Implementing the Teachings of Edward Tufte

Kristy Wendt

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HANDOUTS SHOULD BE MADE TO COMPLEMENT SERIOUS PRESENTA-TIONS. The purpose of this handout is to summarize the Edward Tufte lecture on June 16th, 2016 in Chicago.

Tufte began and ended his lecture wordlessly with a clip from the Music Animation Machine project and it is one of the metaphors used for the beautiful potential of clarity in information display. Relatively large amounts of information are displayed in context; the data contains the past, present, and future, and in a short matter of time, the viewer can predict the duration, pitch and sound of the notes heard based on the visual experience of the data. This is a beautiful metaphor for the potential of immediate visual context in multiscale imaging.

Thoughtful Web Content

Deconstructing Success in the Wilderness

PLAY IN THE BIG LEAGUES in the presentation of your web content. That is, reference the sources that Tufte calls "successful in the wild:" Tufte pulls up a story from the *New York Times* and deconstructs the content display. For little data, no data graphics, clear icons, and information is adjacent in space, not stacked in time. At the bottom of the *New York Times* site is a list that Tufte notes, "appeals to every possible constituency" (Figure 2).

Always put your name on your work. Don't say "we" in presentations.

Sentences have agency. They are powerful for thinking. Stop using bullet points.

Whenever possible, get the story out of your voice and into the voice of authority.

Little data is always numbers in sentences (Figure 3).

If in doubt, pull up a *New York Times* piece, or an *ESPN* report and put it alongside your content. In N*ew York Times* graphics, the emphasis is on the highs and lows of the data, rather than x and y axis. Data is always in contextual order, never alphabetical order.

Every Meeting Begins with a Document

20% SHORTER MEETINGS OCCUR NATURALLY when you put your content adjacent in space, rather than stacked in time, and no one

Figure 1: Beautiful data is adjacent in space, not stacked in time. See Music Animation Machine: https://www.youtube.com/watch?v=OxM–mALGXc
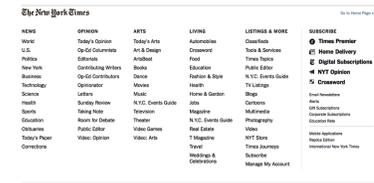
Figure 2: At the bottom of the *New York Times* is a list that Tufte notes, appeals to "every possible constituency."

Figure 3: A clip from the *New York Times* showing "little data" as numbers in sentences.

complains. Tufte recommends using an 11 X 17" paper – filling it with the information normally contained in 50-100 PowerPoint slides – and folding it in half, but we can use this template that I have modified from LaTex to accomplish similar goals. It may seem time/labor intensive, but I can help. When you document your presentation this way, every move is about content, and you accommodate everyone's cognitive style. What is important is high on the page. During a meeting, take notes when someone asks a question. Never embarrass a questioner. No meeting should exceed 24 minutes.

Evidence Decays, but Analytical Thinking is Forever

Every Move is About Content

THE ONLY CONSTANT IS CHANGE. Tufte cites "Why Most Published Research is False" Ioannidis, *PLOS* (Figure 4). There is an evidence decay cycle, and only around 1% of content ever ends up being cited. Tufte notes, "You may have a stalker, or an Assistant Professor may be citing your work for a grant, but in both cases, they are only reading your abstract. So really work on that abstract. It should clearly state what the problem is, who cares, and what you're going to do about it. Stated again: problem, relevance, solution. Work on your abstract early.

Similarly, imbue your data with longevity by focusing on 1) causality, 2) comparison (3 or 4 variables) and 3) mechanism. Look in Overleaf for LaTex (what I used to make this handout)for table templates used in *Nature*. In your presentation of data, be driven not by process, but by content. Always pre-specify your methods of display. Put information in your linking lines. Shift from pronouns to what things do.

