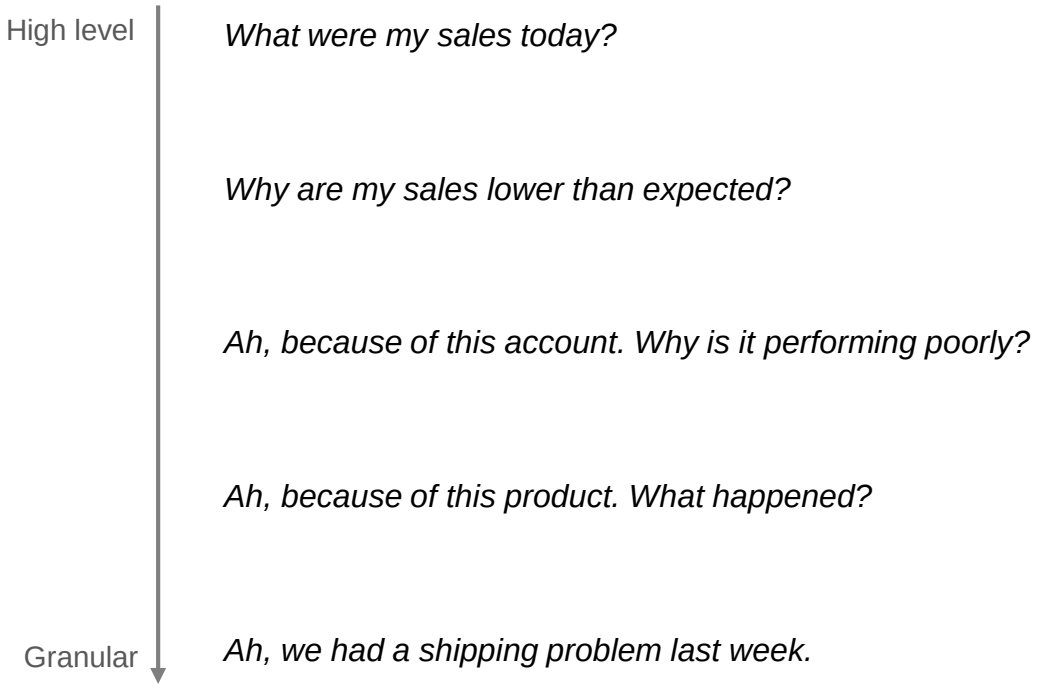
Users focus on what stands out…

…or, look in an F pattern

IS YOUR VIZ HIGH-LEVEL TO LOW-LEVEL?

“Overview first, details on demand, zoom and filter”[26]**.**

When structuring your viz, **show high-level detail first, and then get more granular later on**. This reflects the order in which we, as human beings, think about our questions.

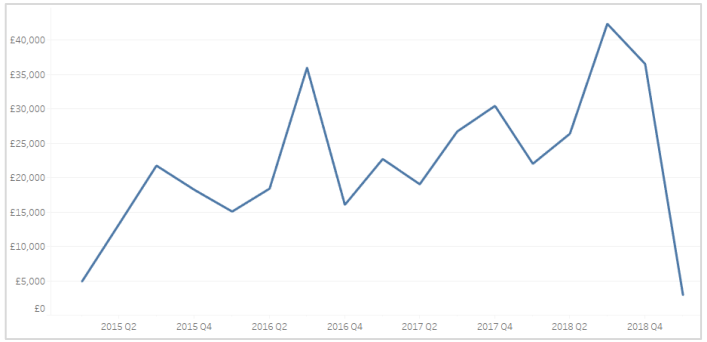


HAVE YOU RESPECTED CONVENTIONS?

Cultural conventions dictate a lot of what we *expect* to see[27]. These vary across the world.

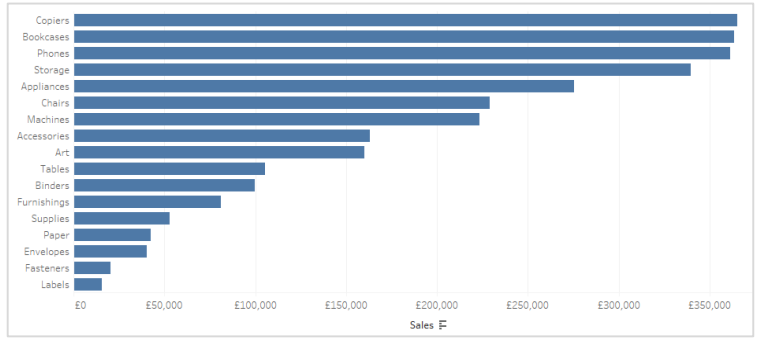
There are two conventions will work well in most Western situations:

- Time flows left-to-right, on the x-axis.
- Rankings flow top-to-bottom, with 1st at the top.



