Pino Trogu

Small Handbook of Information Design: 16 Principles for Better Data Visualizations

Every graphic is an ad hoc construction, therefore these rules can be broken depending on the context. However you should try to do the graphic by following these rules first and break them later if necessary.

San Francisco State University
College of Liberal and Creative Arts
School of Design

DES 523 Information Design 1: Data Visualization
Spring 2020

Notes:

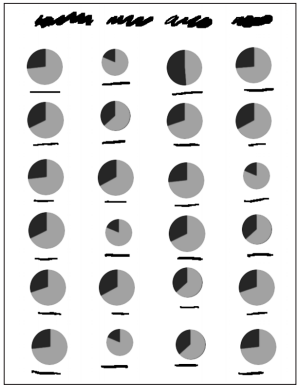
01 Use pencil and paper

In the early and later phases of a project, simply use pencil and paper as your design tools, use graph paper if needed, to sketch ideas, try out designs, and work out your proposal. Work on your ideas and your concepts by sketching your visualizations. Solve problems through sketching by hand, not by staring at a computer screen.

02 Content is first

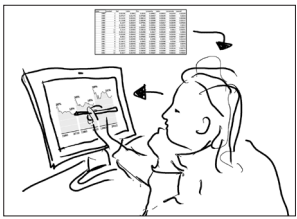
year	bracket	fed
1980	1	0.02306

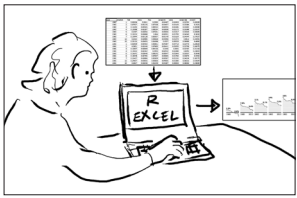
year	bracket	fed	state	fica	property	sales	corporate	overall
1980	1	0.02306	0.0041	0.0535	0.04467	0.04923	0.02754	0.20209
1980	2	0.07927	0.01276	0.07368	0.03457	0.03149	0.03084	0.2816
1980	3	0.11445	0.01925	0.08513	0.02995	0.02506	0.03103	0.30488
1980	4	0.13588	0.02267	0.08294	0.02008	0.02172	0.03188	0.31537
1980	5	0.1597	0.02654	0.07491	0.03004	0.01917	0.03649	0.34685
1980	6	0.18233	0.02888	0.064	0.02951	0.01799	0.04049	0.3613
1980	7	0.19044	0.03128	0.05037	0.03149	0.01624	0.04944	0.37827
1980	12	0.2324	0.02985	0.03618	0.04056	0.01072	0.0812	0.43091
1980	15	0.29113	0.02653	0.02098	0.0557	0.00529	0.09999	0.4986
1981	1	0.02909	0.00493	0.05851	0.04387	0.04713	0.02476	0.20829
1981	2	0.0851	0.01346	0.07865	0.03441	0.03055	0.02758	0.28075
1981	3	0.12037	0.02039	0.09156	0.0396	0.0241	0.02747	0.31318
1981	4	0.14412	0.02362	0.0905	0.02932	0.02088	0.0296	0.33803
1981	5	0.16341	0.02646	0.08242	0.03047	0.01846	0.03337	0.3546
1981	6	0.18578	0.02785	0.07007	0.03065	0.01704	0.03879	0.3702
1981	7	0.21417	0.02886	0.05839	0.02967	0.01536	0.04134	0.38779
1981	12	0.24037	0.03015	0.03826	0.04005	0.01089	0.06632	0.42404
1981	15	0.2817	0.01948	0.01349	0.04287	0.00553	0.08502	0.44809



Content is first, form is second. Select interesting content. Content-less stuff produces form-less, uninformative visualizations. This means that you need one or more data sets that are rich with data. Many columns and many rows (lots of data points) are better than just two data points. For example, two percentages: 25 and 75 are in themselves not very interesting and it would be hard to pull off an interesting visualization based on just those two numbers.

