**The Visual Display of Quantitative Information 2nd edition**, Tufte Edward

Instead, graphics should be reserved for the richer, more complex, more difficult statistical material.

Graphical excellence is the well-designed presentation of interesting data - a matter of  *substance,* of *statistics* and of *design.*

Graphical excellence consists of complex ideas communicated with clarity, precision and efficiency.

Graphical excellence is that which gives to the viewer the greatest number of ideas in the shortest time with the least ink in the smallest space.

Graphical excellence is nearly always multivariate.

And graphical excellence requires telling the truth about the data.

Show data variation, not design variation.

To be truthful and revealing, data graphics must bear on the question at the heart of quantitative thinking: “Compared to what?”

Graphics must not quote data out of context.

Graphical competence demands three quite different skills: the substantive, statistical, and artistic.

Above all else show the data.

Maximize the data-ink ratio.

Erase non-data-ink.

Erase redundant data-ink.

Revise and edit.

Mobilize every graphical element, perhaps

several times over, to show the data.

More information is better than less information, especially when the marginal costs of handling and interpreting additional information are low, as they are for most graphics. The simple things belong in tables or in text; graphics can give a sense of large and complex data sets that cannot be managed in any other way.

Small multiples are inherently multivariate, like nearly all interesting problems and solutions in data analysis.

Aren’t data wonderful?

*“The idea is to be approximately right rather than exactly wrong.”* John Tukey

For non-data-ink, less is more.

For data-ink, less is a bore.

Graphical elegance is often found in simplicity

of design and complexity of data.

The basic structures for showing data are the sentence, the table, and the graphic. Often two or three of these devices should be combined.

Tables are clearly the best way to show exact numerical values although the entries can also be arranged in semi-graphical form.

Words and pictures belong together. Viewers need the help that words can provide. Words on graphics are data-ink, making effective use of the space freed up by erasing redundant and non-data-ink. It is nearly always helpful to write little messages on the plotting field to explain the data, to label outliers and interesting data points, to write equations and sometimes tables on the graphic itself, and to integrate the caption and legend into the design so that the eye is not required to dart back and forth between textual material and the graphic.

Data graphics are paragraphs about data and should be treated as such.

* If the nature of the data suggests the shape of the graphic, follow that suggestion.
* Otherwise, move toward horizontal graphics about 50 percent wider than tall:

Design is choice.

What is to be sought in designs for the display of information is the clear portrayal of complexity. Not the complication of the simple; rather the task of the designer is to give visual access to the subtle and the difficult - that is,

the revelation of the complex.

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