Time moves to left-to-right

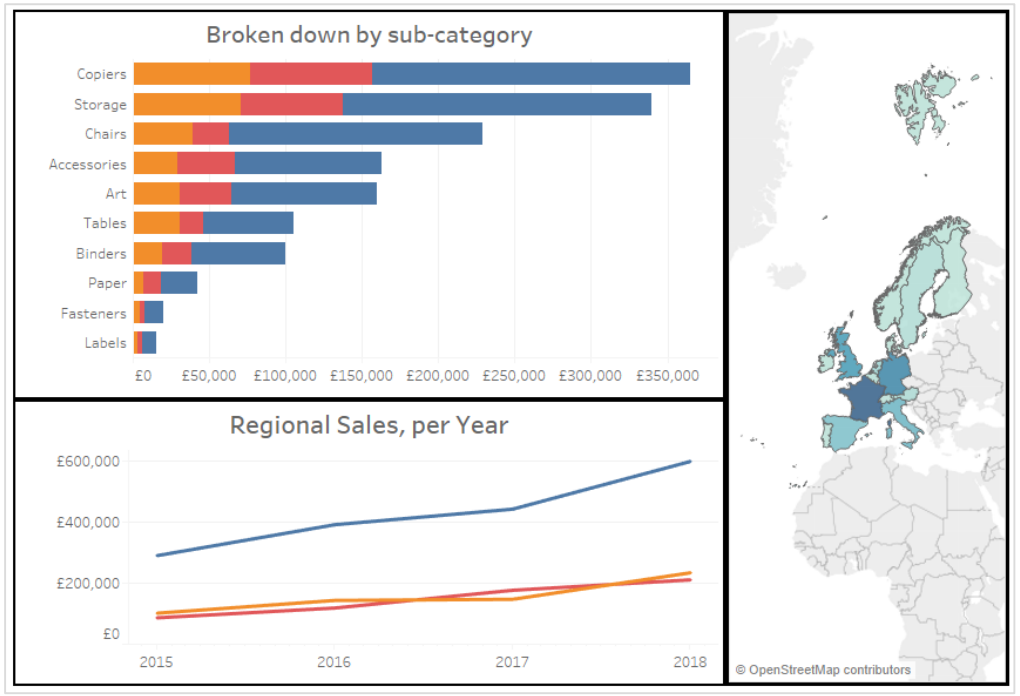
Rankings move top-to-bottom

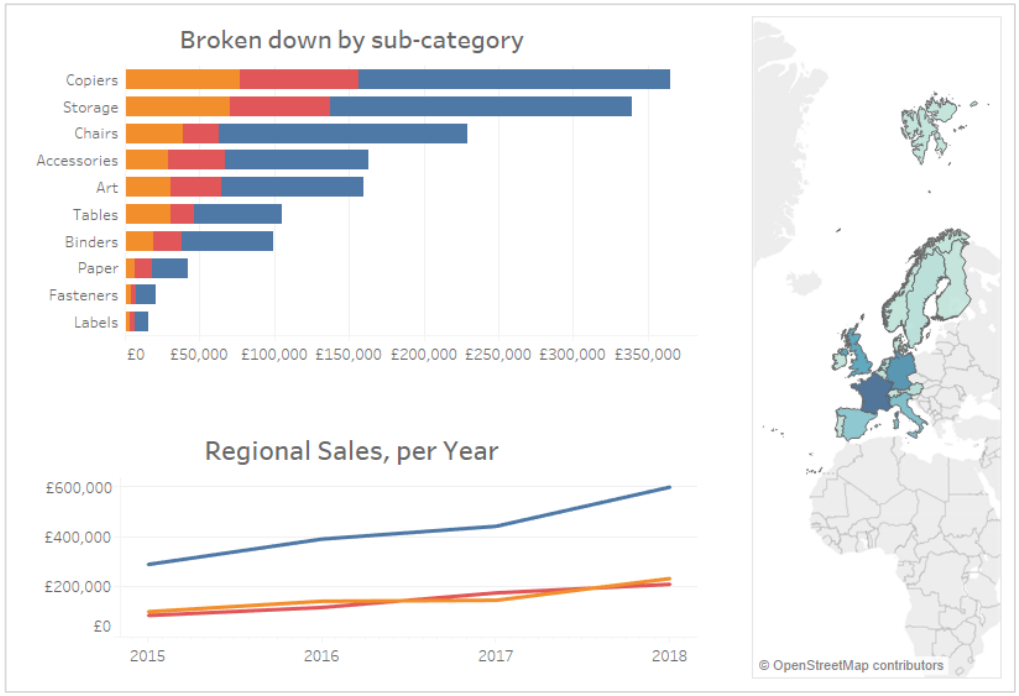


HAVE YOU USED WHITESPACE EFFECTIVELY?