03 Do not draw graphs by hand

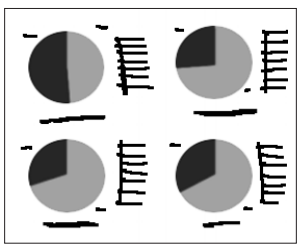




Do not take a numerical table or spreadsheet and then render the shapes (the bars, the lines) by hand, even if you're using Illustrator. Rather, take the data set and process it through a data visualization program, such as R, Excel, or other. Then bring the file into Illustrator to clean up and fine-tune line weights, typography, color, etc.

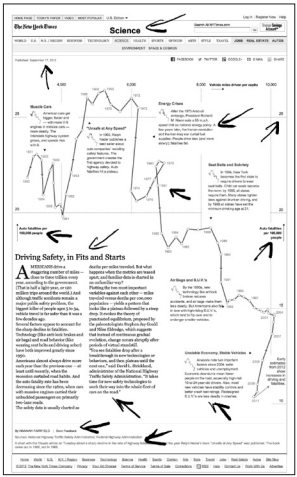
04 Do not enlarge numbers

55% BLA BLA BLA
27% BLA BLA BLA
30% BLA BLA BLA
35% BLA BLA BLA



Do not turn data points into stand-alone enlarged numbers with a percentage sign next to them to make them look important. Filling up your visualization with such “visuals” is not any better, and might in fact be worse, than just having plain text, with no “visualizations” at all. An infographic is not a PowerPoint template. The best thing to do is to combine words and images together.

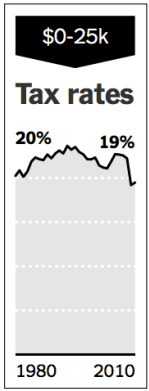
05 Use words, not just images



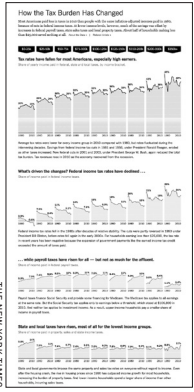
THE NEW YORK TIMES

Use sentences: subject, verb, object. Close your clauses. Set up an introduction and follow through with visualizations. Use a title, a subtitle, an introduction, main text if needed, labels, captions, credits (for pictures) call-outs, footnotes, sources (for data sets), and a signature (colophon). This is called “the annotation layer”. Plus, you can include numerical tables, if needed and appropriate, within the visualization.

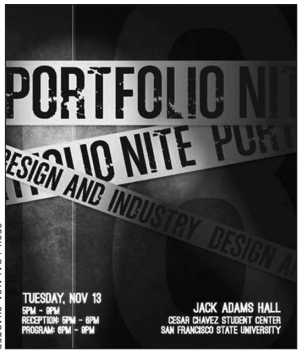
06 Use small multiples



Content is king. One single blown-up graphic is not so good, especially if it's just showing very few data points. Don't be stingy. For example, a pie chart showing 25 and 75 percent and filling up a whole poster is not so good. It's much better to have a high number of elements even if they're small, like in a geographic map. Twenty little pies are better than one giant pie. Ten little line graphs are better than a single giant line graph.

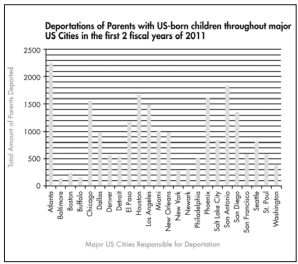


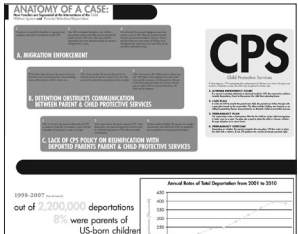
07 Do not bungle the meaning



Do not bungle the meaning of your visualization. Say what you mean and do not confuse the reader, starting with your opening title and subtitle. This applies to choice of words as well as pictures. For example, if the topic is “Tuition fee increases” do not say: “Fee hikes on Mount Everest”; say instead: “Fee increases reach new high”. If the topic is “Black Friday (shopping)”, do not say: “Products cheap as a black sheep”; say instead: “Black Friday keeps more green in your wallet”. If the topic is “Christmas shopping”, do not say: “Christmas shoppers pray to God for bigger discounts”; say instead: “Consumerism and religion mix in traditional Christmas holiday”. Do not play loosely with irony and puns, and don’t mix-up your metaphors.