Refer to Figure 5. The SARS graphic focuses on causality, has multiple sources and levels of data, annotated linking lines, annotated nouns (patient names with virus strain identification) and efficiency of design and credibility. Google "Links, Causal Arrows, and Networks" to view on Tufte site.

In data displays, use the most widely used graphic in human history as your metaphor - Google maps (Figure 7). In a map, the color has gray value, information is spread in space rather than stacked in time, information is not aggressively segregated from the user. There is no operating system. Nothing is segregated by mode of production. See Figure 8, next page. Use a natural color palate.

Figure 4: "Why Most Published Research Findings are False," a controversial and highly cited article by John Ioannidis.
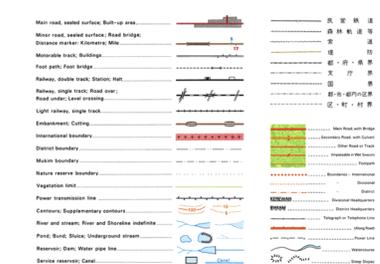

Figure 5: Maps show information with differentiated lines all the time with greater richness than art history charts and network drawings. Cartographic lines have a high-resolution and lightness and clarity, similar to typography
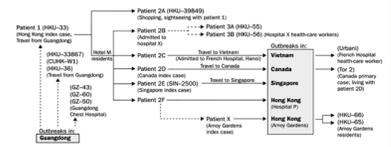
Figure 6: This practical, workaday diagram demonstrates good analytical practices in displays that use links to and arrows to tie together nouns, displays such as process, historical narratives, trees, networks, organization charts, project management charts, and the like.
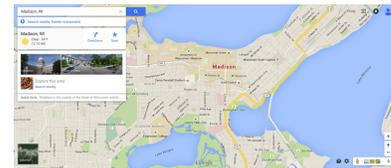
Figure 7: The metaphor is the map.

Presentation

Know Your Content, Respect your Audience

THE RULES FOR PRESENTATION IN ACADEMIC PURSUITS ARE PAR-
ALLEL TO SPECTATORSHIP and the two skills complement one an-
other. In your presentations, always provide downlinks to material.

The three dangers within your academic community are 1) stu-
pidity, 2) conspiracy, and 3) malice and in most cases the problem is
stupidity. Be as hard-headed about identifying stupidity in content as
you would be in hiring a new employee.

Your motives are no better or worse than any of your colleagues.

Do not fear negative feedback. In the evolution of *homo sapiens*,
disproportionate weight on negative feedback was necessary for
survival; we needed to act fast to potential threats. Too often, we tend
to disproportionately react to negative feedback and criticism. Take a
breath.

Remember, there are evil people in the world, but they are prob-
ably not your colleagues. Take questions, but never condescend to
the questioner. Keep in mind most questions arise from personal
concerns.

Do not be stupid. Demonstrate mastery of detail in your presen-
tations. Do not throw jargon in the air. Do not fly so high in the air.
We are all reasoning analytically. Your presentations should demon-
strate a hands-on quality. Not personal, not first-person, Follow PGP:
particular/general/particular when presenting complicated mate-
rial. Take the broad view, but don't forget to dive in and demonstrate
your mastery of some relevant detail of the content.

Know your content. In marketing, too much emphasis is placed on
knowing your audience, but great companies don't do a lot of market
research. Know your content, and respect your audience. Give your
audience endless respect. Think the best you possibly can of your
audience. You are lucky to be there. Isn't this great?

Practice intensely beforehand.

Do not pander. Tufte mentions watching some of the best online
courses at MIT, and watching professors pander to the students.
"How was everybody's weekend?" Don't do it.

Express enthusiasm, but only if your enthusiasm is real.

Use humor only if it is relevant to your content.