Whitespace reduces visual stress – allows the user's eye to 'pause' between one viz and the next[21, 28]**.**

Use whitespace, rather than borders, to naturally separate elements on your viz.





FURTHER READING & REFERENCES

REFERENCES

1. Patkar, M. (2014) *Learn the Basics of Color Theory to Know What Looks Good*. Available here.
2. MyLearning training: 'A Guide to Visual Literacy: Advanced Principles and Techniques'.
3. Mollica, P. (2013) *Color Theory: An essential guide to color-from basic principles to practical applications*. US: Walter Foster Publishing.
4. Flow Graphics (2017) *Color Theory for Noobs | Beginner Guide*. Available here.
5. Graf1x (2018) *Color Meaning and Psychology of Red, Blue, Green, Yellow, Orange, Pink and Violet colors*. Available here.
6. Wikipedia (2018) *Color Symbolism*. Available here.
7. Cotgreave, A., Shaffer, J. & Wexler, S. (2017) *Big Book of Dashboards*. London: Wiley.
8. Berinato, S. (2016) *Good Charts: The HBR Guide to making Smarter, more Persuasive Data Visualizations*. Boston, MA: Harvard Business Review Press, p37.
9. Cairo, A. (2013) *The Functional Art: an introduction to information graphics and visualisation*. USA: New Riders.
10. Kirk, A. (2015) *Make grey your best friend*. Available here.
11. Birch, J. & McKeever, L. M. (1993) 'Survey of the accuracy of new pseudoisochromatic plates'. Ophthalmic & Physiological Press, 13(1), pp. 35-40.
12. Kolenda, N. (2018) *Font Psychology*. Available here.
13. Cousins, C. (2018) *Serif vs. Sans Serif Fonts: Is One Really Better Than the Other?* Available here.
14. Tufte, E. (1983) *The Visual Display of Quantitative Information*. Cheshire, Connecticut: Graphics Press.
15. Inbar, O., Tractinsky, N. & Meyer, J. (2007) 'Minimalism in information visualisation: Attitudes towards maximizing the data-ink ratio'. *Proceedings of the 14th European Conference on Cognitive Dynamics*. New York: ACM.
16. Bateman, S., Mandryk, R. L., Gutwin, A. M., Genest, D. M. & Brooks, C. (2010) 'Useful junk? The effects of visual embellishment on comprehension and memorability of charts'. *Proceedings of the 28th International Conference on Human Factors in Computing Systems*. New York: ACM.

REFERENCES

17. Norman, D. (2004) *Emotional Design: Why We Love (or hate) Everyday Things*. New York: Basic Books.
18. Dondis, D. A. (1973) *A Primer of Visual Literacy*. London: MIT Press.
19. Few, S. (2004) *Tapping the Power of Visual Perception*. Available here.
20. Ware, C. (2004) *Information Visualisation: Perception for Design*. London: Elsevier.
21. Berinato, S. (2016) *Good Charts: The HBR Guide to making Smarter, more Persuasive Data Visualizations*. Boston, MA: Harvard Business Review Press.
22. Humans cannot accurately perceive 3D data on a 2D plane. However, Virtual Reality may change this...
23. Few, S. (2004) *Show me the Numbers: Designing Tables and Graphs to Enlighten*. US: Analytics Press.
24. Alberts, A. (2017) *Eye-tracking study: 5 key learnings for data designers everywhere*. Available here.
25. Pernice, K. (2017) *F-Shaped Pattern of Reading on the Web: Misunderstood, But Still Relevant (Even on Mobile)*. Available here.
26. Shneiderman, B. (1997) *A Grander Goal: '*A thousand-fold increase in human capabilities'. *Educom Review*, 32(6), pp. 4-10.
27. Norman, D. A. (2013) *The Design of Everyday Things*. London: The MIT Press, pp120-140.
28. Lidwell, W., Holden, K. & Butler, J. (2003) *Universal Principles of Design*. Beverley, MA: Rockport Publishers.