08 Do not create op-art

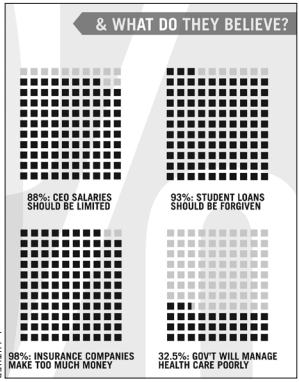


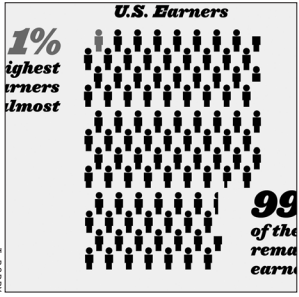


D. MARTINEZ

Do not make op-art (optical art) effects by using bold condensed sans-serif fonts where the strokes are the same width as the counters in the font and also the width of the spacing between the letters. This creates a very annoying, vibrating checkerboard effect. Do not use solid backgrounds, boxes, thick borders, or arbitrary bold type. If you are using solid backgrounds throughout, invert the whole image to see if it's better with the opposite values. On a Mac, use control-option-command-8 to instantly invert the colors of your screen on the computer. See if it would be better the other way around (black type on white background). If nothing is gained by the solid fills, then get rid of them.

09 Do not use little dots for numbers



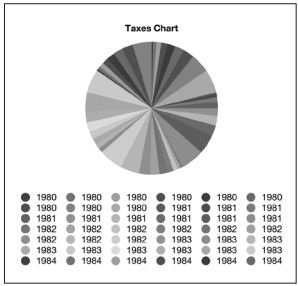


Do not use little dots for percentages. Do not use little people for quantities. Do not visualize quantities by the endless repetition of single units like little dots or little squares. We don't use pebbles to count anymore, and we have invented a tool called "place value". It's better to write out the number or to visualize it using a single solid area, not many tiny areas in little rows. Do not use little people as units to show quantities, even if the quantities represent people. Think of those poor little guys whose limbs get mutilated when you have to represent a fraction: arms, legs, even heads get cut off without mercy!

Link to my article on Otto Neurath (rule # 9) added February 12, 2019:

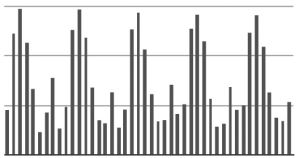
t.co/E5yN3U7EYq

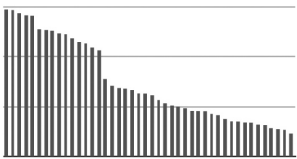
10 Do not use colors (to be memorized)



Do not use colors if the reader has to memorize them. Do not use colors if you have to have a legend for every single color in order to understand the graphic. If no legend is required, then little thinking is needed in order to perceive the graphic. Too many colors in the graph take a huge toll on the attention capacity of the reader. One cannot remember all those colors because we can only remember a small set of things at once: five-seven. Also, colors do not have an intrinsic order, therefore they should not be used to sort things, unless you use value as well: darker color for more, lighter color for less, both being from the same hue or two diverging hues maximum.

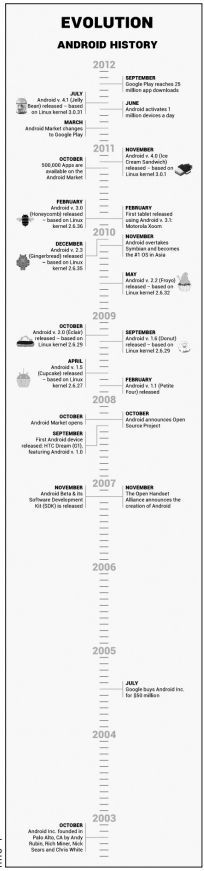
11 Sort by value, not category





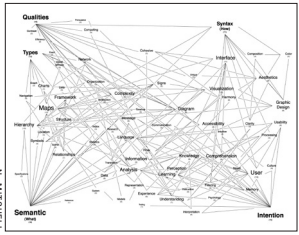
Sort by performance (value), not alphabetically. When part of the information is categorical but includes values for each category, do not sort the categories alphabetically. Instead, sort by the values for each of those categories. For example if the categories are products or states and each is a value, sort by the value, not by the alphabetical names of the states or the names of the products.