Finish early.
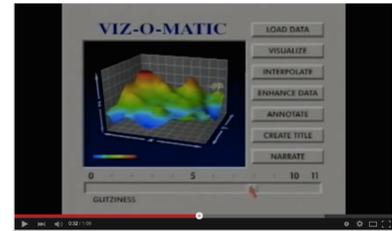
Figure 8: Wach the Viz-O-Matic video by Wayne Lytle. https://youtu.be/fP-7rhb-qMg

YOUR MOTIVES ARE NO BETTER OR WORSE THAN ANY OF YOUR COL-LEAGUES. -EDWARD TUFTE

Spectatorship

See with an Open Mind, not an Empty Head

Stay on the content. That's why you are there.

See with an open mind, but not an empty head (Figure 9). Give your undivided attention as long as you can. Loot. Don't let a contrary thought spoil the seeing, maybe you'll learn something. Sit at the back. After 2 or 3 absurdities, walk. Don't go meta. Don't be prematurely judgmental. Listen, see, think, learn.

When you present, you want people to think.

Practice data thinking. Use your best cognitive sense: what is relevant? How important is it? What problems will we work on? Learn the art of the solvable problem.

Final Comments

Analytical thinking is forever.

Annotate everything. If in doubt, use small multiples.

Small multiples are a visualization concept introduced by Edward Tufte. Tufte spent some time showing Image Quilt, which uses google search to create small multiple images.

Small multiples are:

"Illustrations of postage-stamp size are indexed by category or a label, sequenced over time like the frames of a movie, or ordered by a quantitative variable not used in the single image itself."

In other words, small multiples use the same basic graphic or chart to display difference slices of a data set. Small multiples can show rich, multi-dimensional data without trying to cram all that information into a single, overly-complex chart. Small multiples go by many names, including Trellis Chart, Lattice Chart, Grid Chart, and Panel Chart. I would even argue that sparklines are a simpler, smaller cousin of small multiples.

What problem does this solve?

Small multiples offer a few valuable features:

They allow for the display of many variables with less risk of confusing your audience. Trying to display three or more variables in a single chart is a challenge Stephen Few calls overplotting (PDF). The reader can quickly learn to read an individual chart and apply this knowledge as they scan the rest of the charts. This shifts the reader's effort from understanding how the chart works to what the data says. That's a worthy goal in all data presentation.

Small multiples enable comparison across variables and reveal the range of potential patterns in the charts.
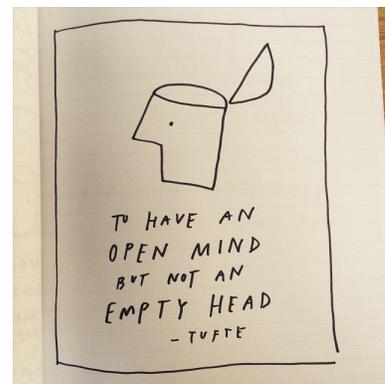

Figure 9: An open mind does not mean an empty head.
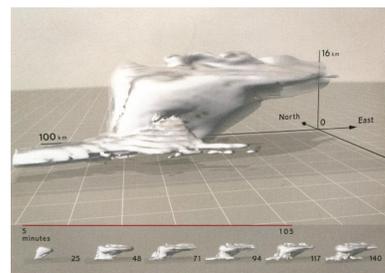
Figure 10: The classic severe storm animation from Tufte's Visual Explanations. This image was created in a collaboration between Tufte and the University of Illinois National Center for Supercomputing Applications. Posted by permission Edward R. Tufte, Visual Explanations, Graphics Press, Cheshire, CT, 1997.
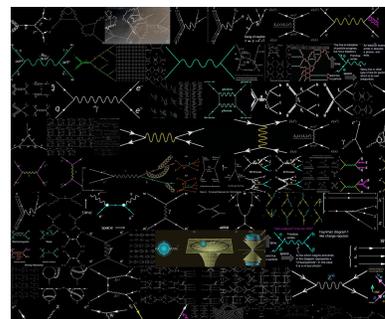
Figure 11: An image quilt of a Feynman Diagram by Adam Schwartz.