12 Equally space time intervals in timelines



Keep the spacing equal (for equal periods of time) even if that results in big information gaps within certain periods of time. Gaps are as meaningful as periods of concentrated activity. When data is concentrated within a few years, use typography and other means to make everything readable while keeping the temporal spacing even and correct.

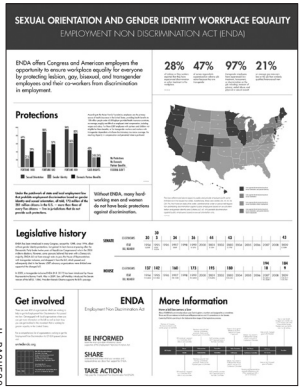
13 Avoid meaningless concept maps



N. MITCHELL

Avoid meaningless concept maps and network graphs. For a simple reason: they include on the page too many items and abstract concepts at once. Our working memory (short-term memory) allows us to hold in memory only a few items (4-7) for a very short time (2-4 seconds) before we have to move on. Concept maps look very cool but they are also very uninformative and little information is retained from them in our long-term memory. Generally, the thing one remembers from them is their vague visual form – the shape of the graph – rather than the more important subject matter.

14 You can use small type



H_PACHECO

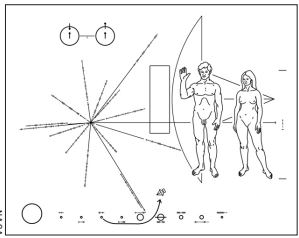
You can use small type in a big poster. Use as many sizes as needed. A range from 16-18pt to 24pt is the best size range for most text on a poster, excluding the main title and possibly the subtitle, with even smaller sizes for captions and labels. For short texts, use 24pt. Sometimes 30pt for larger text can be used. In general, imagine that you're standing 20 to 30 inches from the poster. At this distance, you should be able to read most text elements in the layout.

15 Do not screen type

Every font is a wonderful and beautiful universe unto itself. Do we really need to tinker with what is already a very sophisticated sign system? Do not reverse, screen (make tints), border, condense or expand type. Do not italicize type by pressing the “oblique” button. Use a font that already has a wide range of weights. Traditional old-style italic fonts are best to save space if needed, as they are naturally condensed and were designed for this purpose.

Do not let your text lines run longer than two-and-a-half times the alphabet – about 60 characters. Break up the big text boxes into two or more columns whenever necessary so that your measure (box width) is “measured” and correct. Do not justify text if possible, use flush left / ragged right (FL/RR).

16 Psychology of perception



NASA

Be aware of the following terms related to cognitive psychology and psychology of perception: working memory, co-construction of meaning, background knowledge, conventions of representation, cultural (visual and verbal) conventions, context, genre, the annotation layer, closure.

For more information about the terms above, read my two papers:
The Four-Second Window
http://bit.ly/Ve2mph
and
The Double Constraints of Convention and Cognition in Successful Graphic Design
http://bit.ly/12zLinL
Visit URLs to download the PDFs of the articles.

Notes:

Small Handbook of Information Design:
16 Principles for Better Data Visualizations

01 Use pencil and paper

02 Content is first

03 Do not draw graphs by hand

04 Do not enlarge numbers

05 Use words, not just images

06 Use small multiples

07 Do not bungle the meaning

08 Do not create op-art

09 Do not use little dots for numbers

10 Do not use colors (to be memorized)

11 Sort by value, not category

12 Equally space time intervals in timelines

13 Avoid meaningless concept maps

14 You can use small type

15 Do not screen type

16 Psychology of perception

Some of these principles are based in part on
Edward Tufte's books and workshops.
To print more booklets: **bit.ly/1bhDU4y**
Thanks (and apologies) to my students for showing
details from their various projects.